

Automotive Electrics and Electronics



Motor Management



Networked Systems, Safety and Comfort



Transmission, Brakes and Chassis

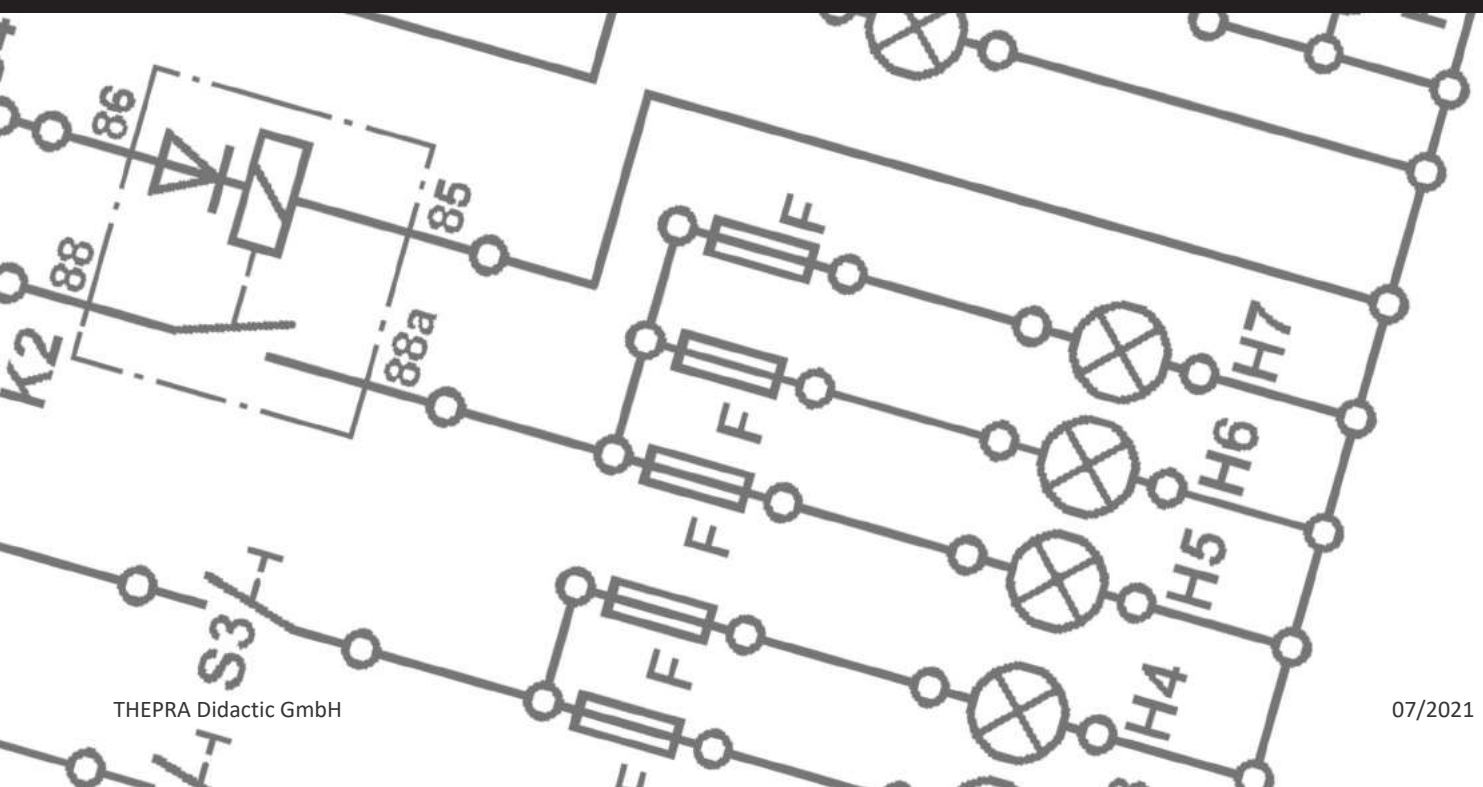


E-Mobility



Training Packages General Basics

Automotive Training



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Automotive Electrics and Electronics

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Item no. 12 020 110

Manual 60 pages	
Digital work orders	
266 x 100 x 297 mm	
10 V - 15 V DC (3 A)	
EQF level	

Automotive Electrics Trainer

Compact, versatile learning system for automotive electrics - basic laws and circuit diagnosis. All components can be freely wired according to real automotive electrical circuits.

Features

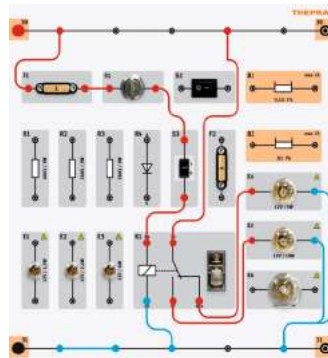
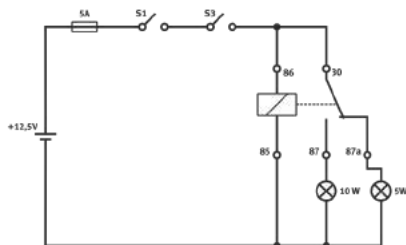
- Clear display of the available components with coloured imprints
- Wire any circuits - just like with conventional plug-in modules
- Electronically protected components
- Extensive digital worksheets available for Electude e-learning system

Learning content

- Getting to know electrical components and symbols according to equipment
- Interpreting electrical laws in vehicle-related circuits
- Multimeter as a measuring device

Equipment

- Laboratory trainer in desk housing for use on the table or in the DIN-A4 support frame.
- 3 x various switches, 2 x fuse, 2 x precision shunt, 6 x automotive lamps, 3 x resistor, diode, relay
- 49 x connection sockets for wiring and measuring, 4 x sockets for power supply

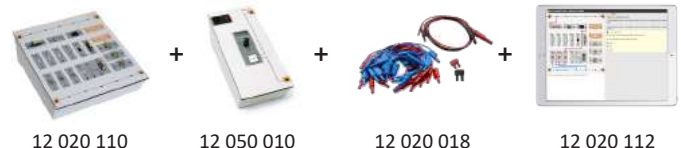


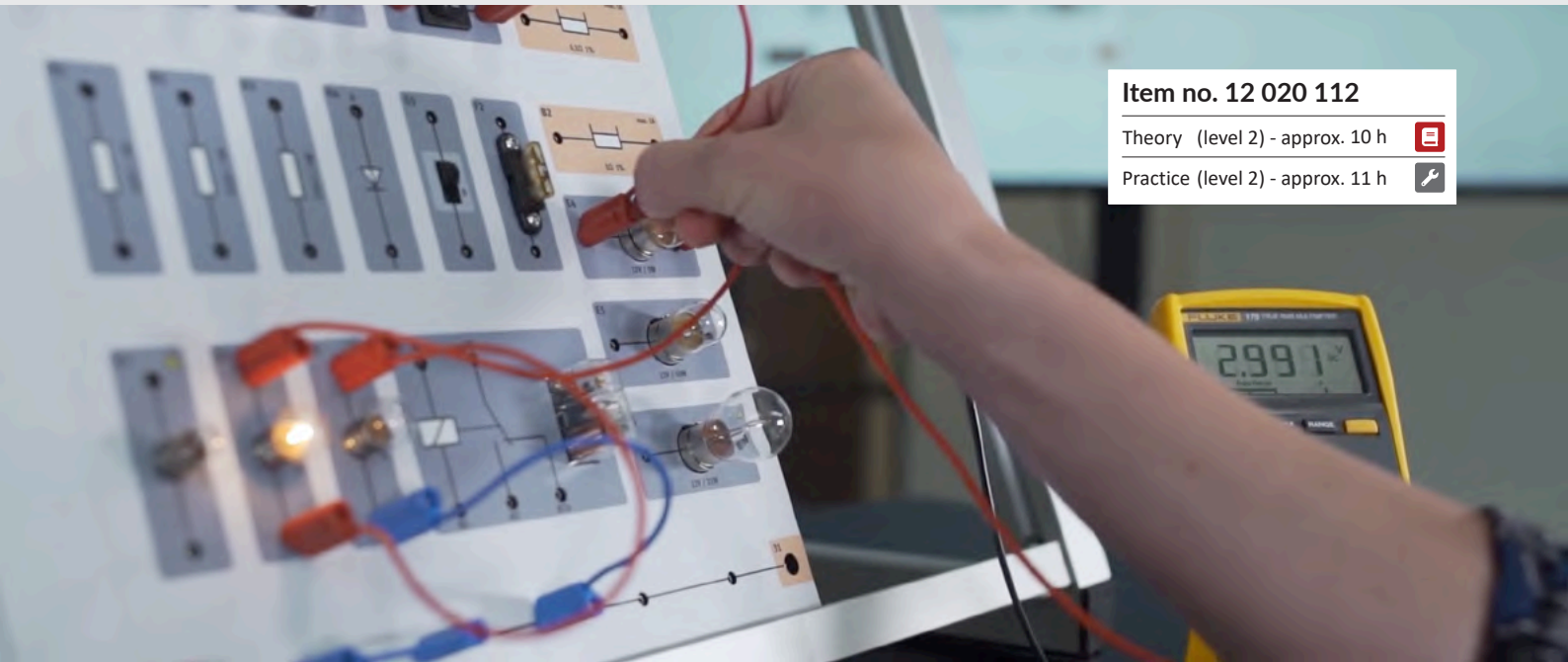
Recommended accessories

- Cable set Lab trainer 2mm
- Power supply TS10

Also available as training package: Item no. 14 025 020

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.





Item no. 12 020 112

Theory (level 2) - approx. 10 h

Practice (level 2) - approx. 11 h

Digital work orders Automotive Electrics Trainer

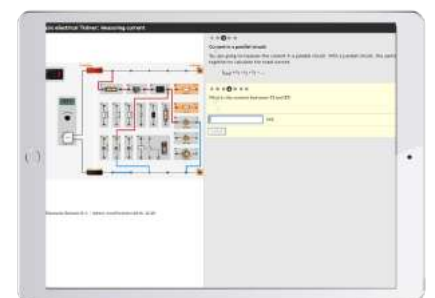
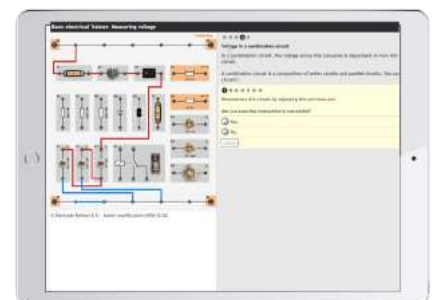
After completing the practical tasks, you will be able to: plug in different circuits; identify components of an electric circuit; explain processes in electric circuits; assign circuit symbols; carry out measurements in different circuits.

Preliminary theory *

- Basics of electrics, resistance, coil, capacitor, diode
- Multimeter: Volt measurement, Ohm measurement, Ampere measurement, Automatic range selection.
- Ohm's law, Kirchhoff's first law
- Series circuits, parallel circuits

Practical tasks

- Introduction, Setting up series circuits, Setting up parallel circuits, Setting up mixed circuits
- First measurements, Measuring voltage, Measuring current, Measuring resistance
- Electrical power
- Resistance circuits
- Lamp circuits
- Relay circuits
- Circuits with diode



Have you tried it?



Course layout

Level **2** 9h 57m 11h 11m

Licence: You acquire a user licence for any number of students and teachers with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.



Item no. 12 020 150

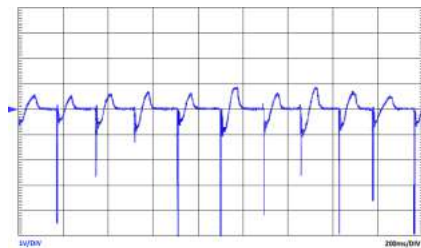
Manual 68 pages	
Digital work orders	
266 x 120 x 297 mm	
10 V - 15 V DC (3 A)	
EQF level	

Automotive Sensors Trainer

Compact, versatile learning system for automotive sensor technology - diagnostic basics. All components can be freely wired according to real automotive electrical circuits.

Features

- Clear display of the available components with coloured imprints
- Wire any circuits - just like with conventional plug-in modules
- Electronically protected components
- Extensive digital worksheets available for Electude e-learning system



Equipment

- Laboratory trainer in desk housing for use on the table or in the DIN-A4 support frame.
- 2 x fuse, switch, 5 V DC voltage source, piezo sensor as knock sensor, hot film sensor, induction sensor, Hall sensor and encoder wheel
- 2 x precision shunt, pulse-width frequency generator to control encoder wheel, 2 x temperature-dependent semiconductor resistors (NTC, PTC)
- 3 x resistors, potentiometer, NPN power transistor, photo resistor, lamp, photo diode/photo element, pressure/force sensor
- 54 x connection sockets for wiring and measuring, 4 x sockets for power supply

Learning content

- Getting to know vehicle-typical sensors according to equipment
- Interpret sensor-typical voltage values in vehicle-related circuits
- Multimeter and oscilloscope as measuring instruments

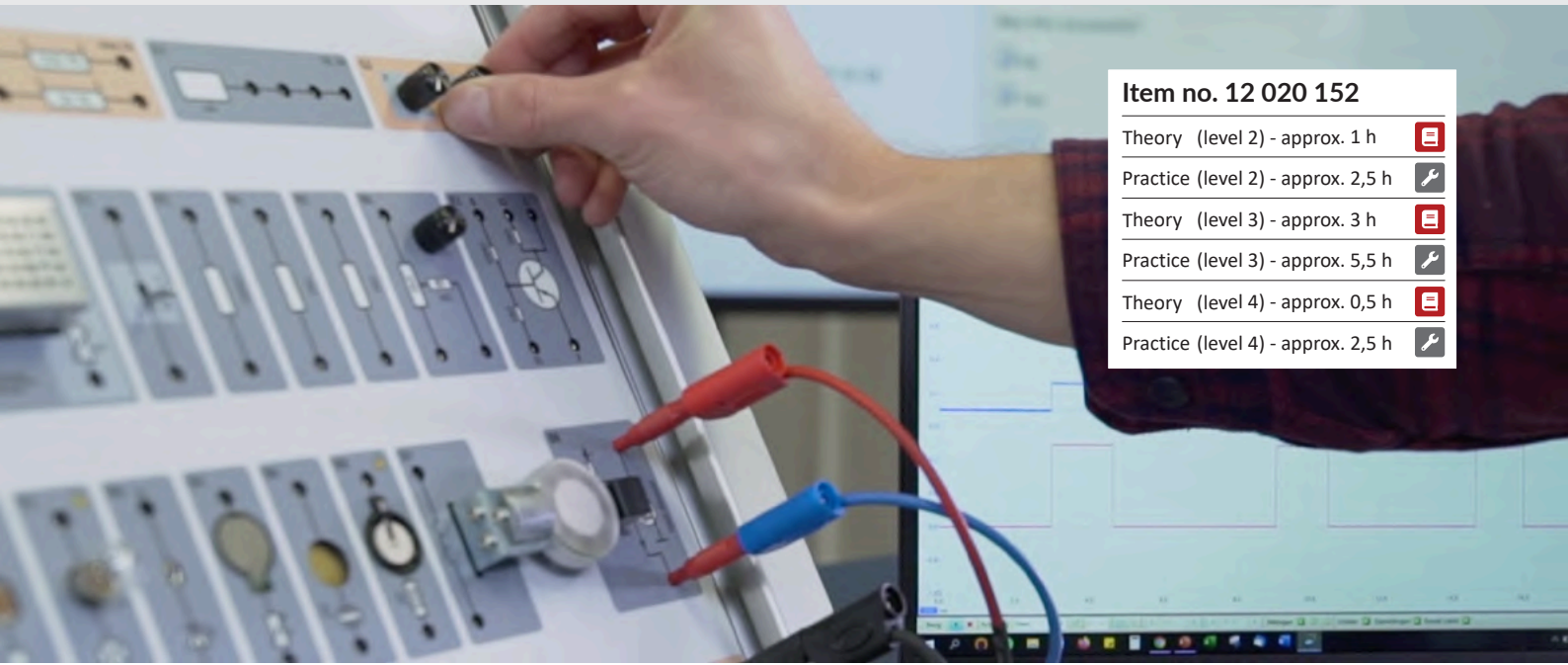
Recommended accessories

- Cable set Lab trainer 2mm
- Power supply TS10

Also available as training package: Item no. 14 025 210

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.





Item no. 12 020 152	
Theory (level 2) - approx. 1 h	
Practice (level 2) - approx. 2,5 h	
Theory (level 3) - approx. 3 h	
Practice (level 3) - approx. 5,5 h	
Theory (level 4) - approx. 0,5 h	
Practice (level 4) - approx. 2,5 h	

Digital work orders Automotive Sensors Trainer

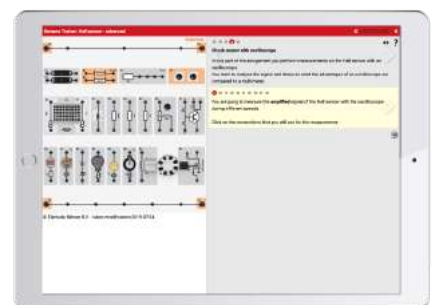
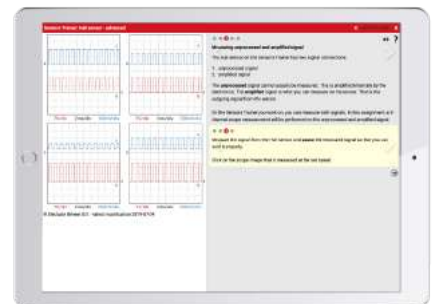
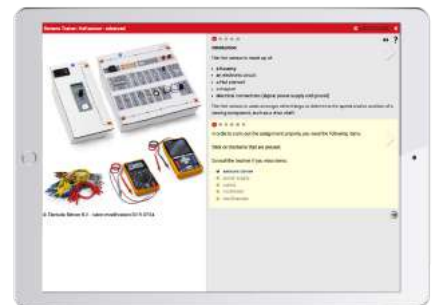
After completing the practical exercises, you will be able to: recognise sensors, explain how sensors work, name the field of application of sensors, check sensors, explain measurement results, set up circuits, carry out measurements on the electrical circuits.

Preliminary theory *

- Inductive sensor
- Negative and positive temperature coefficient
- Accelerator pedal position sensor
- Camshaft position sensor
- Photo resistor
- Transistor
- Photo resistor

Practical tasks

- NTC sensor
- PTC sensor
- Inductive sensor
- Potentiometer
- Sensors and signals
- Inductive sensor
- Hall sensor
- Piezo sensor
- LDR
- Circuit automatic
- Light switching
- Coupling NTC sensor



Try it out now!



Video



Demo

Course layout

Level 2	52m	2h 38m
Level 3	3h 12m	5h 32m
Level 4	6m	2h 19m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.



Item no. 12 020 160

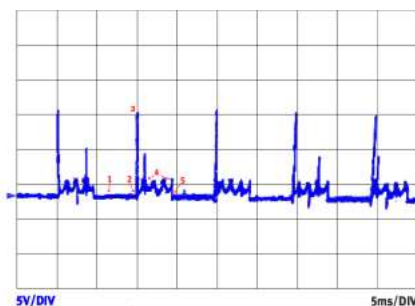
Manual 57 pages	
Digital work orders	
266 x 120 x 297 mm	
10 V - 15 V DC (3 A)	
EQF level	2 3 4

Automotive Electronics and Actuators Trainer

Compact, versatile learning system for automotive electronics and actuators. All components can be freely wired according to real automotive electrical circuits.

Features

- Clear display of the available components with coloured imprints
- Wire any circuits - just like with conventional plug-in modules
- Electronically protected components
- Extensive digital worksheets available for Electude e-learning system



Equipment

- Laboratory trainer in desk housing for use on the table or in the DIN-A4 support frame.
- 2 x fuse, switch, 2 x precision shunt, pulse width frequency generator for simulation of control units
- 5 V DC voltage source, capacitor, 3 x resistors, potentiometer, rectifier diode, Z-diode, thyristor
- NPN transistor, field-effect transistor, 2 x lamps, relay, proportional solenoid valve, collector motor
- 65 x connection sockets for wiring and measuring, 4 x sockets for power supply

Learning content

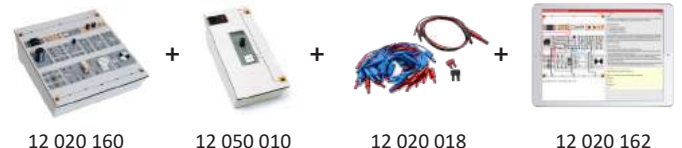
- Getting to know vehicle-typical electronic components and actuators according to equipment
- Interpret typical voltage values in vehicle-related circuits
- Multimeter and oscilloscope as measuring instruments

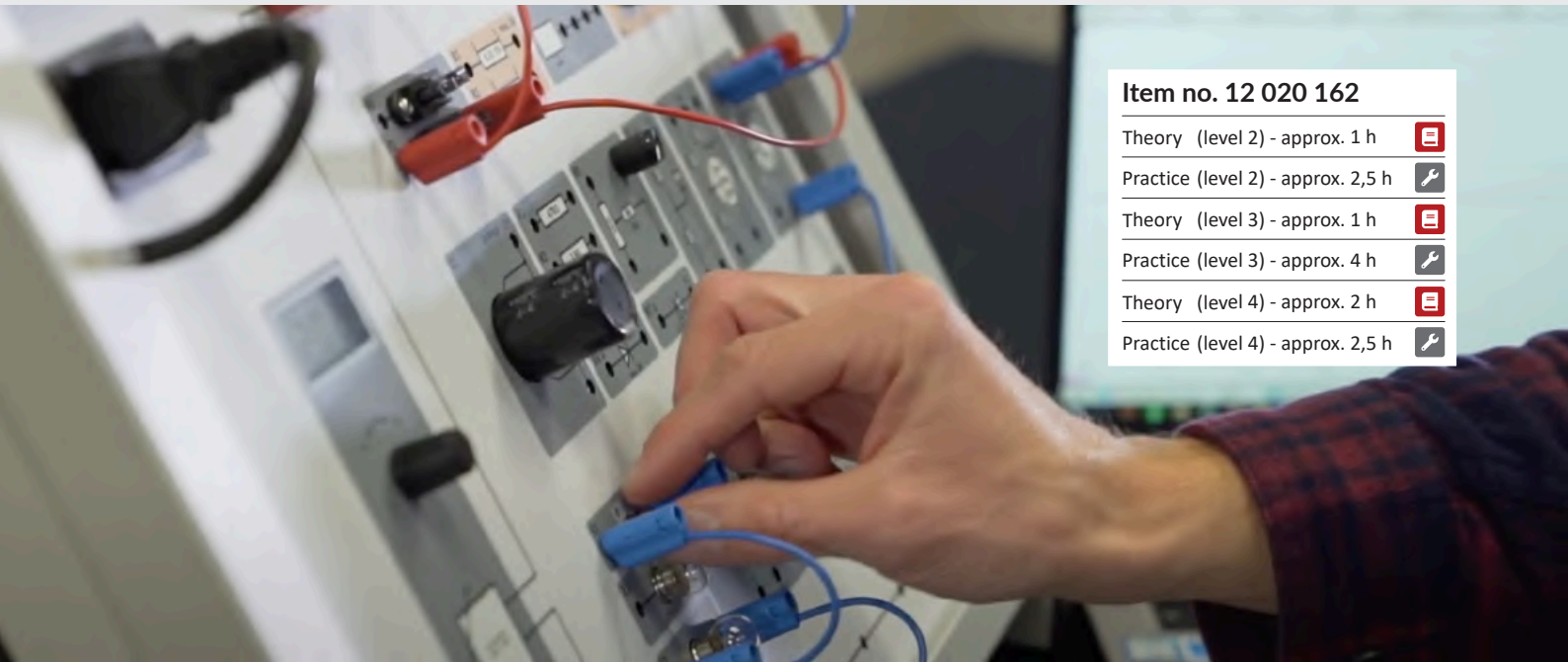
Recommended accessories

- Cable set lab trainer 2mm
- Power supply TS10

Also available as training package: Item no. 14 025 220

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.





Item no. 12 020 162	
Theory (level 2) - approx. 1 h	
Practice (level 2) - approx. 2,5 h	
Theory (level 3) - approx. 1 h	
Practice (level 3) - approx. 4 h	
Theory (level 4) - approx. 2 h	
Practice (level 4) - approx. 2,5 h	

Digital work orders Electronics and Actuator Trainer

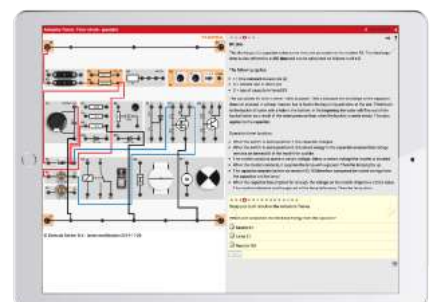
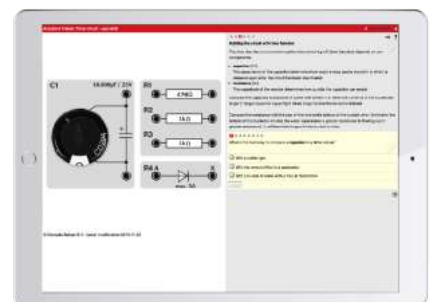
After working through the practical exercises, you will be able to recognise actuators, explain how actuators work, explain the field of application of actuators, check actuators, analyse measurement results, set up circuits, carry out measurements on the electrical circuits.

Preliminary theory *

- Relay
- Diode
- Zener diode
- Pulse width modulation
- Capacitor
- Photo resistor

Practical tasks

- Relay
- Diode testing with a multimeter
- Diode test with a lamp
- Zener diode
- Structure of lighting circuit
- Timer switch
- Electric motor and shunt resistor



Try it out right away!



Course layout

Level 2	44m	2h 32m
Level 3	1h 09m	4h 01m
Level 4	1h 47m	2h 39m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

18 x faults
switchable



Item no. 12 020 210

Manual 107 pages	
Digital work orders	
266 x 120 x 297 mm	
10 V - 15 V DC (3 A)	
EQF level	2 3

Multimeter Diagnosis Trainer

Innovative laboratory trainer for learning the electrical and electronic basics for safe use of the multimeter. Automotive reference with three typical, simple circuits for automotive lamps: conventional, with relay, with transistor.

Features

- Automotive reference with three typical, simple circuits for automotive lamps: conventional, with relay, with transistor.
- Six individual faults can be selected in each circuit via rotary switch
- 47 measuring sockets are available for troubleshooting and voltage drop measurements
- Colour-printed circuits in standard-compliant representation

Learning content

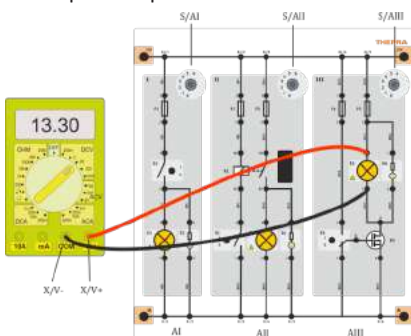
- Getting to know typical lamp circuits
- Using the multimeter to measure voltage
- Measuring at the right place in the wiring harness
- Interpret measured voltages correctly and thus identify the actual cause of a fault
- Using partial voltage measurements in intact and defective circuits as a diagnostic method
- Create and evaluate setpoint/actual value protocols

Equipment

- Laboratory trainer in desk housing for use on the table or in the DIN-A4 support frame.
- 3 x rotary switches with seven positions for errors, 3 x toggle switches for on/off
- 3 x car lamp sockets fitted with 10 W lamps (12 V), 3 x LED, 1 x relay
- 47 x measuring sockets, 4 x sockets for power supply
- Detailed documentation and extensive worksheets for teachers and students

Recommended accessories

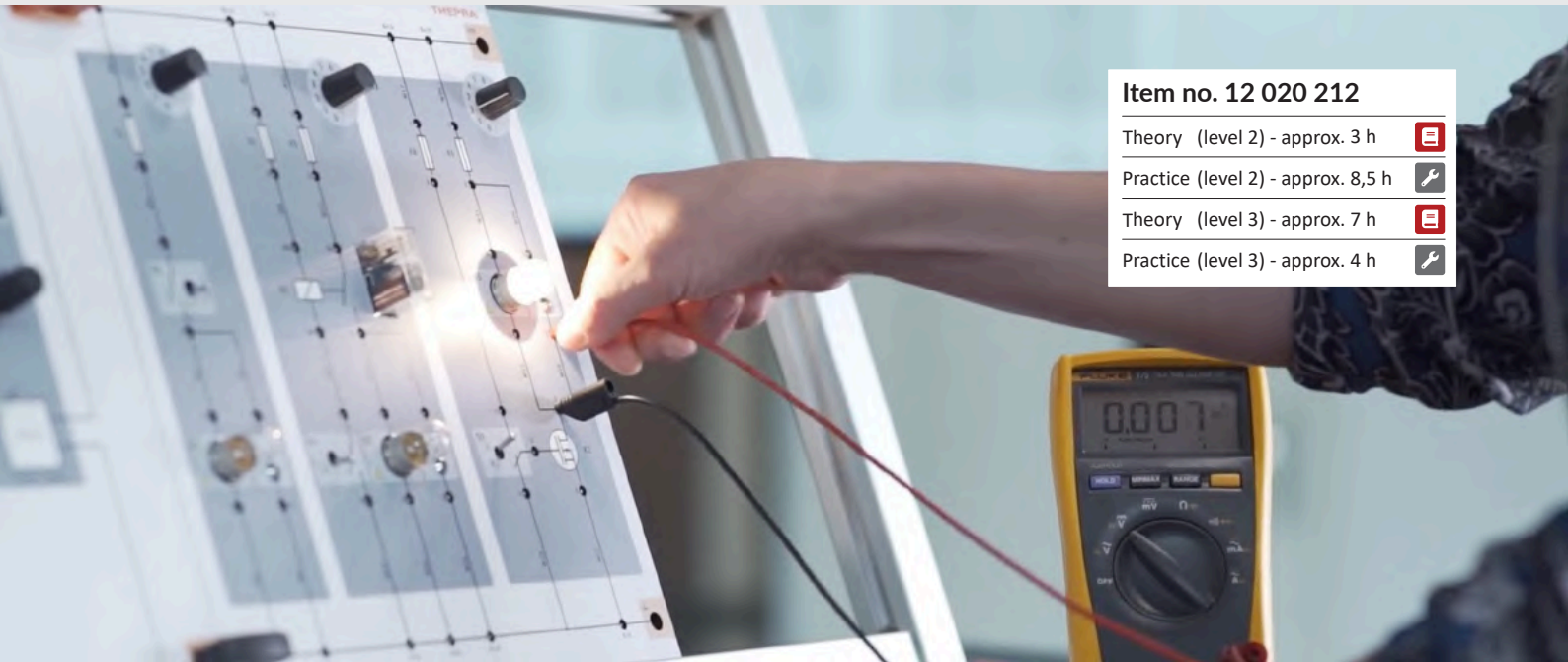
- Power supply TS10



Also available as a training package: Item no. 14 025 060

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.





Item no. 12 020 212	
Theory (level 2) - approx. 3 h	
Practice (level 2) - approx. 8,5 h	
Theory (level 3) - approx. 7 h	
Practice (level 3) - approx. 4 h	

Digital work orders Multimeter Diagnosis Trainer

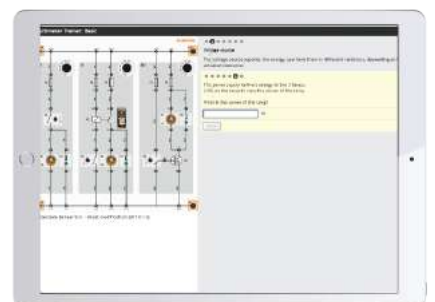
In this course you will learn how to troubleshoot a simple circuit, a relay circuit and a transistor circuit with MOSFET.

Preliminary theory *

- Basics of electrics
- Ground and positive connection
- Kirchhoff's first law
- Multimeter: Automatic measuring range selection
- Magnetism, relay
- Ohm's law
- Power law according to Watt
- Resistance, transistor

Practical tasks

- Basic: Basics, Guided troubleshooting 1, Malfunction 2, 3, 4, 5, 6
- Relay: basics, guided troubleshooting 1, malfunction 2, 3, 4, 5, 6
- MOSFET: in-depth, Guided troubleshooting 1, malfunction 2, 3, 4, 5, 6



Try it out right away!



Video



Demo

Course layout

Level 2	3h 03m	4h 13m
Level 3	7h 10m	3h 55m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

12 x faults
switchable



Item no. 12 020 220

Manual 93 pages



266 x 120 x 297 mm



110 V - 240 V AC



EQF level



Oscilloscope Diagnosis Trainer

Innovative laboratory trainer for the development of the electrical and electronic basics for the safe use of the oscilloscope. Sinusoidal, square-wave and pulse-width modulated control of components, automotive reference with two classic components: Heating resistor and electric motor.

Features

- Sinusoidal, square-wave and pulse-width modulated control of components
- Automotive reference with two classic components: Heating resistor and electric motor
- Six individual faults each selectable via rotary switch for both components
- 35 measuring sockets are available for troubleshooting and measurement
- Colour-printed circuits in standard-compliant representation

Learning content

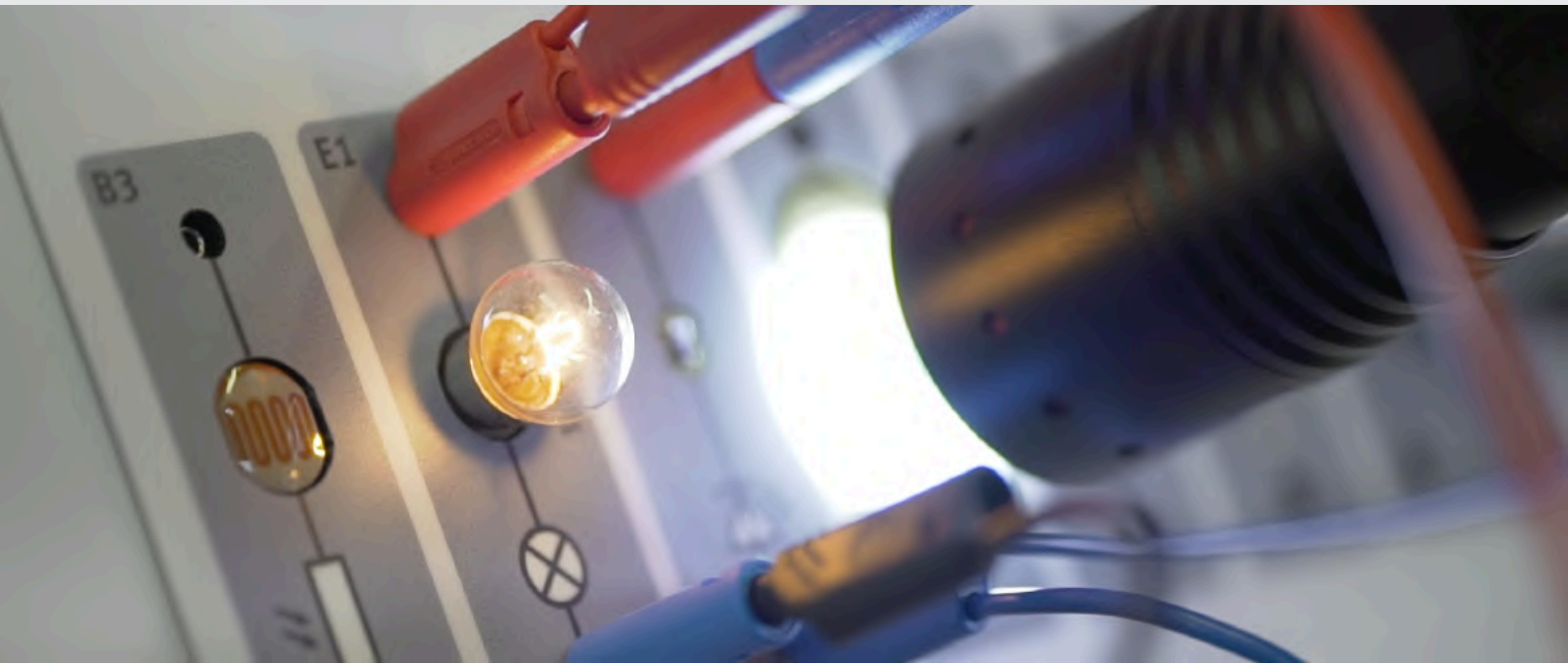
- With the help of sine and square wave signals, you will work on the basics of the effective value (RMS) and learn how to use your measuring device.
- How to use the oscilloscope for voltage measurement
- Measuring at the right place in the wiring harness
- Evaluate measured signals correctly and thus recognise the actual cause of a fault
- Use partial voltage measurements in intact and defective circuits as a diagnostic method

Equipment

- Laboratory trainer in a desk housing for use on a table or in a DIN-A4 support frame
- 2 x signal generator with two controllers each
- 1 x rotary switch with seven positions for errors
- 1 x car lamp socket equipped with 10 W lamp (12 V), 1 x heating resistor with LED, 1 x electric motor
- 35 x measuring sockets, 110 V - 240 V AC power supply
- Detailed documentation and extensive worksheets for teachers and students

Recommended accessories

- Measuring cable BNC to 2mm for lab trainer 150cm



Laboratory Trainer Accessories

Power supply TS10

This power supply fits all THEPRA laboratory trainers. It offers a variable 4-15 V DC voltage output at I_{max} 6 A.



Item no. 12 050 010

Table frame DIN A4

Aluminium design, suitable for all THEPRA laboratory trainers with console housings. Various dimensions available.



Item no. 12 090 405

HV accessory set universal

Accessory set for safe work on high-voltage vehicles and teaching equipment. The case contains gloves, voltage testers, etc.



Item no. 38 066 050

Metrahit H+E Car-Set

Test case kit with: Metrahit 27 in protective rubber cover orange, test probes, 1 pair of test leads 2 m, 1 pair of Kelvin test leads with crocodile clips



Item no. 16 162 150

Digital multimeter Fluke 175

Universal digital multimeter with outstanding technical capabilities. Simple operation, TrueRMS true effective value.



Item no. 16 062 014

PicoScope 2-Channel Starter Set

USB oscilloscope 2-channel for car diagnosis. The set includes the oscilloscope, the software and common test leads.



Item no. 16 152 040

20 x faults
switchable



Item no. 14 020 100

Manual 123 pages	
Digital work orders	
71 x 110 x 178 cm	
13,8 V DC (40 A)	
EQF level	

Starter Set T-Varia Lighting

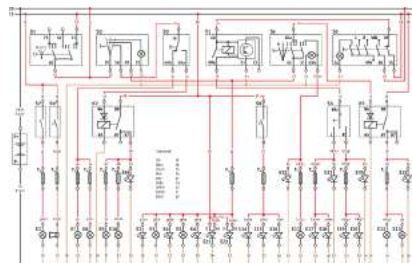
The basic equipment of the modular training systems for T-Varia Connect. This is ideal for assembling individual components into a complete system. Here, trainees learn to create and read circuit diagrams, assign terminal designations and wire the system in a functional way.

Features

- Wiring of all original automotive components according to circuit diagrams
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults into the circuit structure
- Additional integrated fault circuit with 20 faults, lockable with cover
- Use of workshop-standard test equipment for diagnosis and troubleshooting.
- All connections in 4mm / 6mm safety version for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

The starter set contains

- T-Varia cart in aluminium design (item no. 11 010 020)
- T-Varia front lighting (item no. 11 011 050)
- T-Varia controls with 20 switchable faults (item no. 11 012 050)
- T-Varia rear lighting (item no. 11 013 050)
- Cable set, various lengths and colours (item no. 11 035 170)
- Power supply 3-15 V, 40 A (item no. 10 138 100)

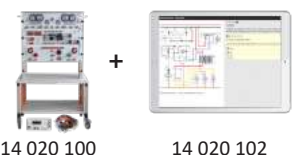


Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

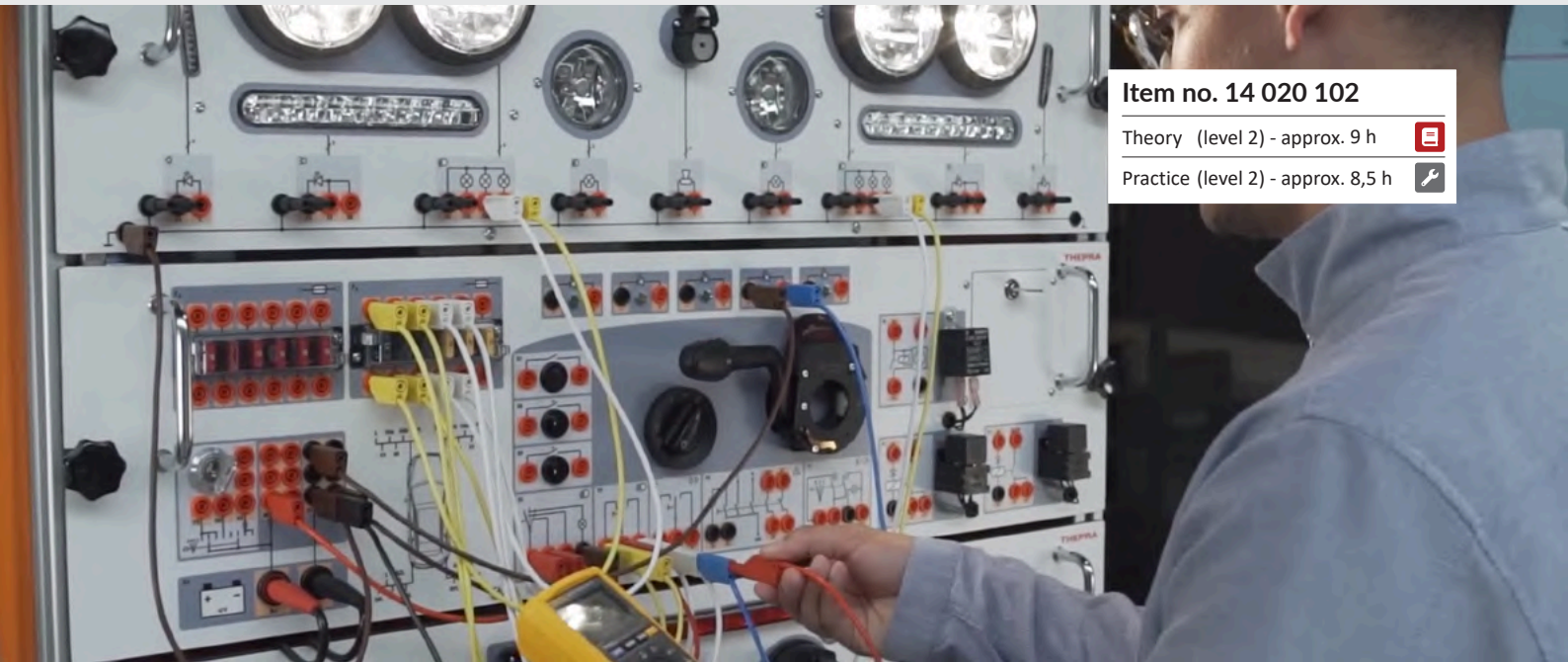
Also available as a training package: Item no. 14 025 070

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



14 020 100

14 020 102



Item no. 14 020 102

Theory (level 2) - approx. 9 h

Practice (level 2) - approx. 8,5 h

Digital work orders T-Varia Lighting

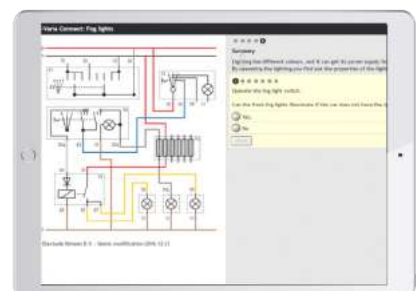
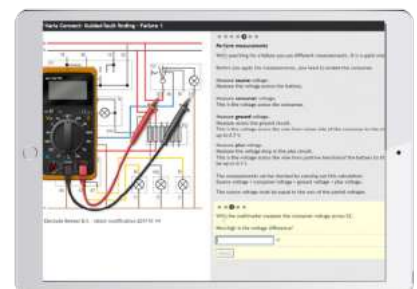
After completing the digital work assignments, you will be able to: Identify the structure of a lighting system. Explain the function of the different lighting components. Perform a measurement on a lighting system and evaluate it. Perform a diagnosis on a lighting system.

📖 Preliminary theory *

- Basics of electrics, resistance, Ohm's law
- Multimeter: Automatic measuring range selection
- Series circuits
- Parallel circuits
- Power law according to watts
- Relays, lighting, light sources
- Rear lamps, headlamps, bend lighting
- Legal regulations for the lighting system (UNCE)

🔧 Practical tasks

- Parking light / tail light
- Low beam / High beam
- Daytime running light
- Brake light, reversing light and horn
- Fog light
- Indicator light
- Guided troubleshooting: 1, 2
- Fault 1, 2, 3, 4, 5, 6, 7



Have you tried it yet?



Course layout



Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

Item no. 11 011 050

Manual 16 / 123 pages



Digital work orders



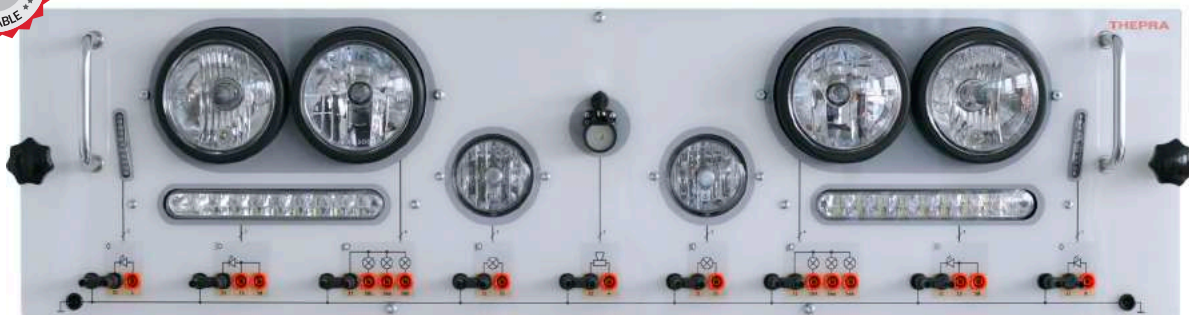
25 x 96 x 25 cm



13,8 V DC (40 A)



EQF level



T-Varia Front Lighting

With this module panel, you can expand your T-Varia system to include the common front lights of a modern car. In conjunction with one of the control panels such as „Controls“ or "Bus basics", this unit can be controlled and connected according to the circuit diagram.

Features

- Wiring of all original automotive components in accordance with circuit diagrams
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults into the circuit diagram, also combined with fault circuitry of the system panel "control panels"
- Use of workshop-standard inspection and test equipment for diagnosis and troubleshooting.
- 32 x connections in 4mm safety version, 4 x with jumper plugs for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, as well as rear cover.
- 2 x double headlamps with H7 bulb for high beam and H4 bulb for low beam. And one lamp each 12V 5W (W5W) in glass base design for parking light.
- 2 x modern fog lights in clear glass version with free-form reflectors and H3 bulbs.
- 2 x daytime running light lamps in LED version
- 2 x modern indicator lamps in LED version orange
- 1 x horn electronic






Recommended as part of the starter set: Item no. 14 020 100

The ideal system for getting to know the complex interplay of electrical and electronic vehicle components in a practical way using original components: The T-Varia Connect Starter Set Lighting Conventional.



14 020 100

Item no. 11 012 050

Manual 123 pages	
Digital work orders	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	

20 x faults
switchable



T-Varia Controls

This module panel is the centre of your T-Varia system in the area of conventional central electrics. The combination with other system panels enables versatile variants and expansion stages for controlling components that are connected according to the circuit diagram.

Features

- Wiring of all original automotive components in accordance with circuit diagrams
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults into the circuit structure
- Additional integrated fault circuit with 20 faults, lockable with cover
- Use of workshop-standard test equipment for diagnosis and troubleshooting.
- 85 x connections in 4mm safety version, including 2 x with 6mm safety version, for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, and rear cover
- 2 x fuse box with 12 car fuses for protecting the respective circuits
- 1 x ignition lock with three switch positions
- 1 x light switch for parking light, driving light, fog light and rear fog light with integrated control light
- 1 x steering column switch with indicator switch for left / right, switching between high and low beam, hazard warning switch with integrated control lamp
- 2 x push-button switches for e.g. horn, brake lights, 1 x rocker switch for e.g. reversing lights
- 1 x flasher relay standard version, 2 x working relay switch version

- 5 x indicator lights in red, green, yellow and blue
- Lockable fault switch box with 20 jumper plugs for interruption or for insertion of transition or load resistor

Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Recommended as part of the Starter Set: Item no. 14 020 100

The ideal system for getting to know the complex interplay of electrical and electronic vehicle components in a practical way using original components: The T-Varia Connect Starter Set Lighting Conventional.



14 020 100

Item no. 11 013 050

Manual 15 / 123 pages



Digital work orders



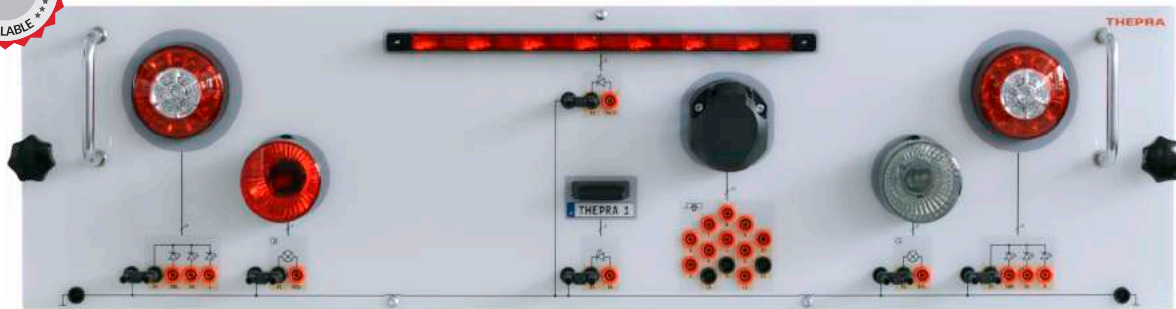
25 x 96 x 25 cm



13,8 V DC (40 A)



EQF level



T-Varia Rear Lighting

With this module panel, you can expand your T-Varia system to include the common rear lights of a modern car. In conjunction with the "Controls" or "Bus basics" control panel, this unit can be controlled and connected according to the circuit diagram.

Features

- Wiring of all original automotive components according to circuit diagrams
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults in the circuit diagram, also combined with fault circuit of the system panels "controls"
- Use of workshop-standard inspection and test equipment for diagnosis and troubleshooting.
- 33 x connections in 4mm safety version, 2 x of which with jumper plugs for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, as well as rear cover
- 2 x rear lights in modern LED design with rear light, brake light and indicator functions
- 1 x number plate light in LED version, 1 x third brake light, 1 x rear fog light in modern clear-glass version, 1 x reversing light in modern clear-glass version
- 1 x trailer socket in 13-pin version

Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.





Recommended as part of the Starter Set: Item no. 14 020 100

The ideal system for getting to know the complex interplay of electrical and electronic vehicle components in a practical way using original components: The T-Varia Connect Starter Set Lighting Conventional.

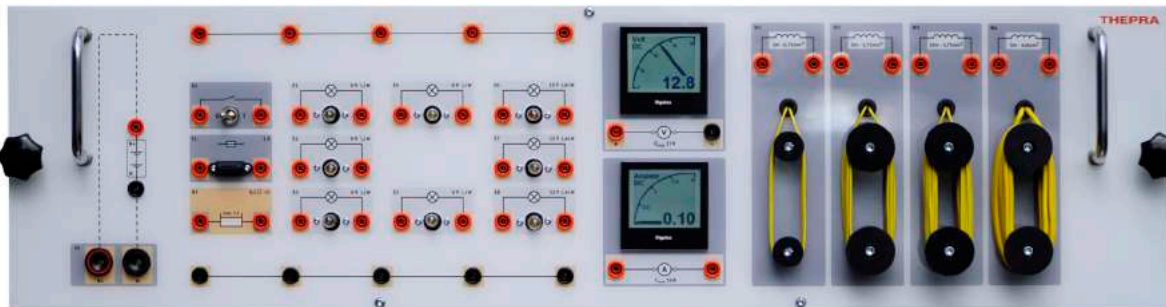


14 020 100

Item no. 11 014 050

Manual 61 pages	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	

2 x integrated measuring devices
also for use with the Starter Set



T-Varia Basic Circuits

This theme panel serves as an introduction to the practical exercises with the T-Varia product family. The students connect different wattage automotive lamps in series and in parallel, and examine the influence of cable lengths and cross-sections, also in conjunction with the "Front lighting" lighting panel.

Features

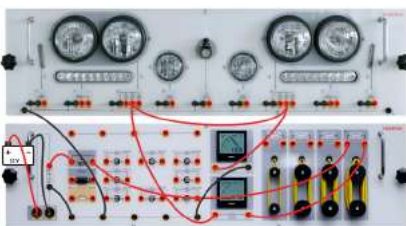
- Wiring according to simple circuit diagrams
- Integrated measuring devices and various cable runs
- 46 x connections in 4mm safety version, for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, and rear cover
- 2 x integrated measuring devices with display for voltage and current
- 4 x cable lengths of different lengths in 0.75qmm and 4.0qmm
- 3 x car lamp 4V, 2 x car lamp 6V, 3 x car lamp 12V
- 1 x car fuse, 1 x rocker switch, 1 x precision shunt
- Cable set complete with matching laboratory cables in safety version

Learning content

- Basic electrical circuits, series connection, parallel connection, mixed circuits, voltage losses.
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.



Voltage drop across cable section at main beam

Recommended as a supplement to the Starter Set: Item no. 14 020 100






The ideal system for getting to know the complex interplay of electrical and electronic vehicle components in a practical way using original components: The T-Varia Connect Starter Set Lighting Conventional.

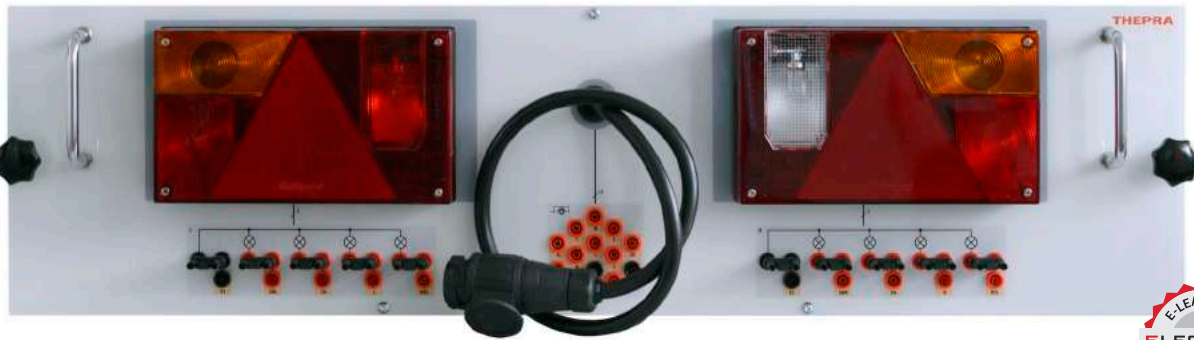


14 020 100

Keyword:
Retrofit

Item no. 11 027 050

Manual 36 pages	
Digital work orders	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	



T-Varia Trailer

T-Varia Connect is ideal for connecting individual components to form a complete system. Here, trainees learn to create and read circuit diagrams, assign terminal designations and plug in the system accordingly.

Features

- Wiring of all original automotive components in accordance with circuit diagrams
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults in the circuit layout
- Use of workshop-standard inspection and test equipment for diagnosis and troubleshooting
- 43 x connections in 4mm safety version, 10 x of which with jumper plugs for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Learning content

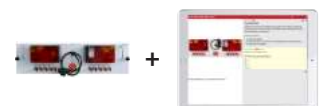
- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- 2 x trailer tail light (left/right) with the functions tail light, brake light, indicator, number plate light, rear fog light and reversing light
- 1 x trailer plug with 50cm cable for connection with T-Varia rear lighting
- Cable set complete with matching laboratory cables in safety version

Also available as a training package: Item no. 14 025 120

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



11 027 050

11 027 052



Item no. 11 027 052

Theory (level 2) - approx. 1,5 h

Practice (level 2) - approx. 1 h

Digital work orders T-Varia Trailer

After completing the practical tasks, you will be able to: identify trailer socket terminal designations, match different trailer lights, recognise different trailer sockets, read the wiring diagram for the trailer socket, connect the trailer socket.

Preliminary theory *

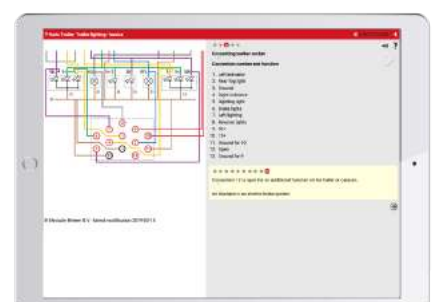
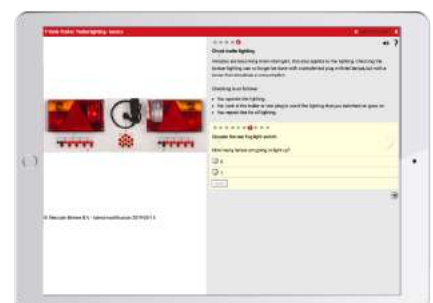
- Lighting
- Light sources

Practical tasks

- Trailer lighting

Course layout

Level **2** 1h 20m 1h 13m



Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

Item no. 11 016 050

Manual 34 pages



25 x 96 x 25 cm



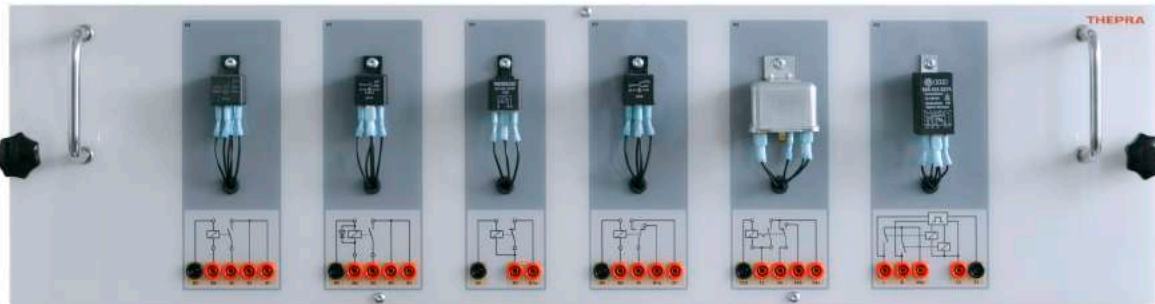
13,8 V DC (40 A)



EQF level



*7 x additional circuits
when supplemented
with the Starter Set*



T-Varia Relay Circuits

With this theme panel, numerous basic circuits of the lighting panels are supplemented with additional relays. The relays most frequently found in a modern vehicle are used. In addition to the extensive wiring according to circuit diagrams, the comfort indicator function further enhances the basic analogue equipment.

Features

- Wiring of all original vehicle components according to wiring diagrams
- Retrofitting of comfort indicator relays
- Practical use of the most common relays
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults in the circuit design
- Use of standard workshop test equipment
- 28 x terminals in 4mm safety version, for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, and rear cover
- 1 x relay type normally open
- 1 x relay type normally open with free-wheeling diode
- 1 x relay type NC
- 1 x relay type change-over
- 1 x relay type driving lamp
- 1 x relay type comfort indicator
- Cable set complete with matching laboratory cables in safety version

Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.





Recommended as a supplement to the Starter Set: Item no. 14 020 100

The ideal system for getting to know the complex interplay of electrical and electronic vehicle components in a practical way using original components: The T-Varia Connect Starter Set Lighting Conventional.



14 020 100

Item no. 11 020 150

Manual 75 pages	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	

6 x faults
switchable



T-Varia Wiper

With this theme panel, you can add a conventional windscreen wiper system to your T-Varia system. The system is an ideal supplement to the conventional basic equipment and includes front and rear wipers, interval relays and the washer pump. 6 different faults can be connected.

Features

- Wiring of all original automotive components according to circuit diagrams
- Quick and easy hidden insertion of practical faults into the circuit diagram, additional 6 x fault switches in lockable box
- 41 x connections in 4mm safety version, for wiring and measuring
- Use of workshop-standard testing and checking devices
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions
- Also suitable for individual use



Integrated fault switches

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Version with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- 1 x original front wiper motor with lever gearbox
- 1 x original rear wiper motor
- 1 x original steering column switch
- 1 x original relay / control unit for wiper-washer-interval automatics
- 1 x original wiper/washer pump
- Switchable electronic drive signal
- 2 x fuses, 6 x fault switches in lockable box
- Cable set complete with matching laboratory cables in safety version

Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Item no. 11 022 050

Manual 29 pages



25 x 96 x 25 cm



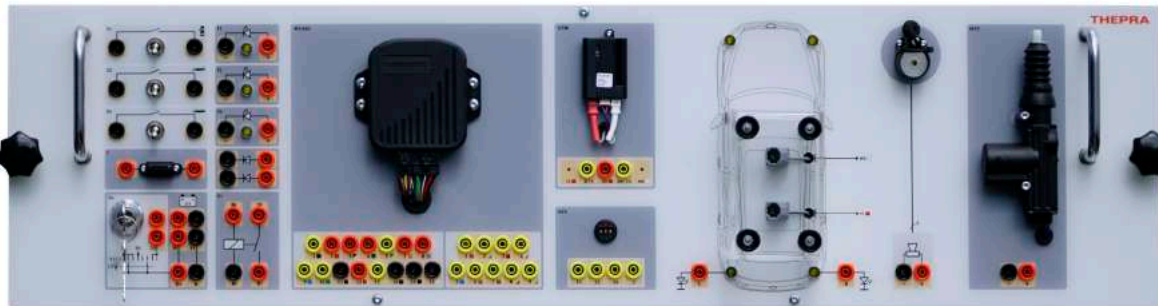
13,8 V DC (40 A)



EQF level

2

Keyword:
Retrofit

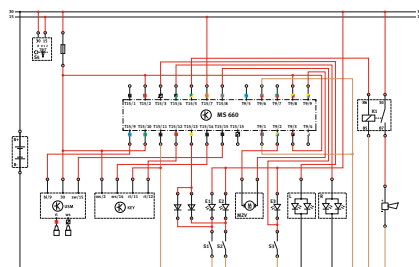


T-Varia Car Alarm System

With this theme panel, you connect an alarm system according to the circuit diagram and installation instructions. The system panel is equipped with a modern alarm system and contains all components required for operation in the vehicle.

Features

- Wiring of all original vehicle components in accordance with the wiring diagram.
- Use of workshop-standard inspection and test equipment for diagnosis and troubleshooting.
- 67 x connections in 4mm safety design
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions
- Also suitable for individual use







Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- Alarm system main control unit, ultrasonic control unit, ultrasonic sensors
- Ignition start switch with key, electronic horn, central locking servomotor
- 3 x switches for bonnet and door contacts, 7 x indicator lights for turn signals and interior lights
- 1 x relay, 2 x diodes, 1 x fuse, 2 x radio remote control
- Cable set complete with matching laboratory cables in safety version

Learning content

- Working with retrofit kits and circuit diagrams
- Function of ultrasonic sensors
- Naming electrical and electronic components, assemblies and systems
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated variables and manufacturer specifications

Item no. 11 024 150

Manual 31 pages	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	

Keyword:
Retrofit



T-Varia Radio and Navigation

The system panel Radio and Navigation is equipped with OEM components from the car. They make it possible to get to know the basic circuits of a car's infotainment. The selection of components is ideal for basic training in automotive professions.

Features

- Wiring of all original automotive components according to circuit diagrams
- Quick and easy hidden insertion of practical faults into the circuit layout
- 37 x connections in 4mm safety version, for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions
- Also suitable for stand-alone operation

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear lid
- 1 x Multimedia double DIN navigation car radio with 18 cm / 7 inch touch screen (incl. navigation software with current Europe map material), with DVD / CD drive, USB connection, MicroSD, connection for steering wheel remote control
- 1 x ignition start switch, 2 x 3-way coaxial speakers, 1 x rear view camera with night vision, 1 x antenna
- 1 x GPS receiver with long cable, 1 x switch for parking brake, antenna connection and function indicators

Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.



Item no. 14 020 256

Manual 66 - 154 pages



71 x 110 x 178 cm



Vehicle battery 12 V



EQF level



T-Varia Starter & Generator Complete Set

The complete T-Varia Connect equipment for starter and generator. This is ideal for combining individual components into a complete system. Here, trainees learn to wire the system functionally, all the details of the respective operating situations and troubleshooting.

Features

- Covers the entire spectrum on the subject of starters and alternators
- Wiring of all original vehicle components in accordance with the wiring diagram.
- Use of workshop-standard inspection and test equipment for diagnosis and troubleshooting.
- All connections in 4mm / 6mm safety version for wiring and measuring
- Didactically prepared documents with exercises and worksheets as well as the corresponding solutions

Recommended measuring devices

- Multimeter, current clamp, oscilloscope




Learning content

- Naming electrical and electronic components, assemblies and systems
- Selecting and using electrical measuring and testing equipment
- Function of the starter, function of the electrical circuit
- Function of the generator, function of the regulator, function of the electrical circuitry
- Operating situations with excitation current, charging current and consumer current
- Battery charging with the generator
- Load on the generator, three-phase generator test
- From alternating current to direct current
- Fault simulation, diagnosis and measurement
- Naming electrical and electronic components, assemblies and systems
- Measuring and assessing electrical quantities and signals

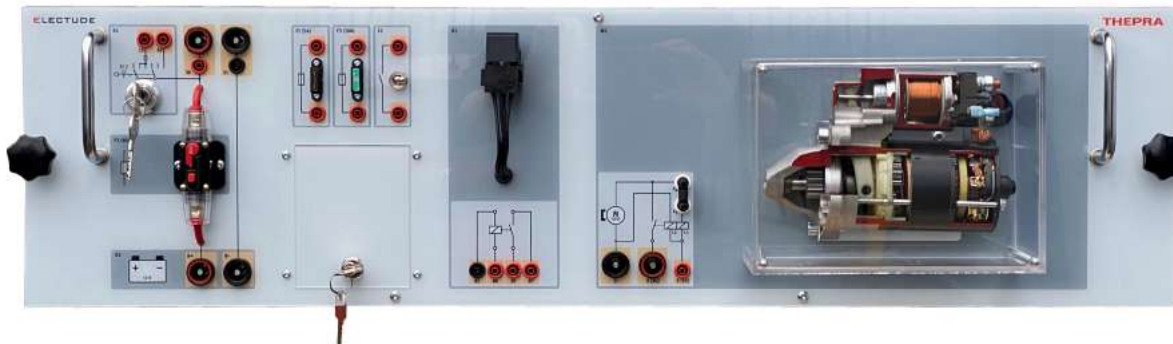
The complete set includes

- T-Varia cart in aluminium design (item no. 11 010 020)
- T-Varia battery holder (item no. 11 010 030)
- T-Varia starter (item no. 11 033 050)
- T-Varia basic equipment generator (item no. 11 035 040)
- Generator with transistor controller (item no. 11 035 120)
- Generator with multifunction controller (item no. 11 035 130)
- T-Varia rectification generator (item no. 11 035 040)
- Cable set complete with matching laboratory cables in safety version

Item no. 11 033 050

Manual 44 pages	
25 x 96 x 25 cm	
Vehicle battery 12 V	
EQF level	2

6 x faults
switchable



T-Varia Starter

With this theme panel you connect a running starter (starter motor) according to the circuit diagram. The starter is cut open to make the switching functions and components visible. Six different faults can be connected. A conventional vehicle battery is required for operation.

Features

- Wiring of the components according to the circuit diagram
- Functional, high-quality cutaway model of an original starter motor
- Fault circuit with 6 practical faults
- 16 x connections in 4mm safety version, 6 x connections in 6mm safety version
- Didactically prepared documents with worksheets and the corresponding solutions
- Also suitable for individual operation

Equipment

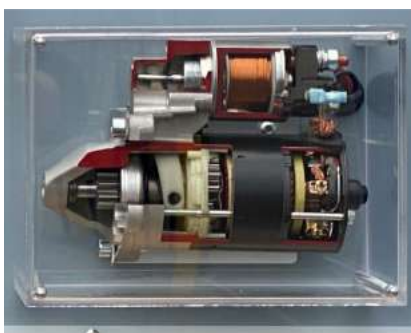
- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, as well as rear cover.
- 1 x original starter motor, cut open, protected behind plexiglass
- 1 x relay as starter relay
- 2 x flat fuses, 1 x main fuse (can be switched on again)
- 1 x toggle switch as clutch pedal switch / brake pedal switch
- 1 x ignition start switch with key
- 1 x lockable fault box integrated with 6 x toggle switch
- Cable set complete with suitable laboratory cables in safety version

Learning content

- Working with circuit diagrams
- Function of the starter, function of the electrical circuit
- Fault simulation, diagnosis and measurement
- Naming electrical and electronic components, assemblies and systems
- Measuring and assessing electrical quantities and signals

Recommended accessories

- T-Varia battery holder



Digital work orders T-Varia Starter: Item no. 11 033 052

Digital work orders for this training system will also be available soon.



Item no. 11 035 040

Manual 66 pages



25 x 96 x 25 cm



Vehicle battery 12 V



110 V - 240 V AC



EQF level



Modular
3 in 1



T-Varia Basic Equipment Generator

With this modular system, original vehicle generators can be operated with three different controller types. The generator control system panel offers all connection options for the required wiring. The generator drive unit is used to accommodate the easily and quickly exchangeable generators.

Features

- Wiring the components according to the circuit diagram
- Use of workshop-standard measuring instruments
- Digital displays for battery voltage and generator speed
- 19 x connections in 4mm safety version, 10 x connections in 6mm safety version
- Didactically prepared documents with worksheets and the corresponding solutions

Equipment

- T-Varia system panel suitable for the T-Varia equipment cart. Version with coloured digital print behind Plexiglas, circuit diagrams and symbols.
- 1 x integrated control for infinitely variable drive motor
- 2 x digital displays for battery voltage and generator speed
- consumer and load unit, 3 x switchable lamps, 2 x indicator lamps
- 1 x blade fuse, 1 x main fuse (can be switched on again), 1 x battery disconnecter, 1 x ignition starter switch with key
- Generator drive unit on aluminium profile plate for use on the table top of the equipment trolley
- Cable set complete with matching laboratory cables in safety version

Learning content

- Function of the generator, function of the controller, function of the electrical circuitry
- Operating situations with excitation current, charging current and consumer current
- Battery charging with the generator
- Loading of the generator, three-phase generator test
- Naming electrical and electronic components, assemblies and systems
- Measuring and assessing electrical quantities and signals

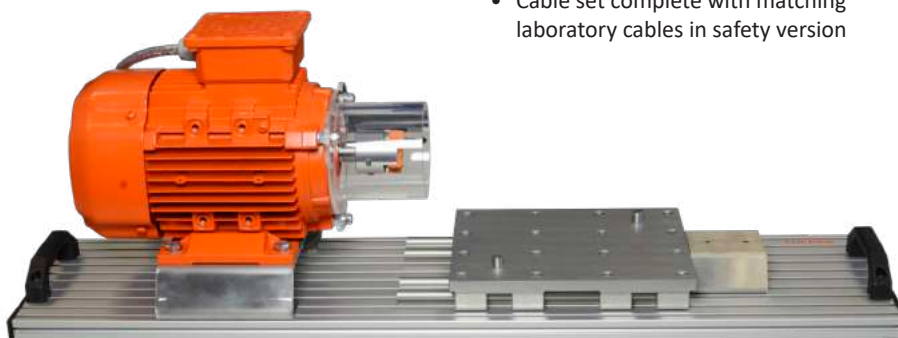
Recommended accessories

- T-Varia cart
- T-Varia battery holder
- Measuring device set

Modular system





Select one or more interchangeable generators:

- Generator with transistor controller
- Generator with multifunction controller
- Generator with LIN bus controller *



The generator drive unit is included in the scope of delivery

Item no. 11 035 130

Manual 66 - 110 pages	
25 x 96 x 25 cm	
Vehicle battery 12 V	
EQF level	



Generator with multifunction controller

Ready-to-use and fully functional vehicle generator. Mounted on adapter plate for use with T-Varia generator drive unit. The integrated measuring box contains all measuring and connection sockets, as well as the outgoing phases U, V, W with jumper plugs.

Features

- Original vehicle generator prepared for training purposes
- Mounted on slide with quick-change coupling and locking pin
- Quick change coupling on drive shaft
- 2 x large handles for easy handling
- Didactically prepared documents with worksheets and the corresponding solutions

Equipment

- Vehicle generator with multifunction controller for use with "T-Varia basic equipment generator".
- Break-Out Box with 11 x connections in 4mm safety version
- Interruption of controller contact DF
- Break of internal diodes at U, V, W allows optional external rectification of current with "T-Varia rectification" system panel
- Permanently attached positive and negative leads in safety version

Learning content

- Function of the generator, function of the controller, function of the electrical circuitry
- Operating situations with excitation current, charging current and consumer current
- Battery charging with the generator
- Loading of the generator, three-phase generator test
- Naming electrical and electronic components, assemblies and systems
- Measuring and assessing electrical quantities and signals

Available in three versions

The T-Varia system can be operated with any of these designs. All are ready to use, specially prepared for training purposes and pre-assembled on the adapter for use with the drive unit, and incl. breakout box.

* Only in conjunction with T-Varia CAN bus Starter Set

Item no. 11 035 120



Generator with transistor controller

Item no. 11 035 130



Generator with multifunction controller

Item no. 11 035 140



Generator with LIN bus controller *

Item no. 11 035 060

Manual 110 pages



25 x 96 x 25 cm

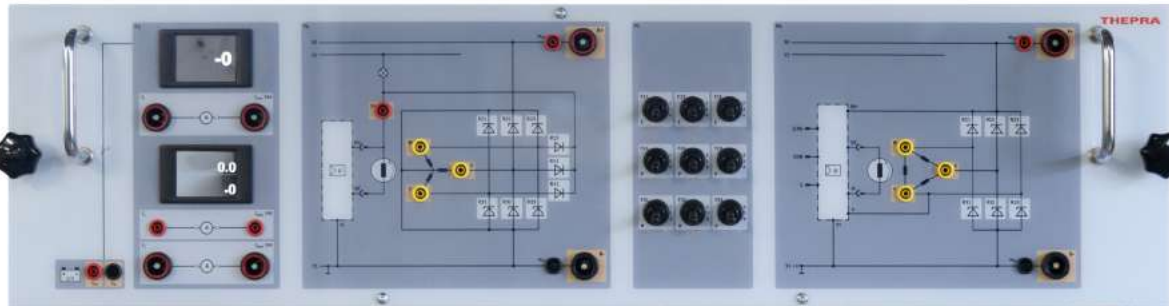


Vehicle battery 12 V



EQF level

3



T-Varia Rectification Generator

With this module panel, you can expand the possible uses of the T-Varia generator system. The panel offers 3 x ammeters for displaying excitation current, charging current and consumer current. This simplifies the investigation of different operating situations. Two diode fields are available for manual rectification.

Features

- 3 x ammeter for visualising the operating situations of excitation current, charging current and consumer current
- 2 x diode fields for manual rectification
- 9 x switches offer three positions each for the individual diodes, thus enabling step-by-step rectification and flexible fault switching
- 15 x connections in 4mm safety version, 8 x connections in 6mm safety version
- Didactically prepared documents with worksheets and the corresponding solutions

Learning content

- From alternating current to direct current
- Function of the electrical circuit
- Error patterns on the generator, troubleshooting with the oscilloscope
- Naming electrical and electronic components, assemblies and systems
- Measuring and evaluating electrical quantities and signals

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, and rear cover
- 3 x ammeter with digital display - 50A, 10A, 50A
- 9 x switches for interruption or short-circuit of the individual diodes
- 2 x diode panels for rectification
- Cable set complete with matching laboratory cables in safety design




Already present

- T-Varia basic equipment generator
- Generator with transistor controller, multifunction controller or LIN bus controller



Fig.: T-Varia cart with battery holder, T-Varia basic equipment generator, generator with transistor regulator as well as T-Varia rectification generator

Item no. 11 023 050

Manual 24 pages	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	2

Keywords: Retrofit,
Driving Assistance

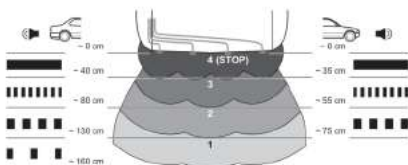


T-Varia Parking Sensors

With this theme panel you connect the PDC parking aid control unit according to the circuit diagram as well as the ultrasonic sensors and the acoustic warning transmitter. The system enables the metrological investigation of the echo sounder principle and the retrofitting of parking sensors in a vehicle.

Features

- Wiring of all original vehicle components in accordance with the wiring diagram
- Use of workshop-standard measuring devices
- 25 x connections in 4mm safety design
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions
- Also suitable for individual use

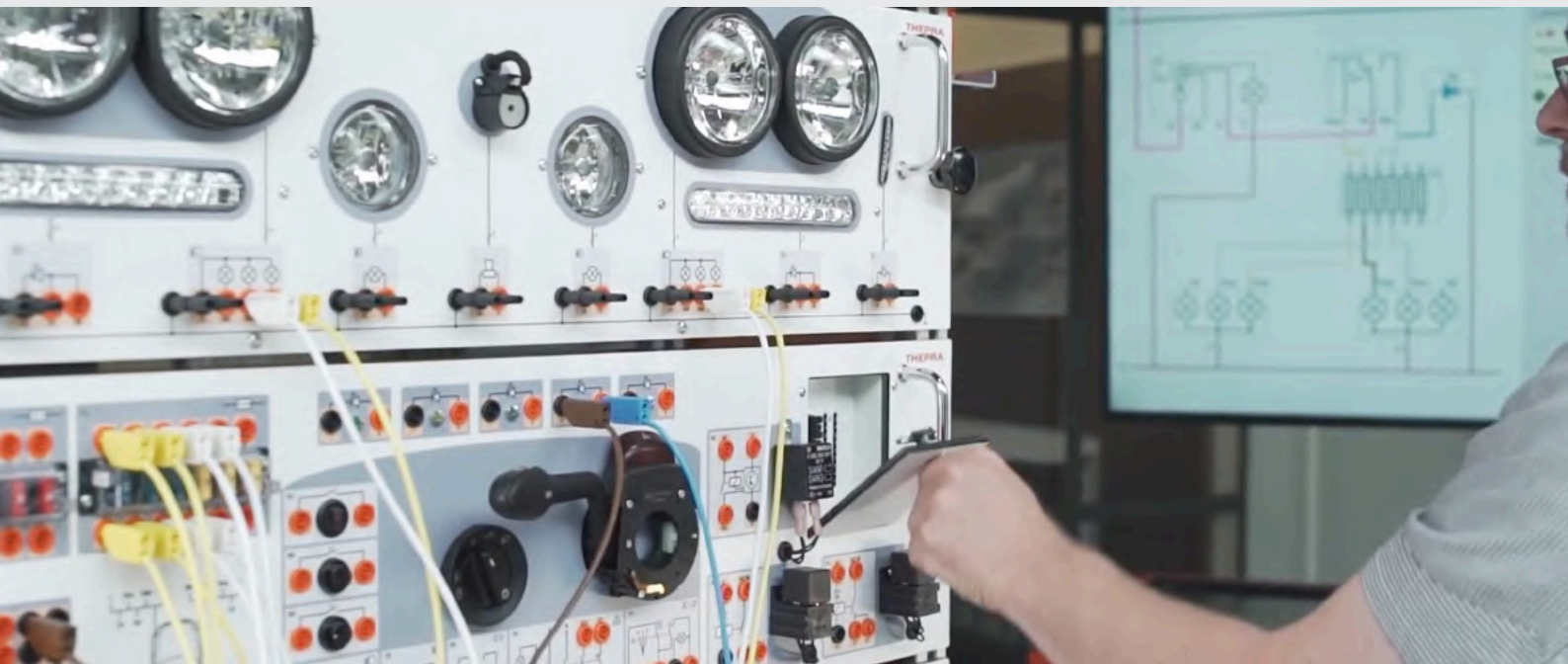


Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- 1 x parking aid control unit
- 4 x ultrasonic sensors
- 1 x Acoustic warning device
- 1 x Reverse signal switch
- 1 x Reversing light
- Cable set complete with matching laboratory cables in safety version

Learning content

- Working with retrofit kits and circuit diagrams
- Function of ultrasonic sensors, fault simulation and measurement
- Naming electrical and electronic components, assemblies and systems
- Measuring and assessing electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated variables and manufacturer specifications



Accessories T-Varia conventional

T-Varia cart

The mobile cart for holding up to eight T-Varia system panels. Loading from the front and rear.



Item no. 11 010 020

Cable set 4mm T-Varia

106 pieces of highly flexible cables with 4mm spring plugs in matching colours and lengths in safety version. Cable cross-section 2.5 mm².



Item no. 11 035 170

Power supply unit 40A

Laboratory power supply unit 3-15V and 40A with LED display for voltage and current. The unit is short-circuit proof and has an insulated housing.



Item no. 10 138 100

T-Varia battery holder

It is attached to the side of the T-Varia cart. Incl. tensioning strap to secure the vehicle battery and anti-slip mat.



Item no. 11 010 030

Monitor holder

For lateral mounting on the T-Varia cart. Tilttable, 3x joints for lateral swivelling, telescopic function.



Item no. 11 010 025

Adapter DIN A4

Adapter strip for fixing to T-Varia system panels on both sides. Enables T-Varia panels to be hooked into DIN A4 element rails.



Item no. 11 010 026



Chapter overview

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Networked Systems, Safety and Comfort

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Item no. 12 031 000

Manual 57 pages	
Digital work orders	
665 x 150 x 297 mm	
10 V - 15 V DC (3 A)	
EQF level	2 3

Automotive Bus Systems Basics Trainer

This laboratory trainer is excellent for initiating the transition from conventional circuits to networked systems. You define addresses for the control units and send free messages. At the outputs, you connect existing lighting units or use the integrated LED lights.

Features

- Two transmitting and two receiving units, each unit can be freely assigned a 4-bit address for communication.
- The two transmitting units can each send 4-bit freely defined messages at the push of a button, either individually or simultaneously
- Messages on the bus line can be measured and recorded with an oscilloscope
- Outputs with power relays for use of automotive lamps
- Use of workshop-standard measuring instruments, oscilloscope
- 28 x connections in 4mm safety design
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Equipment

- Laboratory trainer in a desk housing for use on a table or in a DIN-A4 support frame.
- 3 x transmit switches, 8 x data switches, 16 x address switches
- 1 x transmitting unit with transparent window, 1 x receiving unit with transparent window with 8 indicator LEDs
- 8 x outputs, usable with 12 V
- 12 x LEDs in imprinted vehicle, can be used alternatively as car lamps
- Cable set complete with matching laboratory cables in safety design
- Detailed documentation and extensive worksheets for teachers and students

Recommended accessories

- Digital work orders
- Power supply TS10

Learning content

- Introduction to networked systems in modern vehicles
- Bus systems and topology
- Serial communication, information packets Addresses and data blocks, processing
- Data in binary mode, binary system, conversion of values, bit meaning LSB / MSB addresses
- Conversion of binary values into hexadecimal address assignments
- Collisions of data packets
- Using the oscilloscope, identifying and interpreting messages
- Controlling vehicle lighting in different situations by sending different messages to the respective receivers via a single line

Also available as training package: Item no. 14 025 010

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.





Item no. 12 031 002	
Theory (level 2) - approx. 1 h	
Practice (level 2) - approx. 3 h	
Theory (level 3) - approx. 2,5 h	
Practice (level 3) - approx. 1,5 h	

Digital work orders Serial Communication Trainer

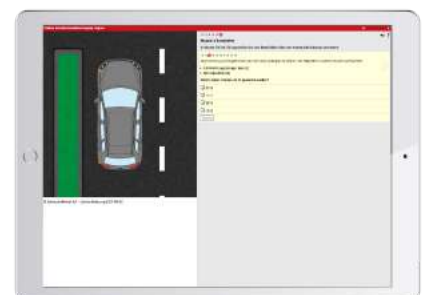
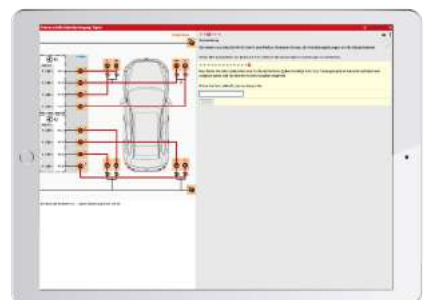
In this course you will learn to create different messages and send them to the right addressees. You will learn how serial communication works in electrical controls. You will record signals with an oscilloscope and evaluate them.

Preliminary theory *

- Networks: Serial interface
- CAN bus: Protocol introduction
- CAN bus: Transmission lines
- Network structure
- Oscilloscope
- Oscilloscope: Introduction, exercises

Practical tasks

- Trainer for serial data transmission: Introduction
- Exercises
- Signal



Try it out now!



Course layout

Level 2	49m	3h 07m
Level 3	2h 44m	1h 26m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

*28 x faults including
the 8 ISO faults,
with OBD diagnosis*



Item no. 14 020 200

Manual 98 pages	
Digital work orders	
71 x 110 x 178 cm	
13,8 V DC (40 A)	
EQF level	

Starter Set T-Varia Lighting CAN bus

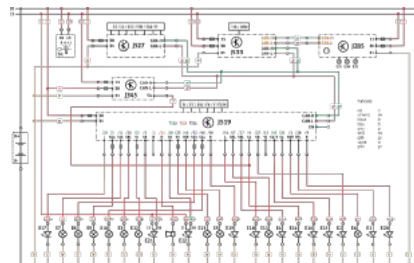
The basic equipment of the modular training systems for T-Varia Connect CAN bus. This is ideally suited for an introduction to networked systems in modern vehicles. The components are to be wired according to original wiring diagrams so that the function of the CAN and LIN bus can be impressively demonstrated.

Features

- Wiring of all original automotive components according to circuit diagrams
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults into the circuit structure
- Additional integrated error circuit with 20 errors, lockable with cover
- 8 x CAN bus ISO faults additionally pluggable
- Use of standard workshop test equipment for diagnosis and troubleshooting.
- All connections in 4mm / 6mm safety version for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

The starter set contains

- T-Varia cart in aluminium design (item no. 11 010 020)
- T-Varia front lighting CAN bus (item no. 11 011 090)
- T-Varia controls CAN bus with 20 faults (item no. 11 012 550)
- T-Varia rear lighting CAN bus (item no. 11 013 050)
- Cable set, various lengths and colours (item no. 11 035 170)
- Power supply 3-15 V, 40 A (item no. 10 138 100)



Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Also available as a training package: Item no. 14 025 230

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.





Item no. 14 020 202

- Theory (level 2) - approx. 11,5 h
- Practice (level 2) - approx. 5,5 h
- Theory (level 3) - approx. 2 h
- Practice (level 3) - approx. 3 h

Digital work orders T-Varia Lighting CAN bus

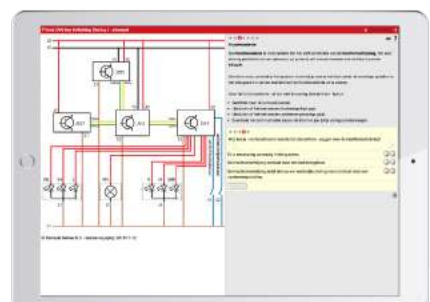
After completing the practical tasks, you will have a deeper insight into the various functions of a CAN bus lighting system. You will learn how to perform diagnostics on a networked system, as well as how to analyse measurements and the effects of malfunctions.

Preliminary theory *

- Basics of electrics, resistance, Ohm's law, multimeter: Automatic range selection
- Series circuits, parallel circuits, power law according to Watt (PUI), relays
- Lighting, light sources, rear lights, headlight beam width adjustment, headlight cleaning systems
- Headlights, bend lighting, legal requirements for the lighting system (UNCE)
- CAN bus: introduction, network structure, topology, protocol
- CAN bus: Error detection and correction, electrical operation, bus arbitration, diagnostics

Practical tasks

- Connecting the CAN bus
- Front lights / rear lights
- Daytime running lights
- Low beam / High beam
- Brake lights, reversing lights & horn
- Fog lights
- Indicator lights / Alarm lights
- Error 3
- CAN bus error
- Measurement at the CAN bus lighting



Course layout

Level 2	11h 19m	5h 35m
Level 3	2h 01m	2h 51m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

Item no. 11 011 090

Manual 22 / 98 pages



Digital work orders



25 x 96 x 25 cm



13,8 V DC (40 A)



EQF level

2 3



T-Varia Front Lighting CAN bus

With this module panel, you can expand your T-Varia system to include the common front lights with CAN bus instrument cluster of a modern car. In conjunction with the "Controls CAN-Bus" control panel, this unit can be controlled and connected according to the wiring diagram.

Features

- Wiring of all original automotive components in accordance with circuit diagrams
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults in the circuit diagram, also combined with fault circuit of the system panel "Controls CAN-Bus"
- Use of workshop-standard inspection and test equipment for diagnosis and troubleshooting.
- 36 x connections in 4mm safety version for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Version with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, as well as rear cover
- 2 x bi-halogen main headlights low beam and high beam
- 2 x modern fog lights with integrated daytime running lights
- 2 x modern, narrow indicator lights in LED design
- 1 x electronic horn
- 2 x servo motors for headlight range adjustment, 1 x potentiometer for headlight height adjustment
- 1 x instrument cluster original VW Golf







Recommended as part of the Starter Set: Item no. 14 020 200

The ideal system for getting to know the complex interplay of electrical and electronic vehicle components in a practical way using original components: The T-Varia Connect Starter Set Lighting Conventional.



14 020 200

Item no. 11 012 550

Manual 98 pages	
Digital work orders	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	 

28 x faults including
the 8 ISO faults,
with OBD diagnosis



T-Varia Controls CAN bus

This module panel is the centre of your T-Varia system in the area of networked central electrics. The combination with other CAN bus system panels enables versatile variants and expansion stages for controlling components that are connected according to the circuit diagram.

Features

- Wiring of all original vehicle components in accordance with the circuit diagram
- Networking of the system by connecting power supply and bus lines of the control units, thus all lines can be measured and separated for diagnostic purposes
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults into the circuit structure
- Additional integrated fault circuit with 20 faults, lockable with cover
- Use of workshop-standard test equipment for diagnosis, programming and troubleshooting.
- 69 x connections in 4mm safety version, including 2 x with 6mm safety version, 7 x jumper plugs in the bus lines, for wiring and measuring
- OBD socket for connecting your diagnostic device
- CAN bus comfort 125 kBit/s, CAN bus

diagnosis 500 kBit/s, LIN bus 20 kBit/s

- Didactically prepared documents with exercises and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, wiring diagrams and symbols, two chrome-plated handles for easy handling, as well as rear cover
- 1 x on-board power supply control unit J519, 1 x diagnostic interface J533, 1 x control unit for steering column electronics J527, 1 x OBD socket
- 2 x fuse box with 12 car fuses, 1 x ignition lock with three switch positions
- 1 x light switch for parking light and driving light and fog light and rear fog light with integrated control light
- 1 x steering column switch with indicator switch for left / right, switch between high and low beam, wiper switch

- 2 x push-button switches for e.g. horn, brake lights, 1 x rocker switch for e.g. reversing lights, 1 x push-button for warning light E229
- Lockable fault switch box with 20 jumper plugs for interruption or for insertion of transition or load resistor

Learning content

- Understanding and applying automotive circuit diagrams, data communication with CAN bus
- Testing and repairing electrical and electronic circuits
- Measuring and assessing electrical variables and signals
- Coding ECUs, adapting software versions and testing data communication lines in compliance with legal and manufacturer-related regulations

Recommended as part of the Starter Set: Item no. 14 020 200

The ideal system for getting to know the complex interplay of electrical and electronic vehicle components in a practical way using original components: The T-Varia Connect Starter Set Lighting Conventional.



14 020 200

Item no. 11 013 550

Manual 20 / 98 pages



Digital work orders



25 x 96 x 25 cm



13,8 V DC (40 A)



EQF level

2 3



T-Varia Rear Lighting CAN bus

With this module panel, you can expand your T-Varia system to include the common rear lights of a modern car. In conjunction with the "Controls CAN bus" or "Bus basics" control panel, this unit can be controlled and connected according to the circuit diagram.

Features

- Wiring of all original vehicle components in accordance with the circuit diagram
- Networking of the system by connecting power supply and bus lines of the control units, thus all lines can be measured and separated for diagnostic purposes
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults into the circuit structure, also combined with fault circuitry of the system panel "Controls CAN-Bus"
- Use of workshop-standard inspection and test equipment for diagnosis and troubleshooting
- 43 x connections in 4mm safety version, 4 x with jumper plug, for wiring and measuring
- Integration of the CAN bus trailer control into the networked system
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, as well as rear cover
- 2 x rear lights in modern LED design with rear light, brake light and indicator functions
- 1 x number plate light in LED design
- 1 x third brake light with a total of 7 lamps which can be replaced in the event of a defect
- 1 x Rear fog light in modern clear glass design with free-form reflector and halogen mini lamp
- 1 x Reversing light in modern clear-glass design with free-form reflector and 12V lamp
- 1 x trailer socket in 13-pin version
- 1 x CAN bus trailer control unit J345

Learning content

- Understanding and using automotive wiring diagrams
- Data communication with CAN bus to the trailer
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and assessing electrical quantities and signals
- Coding control units, adjusting software versions and testing data communication lines in compliance with legal and manufacturer-related regulations
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer specifications.




Recommended as part of the Starter Set: Item no. 14 020 200

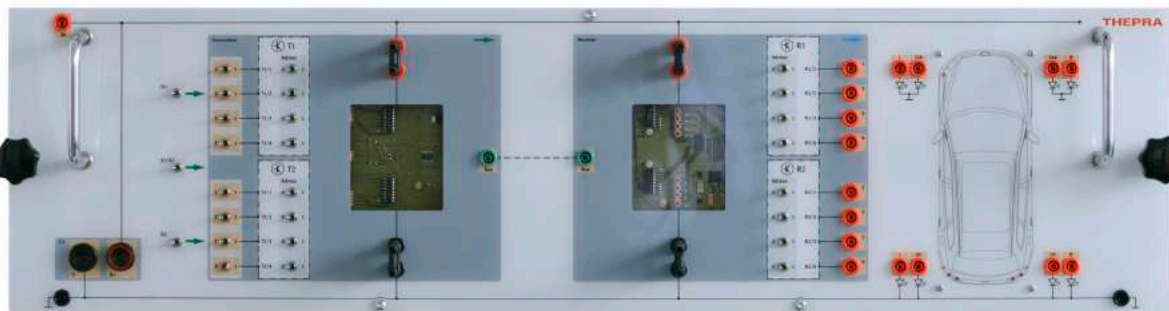
The ideal system for getting to know the complex interplay of electrical and electronic vehicle components in a practical way using original components: The T-Varia Connect Starter Set Lighting Can bus.



14 020 200

Item no. 11 031 050

Manual 55 pages	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	2 3



T-Varia Bus Technology Basics

This theme panel is excellent for initiating the transition from conventional circuits to networked systems. You define addresses for the control units and send free messages. At the outputs, you connect your existing T-Varia lighting panels or use the integrated LED lights.

Features

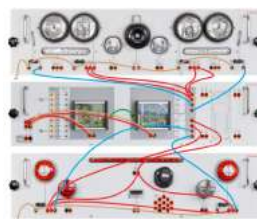
- Two transmitting and two receiving units, each unit can be freely assigned a 4-bit address for communication.
- The two transmitting units can each send 4-bit freely defined messages at the push of a button, either individually or simultaneously
- Messages on the bus line can be measured and recorded with an oscilloscope
- Outputs with power relays for use of automotive lamps
- Use of workshop-standard measuring instruments, oscilloscope
- 28 x connections in 4mm safety design
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- 3 x transmit switches, 8 x data switches, 16 x address switches
- 1 x transmitting unit with transparent window, 1 x receiving unit with transparent window with 8 indicator LEDs
- 8 x outputs, can be used with 12 V
- 12 x LEDs in imprinted vehicle, can be used alternatively as car lamps
- Cable set complete with suitable laboratory cables in safety version

Learning content

- Introduction to networked systems in modern vehicles
- Bus systems and topology
- Serial communication, information packets Addresses and data blocks, processing
- Data in binary mode, binary system, conversion of values, bit meaning LSB / MSB addresses
- Conversion of binary values into hexadecimal address assignments
- Collisions of data packets
- Using the oscilloscope, identifying and interpreting messages
- Controlling vehicle lighting in different situations by sending different messages to the respective receivers via a single line



Control of the main lighting via a single bus line

Recommended as part of the Starter Set: Item no. 14 020 200






The ideal system for getting to know the complex interplay of electrical and electronic vehicle components in a practical way using original components: The T-Varia Connect Starter Set Lighting Can bus.

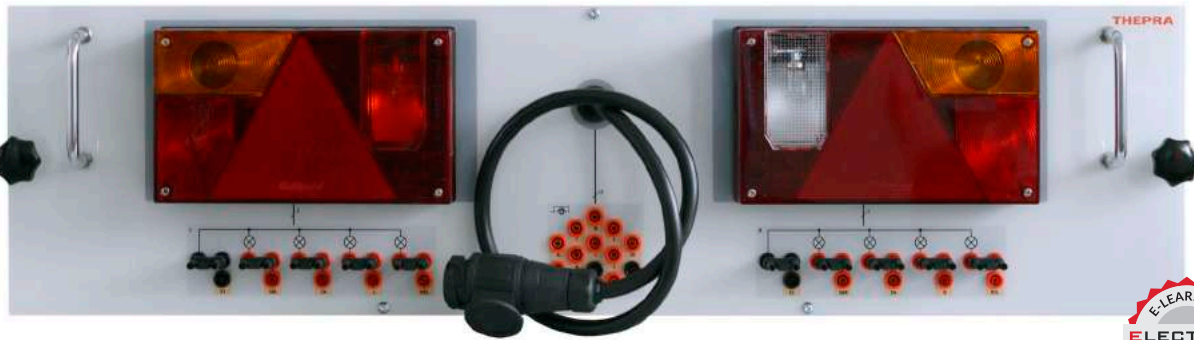


14 020 200

Keyword:
Retrofit

Item no. 11 027 050

Manual 36 pages	
Digital work orders	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	



T-Varia Trailer

T-Varia Connect is ideal for connecting individual components to form a complete system. Here, trainees learn to create and read circuit diagrams, assign terminal designations and plug in the system accordingly.

Features

- Wiring of all original automotive components according to circuit diagrams
- Terminal designations according to DIN 72552, with schematic printing
- Quick and easy hidden insertion of practical faults in the circuit layout
- Use of workshop-standard inspection and test equipment for diagnosis and troubleshooting
- 43 x connections in 4mm safety version, 10 x of which with jumper plugs for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Learning content

- Understand and apply automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Equipment

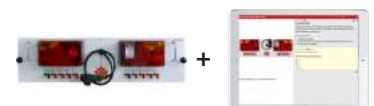
- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- 2 x trailer tail light (left/right) with the functions tail light, brake light, indicator, number plate light, rear fog light and reversing light
- 1 x trailer plug with 50cm cable for connection with T-Varia rear lighting
- Cable set complete with matching laboratory cables in safety version

Already present

- Starter Set T-Varia Lighting CAN bus

Also available as a training package: Item no. 14 025 240

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



11 027 050

11 027 055



Item no. 11 027 055

Theory (level 2) - approx. 1,5 h

Practice (level 2) - approx. 1 h

Digital work orders T-Varia Trailer CAN bus

After completing the practical tasks, you will be able to: identify trailer socket terminal designations, match different trailer lights, recognise different trailer sockets, read the wiring diagram for the trailer socket, connect the trailer socket.

Preliminary theory *

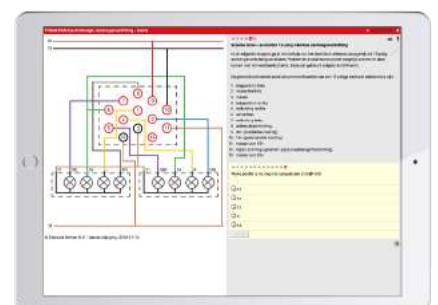
- Lighting
- Light sources

Practical tasks

- Trailer lighting

Course layout






Level **2** 1h 20m 1h 14m

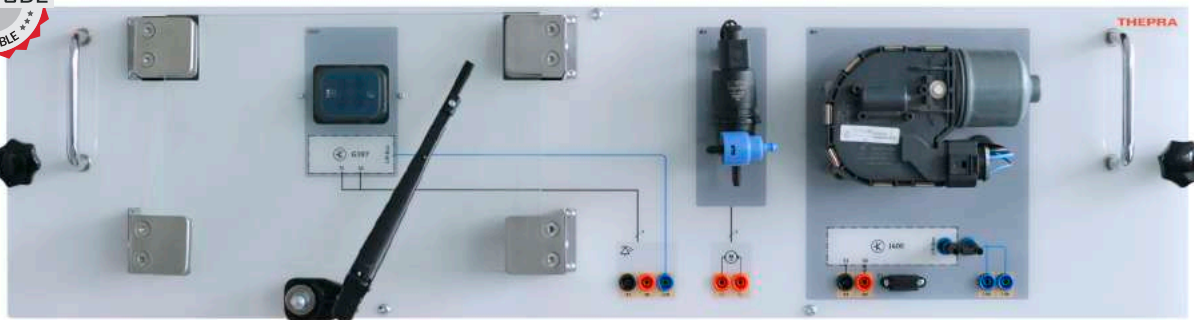


Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

Item no. 11 020 550

Manual 23 pages	
Digital work orders	
25 x 96 x 25 cm	
13,8 V DC (40 A)	
EQF level	



T-Varia Wiper LIN bus

With this module panel, you can expand your T-Varia system to include the windscreen wiper system of a modern car. In conjunction with the "Controls CAN bus" control panel, this unit can be controlled and integrated into the network.

Features

- Wiring of all original vehicle components in accordance with the circuit diagram
- Networking of the system by connecting power supply and bus lines of the control units, thus all lines can be measured and separated for diagnostic purposes
- Terminal designations according to DIN 72552, with schematic printing
- Windscreen wiper has original linkage, 6mm glass pane and rain sensor
- Use of workshop-standard inspection and test equipment for diagnosis and troubleshooting
- 10 x connections in 4mm safety version, 2 x with jumper plug, for wiring and measuring
- Integration of LIN bus components into the networked system
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Learning content

- Understanding and using automotive wiring diagrams
- Data communication with LIN bus
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and assessing electrical variables and signals
- Coding control units, adjusting software versions and testing data communication lines in compliance with legal and manufacturer-related regulations
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer specifications.

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, wiring diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- 1 x original wiper motor with LIN bus control and integrated control unit, 1 x original windscreen washer pump, 1 x original rain/brightness sensor LIN bus
- 1 x windscreen 6mm thick corresponding to a passenger car windscreen, 1 x wiper arm with deflection linkage and wiper
- Cable set complete with matching laboratory cables in safety version

Already present

- Starter Set T-Varia Lighting CAN bus

Also available as a training package: Item no. 14 025 250

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



11 020 550

11 027 055



Item no. 11 020 552
 Practice (level 3) - approx. 3,5 h

Digital work orders T-Varia Wiper LIN bus

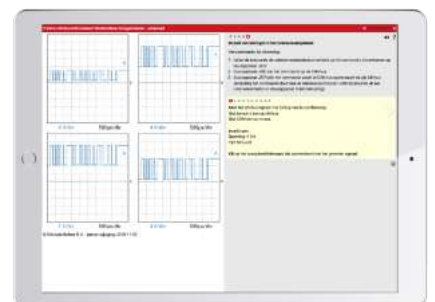
After completing the practical tasks, you will be able to: carry out various measurements on a CAN-B, CAN-C and LIN bus using a multimeter and oscilloscope, simulate malfunctions on the various networks and understand their effects.

Practical tasks

- CAN bus & LIN bus measurement
- Windscreen wiper & rain sensor
- Fault 1
- Fault 2

Course layout

Level 3 3h 28m



Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

Item no. 11 025 550

Manual 33 pages



25 x 96 x 25 cm



13,8 V DC (40 A)



EQF level

3



T-Varia Driver's Door CAN bus

With this module panel, you can expand your T-Varia system to include the windscreen wiper system of a modern car. In conjunction with the "Controls CAN bus" control panel, this unit can be controlled and integrated into the network.

Features

- Functioning of the window regulator end position detection and the anti-trap protection by running rail with cable pull, central locking, mirror control
- Networking of the system by connecting power supply and bus lines of the control units, thus all lines can be measured and disconnected for diagnostic purposes
- Terminal designations according to DIN 72552, with schematic imprint as well as control unit pin designation and cable colours
- Quick and easy hidden insertion of practical faults in the circuit design
- 46 x connections in 4mm safety version, 14 x of which with jumper plug, for wiring and measuring
- Electrical mirror can be connected
- Didactically prepared documents with exercises and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- 1 x original window regulator motor driver's side with integrated control unit, running rail with cables and anti-trap device
- 1 x original door lock driver's side with central locking and manual detent, 1 x original double switch for window regulator control, 1 x original door opener with cable and switch for central locking
- 1 x original joystick switch for optional mirror adjustment and mirror heating, 1 x indicator light door, electric mirror left with holder and connections
- Cable set complete with matching laboratory cables in safety version

Learning content

- Data communication with CAN bus
- Testing and repairing electrical and electronic circuits
- Measuring and assessing electrical variables and signals
- Coding control units, adjusting software versions and testing data communication lines in compliance with legal and manufacturer-related regulations
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer specifications.



Electric exterior mirror connected






Recommended as a supplement to the Starter Set: Item no. 14 020 200

The ideal system for getting to know the complex interaction of electrical and electronic vehicle components in a practical way using original components: the T-Varia Connect Starter Set Lighting CAN bus.



14 020 200

Item no. 79 300 105

Manual 56 pages	
102 x 95 x 145 cm	
Vehicle battery 12 V	
EQF level	 



Electromechanical Power Steering

This training stand of an original electromechanical power steering system allows you to examine and demonstrate all functions in a comprehensible way. The drive pinion is cut open to make the movements and components visible. 6 different faults can be switched on.

Features

- Fully functional electric power steering, original VW Golf 6 components, specially prepared for training purposes.
- Demonstration of the functioning of different situations
- Demonstration of the required power input with and without assistance (resistance pressure box)
- Fault circuit: 6 switches / 12 faults measurements and diagnosis via OBD
- Didactically prepared documents with worksheets and the corresponding solutions



Learning content

- Function of the electromechanical power steering
- Working with wiring diagrams, understanding and diagnosing the electrical circuit and electronic control system
- Active return to straight running, power consumption as required to reduce fuel consumption
- Working with workshop-standard diagnostic systems. Reading out measurement blocks on steering angle, current consumption and torque
- Fault simulation, diagnosis and measurements. CAN data bus communication between the control unit for steering column electronics.

Additionally recommended

- Diagnostic Tool VCDS (Volkswagen) - powerful diagnostic tool (item no. 38 079 135)

Equipment

- High-quality equipment trolley made of aluminium profile, mobile.
- Original electromechanical power steering, double drive pinions cut open and protected behind Plexiglas, original instrument cluster.
- working plate, control panel with ignition switch and OBD interface
- Speed and engine speed infinitely variable
- Fault circuit with 6 x toggle switches*, measuring sockets (pin-outs) in 4mm design on all components*
- Resistance pressure box - to partially increase the steering forces



* The two extensions "Fault circuit" and "Measuring sockets" are mandatory.



Item no. 16 900 950

Manual 184 pages	
Digital work orders	
141 x 70 x 194 cm	
110 V - 240 V AC	
EQF level	2 3 4



Lighting Board Central Electrics CAN bus

This unique CAN bus training system is ready for immediate use and offers 41 practical fault situations. A serial breakout box is connected to the on-board power supply control unit, and all parts and components have jumper plugs with measuring taps. This makes the training system predestined for diagnostic training in the field of central electrics.

Features

- Fully functional CAN light wall, original VW Golf 6 components, specially prepared for training purposes.
- Frame made of aluminium profile on castors, with table top
- All components are wired and faultless in the unit, thus the system is immediately ready for use
- Numerous measuring sockets for all components of the central electrics, numerous measuring sockets for all bus connections
- Diagnostics: Each control unit can be individually disconnected and measured, also each bus connection at the beginning and end
- Integrated on-board power supply via stabilised 12-volt switching power supply unit
- Didactically prepared front panel, printed in colour

Equipment

- Error switch box lockable, 41 switches / errors
- Headlights with bi-xenon curve light and cornering light, rear light combination LED
- Complete trailer lighting at the rear
- Rear fog light, number plate light, additional brake light, reversing light, fog light
- Gateway control unit, on-board power supply control unit, instrument cluster, steering column control unit with switch unit, trailer control unit
- Lighting controls, level sensor, fuse carrier, horn, washer pump, ignition start switch
- OBD diagnostic connector (16 pin), 4 x D-Sub for connection of CAN interfaces, speed and steering angle controller
- LIN wiper, simulation rear window heating with measuring points.

- Front: A total of 276 measuring sockets in 4mm safety design, 136 jumper plugs with measuring taps.
- Breakout box: A total of 88 measuring sockets in 4mm safety version, 44 jumper plugs with measuring taps.
- Rear panel: A total of 20 measuring sockets in 4mm safety version, 10 jumper plugs with measuring tap
- Connection for proline door module, connection for rain/light sensor

Additional equipment

- Light/rain sensor
Item no. 16 900 958
- PCAN-USB
- VCDS diagnosis
- Driver's door
Item no. 16 900 960



Also available as a training package: Item no. 14 025 260

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



16 900 950

+



16 900 952



Item no. 16 900 952	
Theory (level 2) - approx. 1 h	
Practice (level 2) - approx. 3 h	
Theory (level 3) - approx. 1,5 h	
Practice (level 3) - approx. 5,5 h	
Practice (level 4) - approx. 3 h	

Digital work orders Lighting Board proline

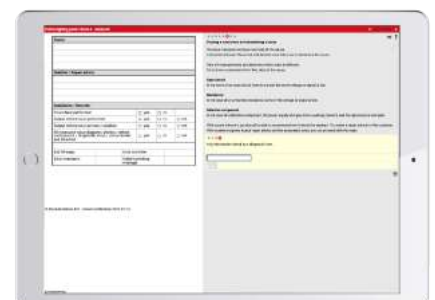
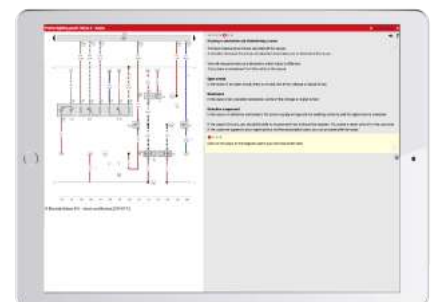
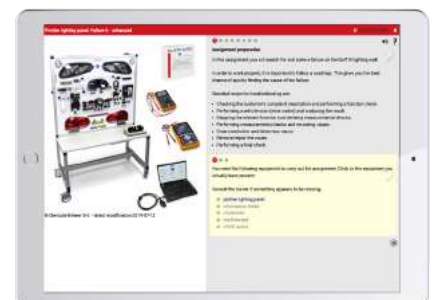
After completing the practical tasks, you will have a deeper insight into the different functions of the lighting system. You will learn what the different components look like and how to check them with a multimeter, an oscilloscope and a diagnostic tester.

Preliminary theory *

- Cornering light
- Ground and positive switched
- Multimeter: Automatic measuring range selection
- Troubleshooting
- CAN bus: protocol, diagnostics
- Oscilloscope: introduction, flow chart, exercises

Practical tasks

- Faults 1, 2, 3, 4, 5
- Faults 6, 7, 8, 9, 10
- Faults 11, 12, 13, 14, 15
- Faults 16, 17, 18, 19, 20



Try it out now!



Course layout

Level 2	1h 05m	2h 47m
Level 3	1h 32m	5h 40m
Level 4	3h 05m	

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.



Item no. 16 900 960

Manual 47 pages



142 x 71 x 192 cm



via 16 900 950



EQF level

2 3

Training System Driver's Door

The original driver's door is mounted on a mobile laboratory table and equipped with a fault circuit. All electrical components are accessible and have pin-outs for measurements. In addition, a serial breakout box for the door control unit is part of the training system.

Features

- Original components, electric windows, door control unit, central locking, child safety lock, emergency locking, door lock
- Mirrors electrically adjustable and heated, mirror indicators
- Breakout box for door control unit with all occupied pins of the control unit, 38 x jumper plug with measuring tap
- Fault circuit with 12 x system faults. Diagnosis via OBD is carried out on light panel Central electrics
- The window regulator mechanism and internal components are protected and made visible by a polycarbonate cover
- Compact unit design, mobile, for laboratory and workshop use

Already present

- Lighting Board Central Electrics CAN bus

Learning content

- Work with original circuit diagrams and define problem-related connection pins on components and control unit.
- Make screenshots of all signals, all control voltages and the CAN data bus with a digital oscilloscope and save them for customer-specific documentation
- Acquire CAN bus signals with an oscilloscope and evaluate signal levels
- Actuator diagnostics e.g. via VCDS
- Control of components via e.g. PCAN-Dongle USB, control via own buttons
- Visualisation of CAN data transmission with e.g. PCAN-Dongle
- Practical faults: recording and evaluating line interruptions and corrosion resistances
- Self-diagnosis via fault reader on light wall Central electrics (original tester)

Equipment

- Original driver's door VW Golf 6, mounted on mobile lab table
- 1 x breakout box with 38 x jumper plugs with measuring tap
- 6 x fault switches for 12 faults
- Pin-outs 4mm on all components
- Connection cable with plug connector to training model central electrics
- Detailed documentation and extensive worksheets for teachers and students



Item no. 79 405 555

Manual 221 pages



450 x 180 x 150 cm



EQF level



*50 x faults
switchable*

Training Vehicle Driving Assistance

This driver assistance systems training vehicle is fully functional and ideal for troubleshooting and diagnostic work. It allows students to learn various measurements, tests and diagnostic procedures on the control units, sensors and other components. The training vehicle is based on a Volkswagen Golf 7.

Features

- Fully functional, prepared training vehicle based on Volkswagen Golf 7 with upmarket equipment.
- Prepared for training purposes, numerous covers removed, easy access to all essential components, control units faultless
- Extensive fault circuitry
- Breakout box with jumper plugs for the wiring system control unit and the CAN bus gateway
- Pin-outs at all relevant diagnostic and fault points of the driver assistance ECUs and all associated sensors and actuators
- Circuit diagrams, detailed documentation for fault circuit and diagnosis

Equipment

- Measuring and breakout box for wiring system control unit and gateway.
- Measuring sockets as pin-outs on all assistance sensors/actuators, 4mm sockets in the colours of the original wiring diagram.
- 40 x fault switches / 50 different faults with work order and description. Excerpt from the error circuit:
 - CAN bus, Lin bus, CAN bus extended, gateway
 - Control unit for power steering, control unit for steering column electronics
 - Control unit for blind spot detection
 - Front camera for driver assistance systems
 - Control unit for distance control - Control unit for parking aid
 - Control unit for high beam assistant - and more...

Recommended accessories

- VCDS diagnostic system
- PicoScope 2-Channel Starter Set





Item no. 79 300 110

Manual 126 pages



160 x 93 x 166 cm



400 V / 16 A



EQF level

2 3

Climatronic Training Model

Training stand constructed with original parts and components of the Dualzone Climatronic from the VW Golf 6. The connections of all function-relevant sensors and actuators and the control units and components of the cooling circuit are original connections as in the vehicle. This makes it possible to work with original manufacturer documents and circuit diagrams.

Features

- Fully functional 2-zone Climatronic, original VW Golf 6 components, specially prepared for training purposes.
- Frame made of aluminium profile on castors, control panels, extra large tabletop
- One pressure gauge each for the high and low pressure side to illustrate the pressures under different load conditions
- Additional connections for the use of maintenance stations: Extraction, cleaning, evacuation and filling of the system with refrigerant "R134a".
- Driven air-conditioning compressor, speed-controlled via frequency converter, 400 volt three-phase motor
- On-board power supply via stabilised 12 volt 40 ampere switching power supply unit
- Emission-free drive for operation in training rooms
- Circuit diagrams, detailed documentation for fault switching and diagnosis

Additional equipment

- Fault switch box mounted separately, lockable, 10 switches / 10 faults (item no. 79 300 118)
- Pin-outs on all sensors/actuators, 4mm sockets in the colours of the original wiring diagram (item no. 79 300 117)
- Interrupt box with all pins of the control unit, 2 x 52 sockets with short-circuit plugs and measuring tap, hardwired. Enables diagnosis by individually disconnecting signals/components. Additionally insertion of: Transient and load resistance or short-circuit (item no. 79 300 119).
- Webasto Thermo-Top parking heater ready for operation with set-up, integrated control element, incl. diagnostic interface and removable 5-litre fuel tank with quick-release fasteners (item no. 79 300 115) *
- Diagnostic Tool VCDS (Volkswagen) - powerful diagnostic tool (item no. 38 079 135)



Fault switch box








Pin-Outs Sensors / Actuators



Interruption box control unit

* Due to the NOT emission-free operation of the auxiliary water heater, use is only permitted outdoors or in rooms with an exhaust extraction system that complies with regulations.

Item no. 79 104 210

Manual 57 pages	
160 x 93 x 166 cm	
Vehicle battery 12 V	
EQF level	 



Airbag Training Model

The training model consists of all original components of an airbag system from the Golf 6. The training device contains non-ignitable airbags and belt tensioner units. This enables safe handling and troubleshooting. The connections of all function-relevant sensors and actuators and the control units and components are original connections as in the vehicle.

Features

- Fully functional airbag training model, original VW Golf 6 components, specially prepared for training purposes.
- Frame made of aluminium profile on castors, control panels, extra large tabletop
- Original components: Airbag control unit, driver airbag, coil spring, steering column electronics, passenger airbag, side airbag, crash sensor for front and rear side airbag, instrument cluster with indicator lamps, driver and passenger belt tensioners, driver and passenger belt buckle with belt buckle switch, passenger seat occupancy sensor (for belt control), passenger airbag deactivation via key switch, diagnostic connection OBD
- Circuit diagrams, detailed documentation on fault switching and diagnostics

Additional equipment

- Fault switch box mounted separately, lockable, 10 switches, 20 faults (item no. 79 104 217)
- Pin-outs on all sensors/actuators, 4mm sockets in the colours of the original wiring diagram (item no. 79 104 216)
- Interruption box control unit with all pins of the control unit, 2 x 34 sockets with short-circuit plugs and measuring tap, hard-wired. Enables diagnosis by individually disconnecting signals/components. Additionally insertion of: Transient and load resistance or short-circuit (item no. 79 104 219).
- Diagnostic Tool VCDS (Volkswagen) - powerful diagnostic tool (item no. 38 079 135)



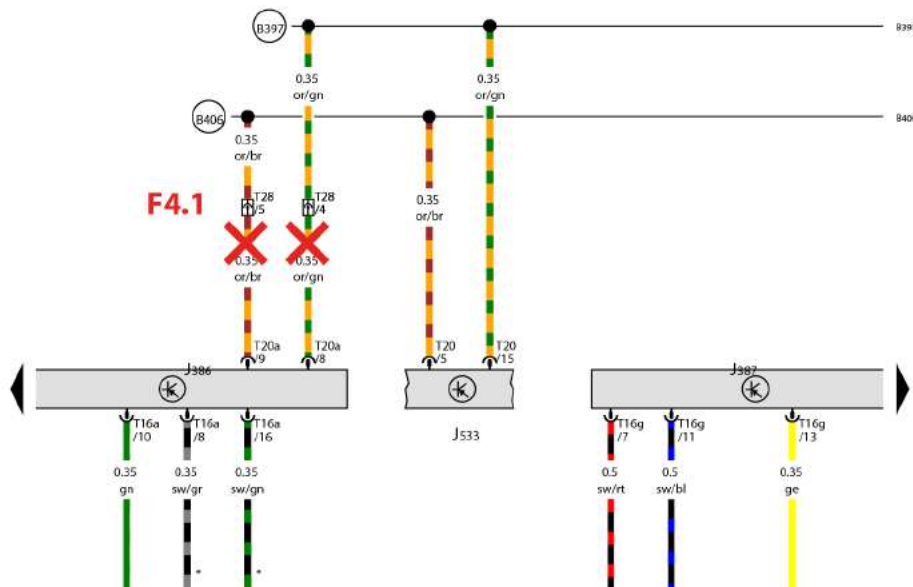
Fault switch box



Pin-Outs Sensors / Actuators



Interruption box control unit



Accessories networked systems

Monitor holder

For lateral mounting on large units. Tiltable, 3x joints for lateral swivelling, telescopic function.



Item no. 11 010 025

Digital Multimeter Fluke 175

Universal digital multimeter with outstanding technical capabilities. Simple operation, TrueRMS true effective value.



Item no. 16 062 014

OBD-Breakout-Box

Fast test of wiring system and ground circuits, identification of communication link protocols, oscilloscope connection for signal acquisition.



Item no. 16 162 123

Diagnostic Tool VCDS (VW)

Diagnostic system for VAG models from 1992 up to the current model series, with VCDS software, in practical storage case.



Item no. 38 079 135

PCAN-USB

The PCAN-USB adapter enables uncomplicated connection to CAN networks. Including software CAN monitor PCAN-View.



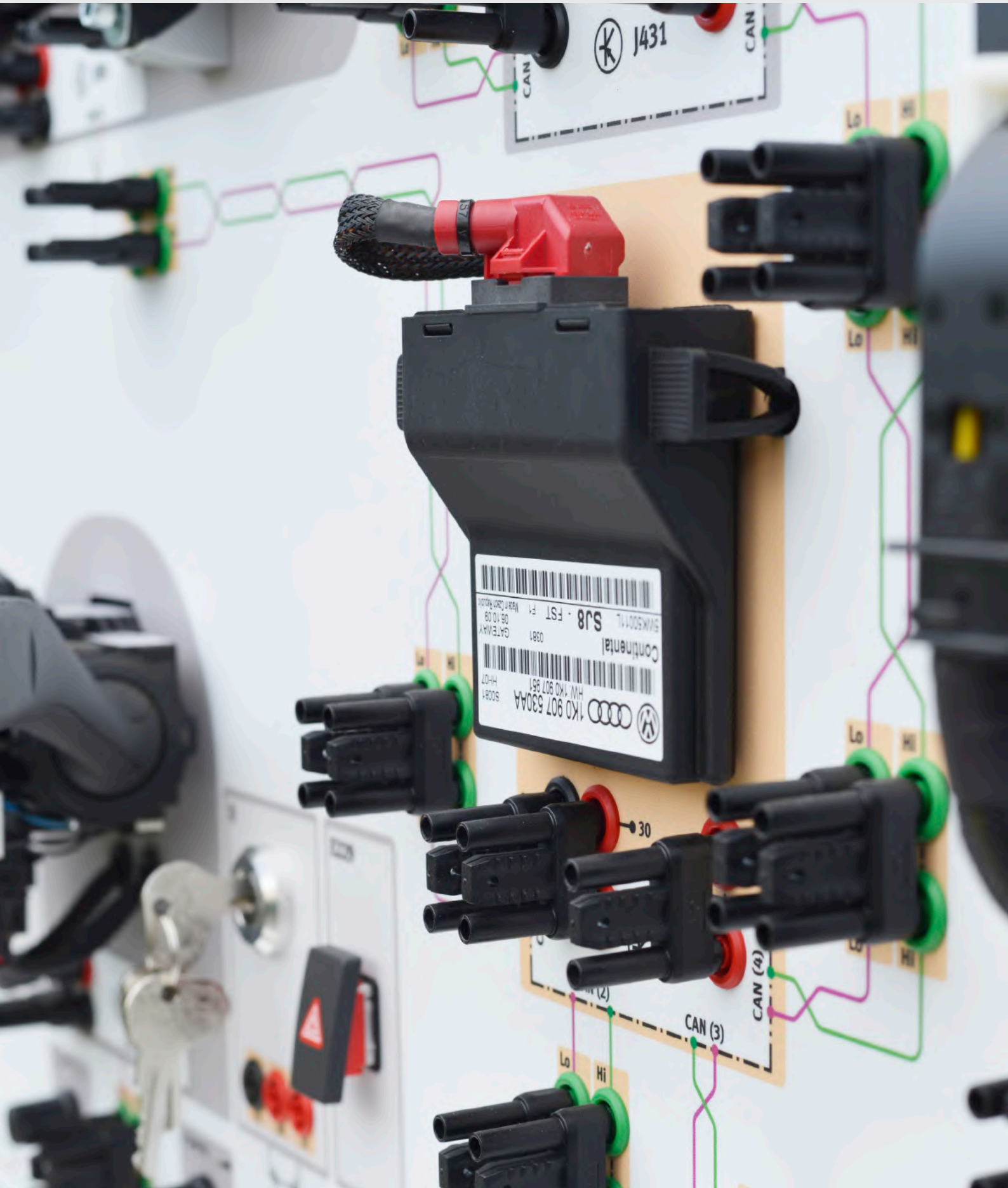
Item no. 16 900 912

PicoScope 2-Channel Starter Set

USB oscilloscope 2-channel for car diagnosis. The set includes the oscilloscope, the software and common test leads.



Item no. 16 152 040



Chapter overview

Automotive Electrics and Electronics	3
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E-Mobility

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Item no. 12 045 100

Manual 176 pages	
Digital work orders	
399 x 150 x 297 mm	
10 V - 15 V DC (3 A)	
EQF level	2 3 4



Automotive HV-Safety Trainer

Training system for enabling and diagnosing high-voltage vehicles. The extensive fault circuitry includes interlock faults as well as single and multiple insulation and equipotential bonding faults. This makes it possible to safely diagnose situations that could be life-threatening on a real vehicle.

Features

- Disconnecting / reconnecting, various methods, accident situation, pilot line, technical safety principles.
- Charging and discharging curves (parking / accident), inverter and motor signals, actual measurement of high-voltage voltages
- 10 practical situations, plus complete work orders and 26 switchable faults
- Diagnostic input mode offers the learner the possibility to have the supposedly found faults and the diagnosis checked by the system.
- Insulation test: motor U V W, air-conditioning A/C + -, battery HV + -, line orange
- Potential equalisation measurements on all individual components
- Special mode for measuring the PWM inverter output signal under voltage
- Use with real 202 V (under 5mA) or 40 V extra-low voltage.

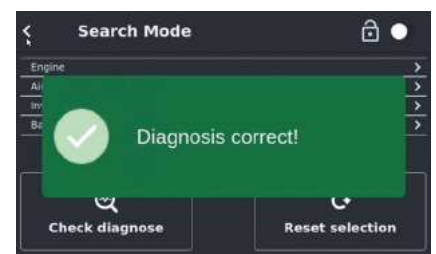
- Original maintenance plug, base lockable with padlock, pilot line measurable.
- Extensive documentation. Digital worksheets available for Electude e-learning system

Equipment

- Laboratory trainer in desk housing for use on a table or in a DIN-A4 support frame.
- 5 inch touch screen display with multilingual control software, 2 x key switches, original maintenance plug
- 5 x earth contact points for potential equalisation, 2 x sockets for power supply with 12 VDC.
- 23 x connection sockets for measuring, 7 x with jumper plug. 3 x HV cable orange with shielding, one of them defective.

Accessories

- Digital work orders
- Power supply TS10
- HV-Accessory set universal
- Metrahit H+E Car Set



Also available as training package: Item no. 14 025 270

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.





Item no. 12 045 102

Theory (level 3) - approx. 2,5 h	📖
Practice (level 3) - approx. 8 h	🔧
Faults (level 3) - approx. 6 h	⚠️
Theory (level 4) - approx. 7,5 h	📖
Practice (level 4) - approx. 4,5 h	🔧
Faults (level 4) - approx. 6 h	⚠️

Digital work orders Automotive HV-Safety Trainer

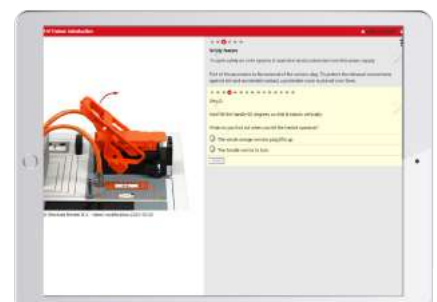
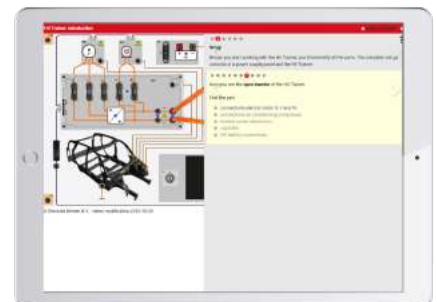
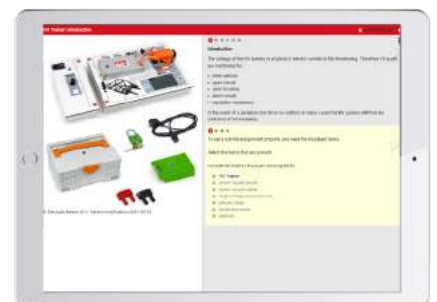
This practical set-up includes a complete HV system, with a realistic measurable high voltage. The course focuses on high-voltage vehicle safety, the de-energising and assessment of the insulation resistance and potential equalisation cables. The participant can also practice in detecting these types of failures in a HV system.

📖 Preliminary theory *

- Working under voltage
- Switching on the HV system
- De-energising the HV system
- Interlock
- Safe voltages in the HV system
- Inverter
- Inverter - mode of operation
- Rotary field
- DC/DC converter - operation

🔧 Practical tasks

- Introduction
- De-energise a HV system basic method
- De-energise a HV system extended method
- Emergency service with an active HV system.
- Interlock circuit
- Checking of potential equalisation
- Measure insulation resistance
- Measuring HV-components signals
- Fault finding for fault 1 to fault 26



Course layout

Level 3	📖 2h 41m	🔧 7h 49m	⚠️ 6h 12m
Level 4	📖 7h 40m	🔧 4h 18m	⚠️ 6h 10m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.



Item no. 12 022 100

Manual 75 pages	
Digital work orders	
399 x 200 x 297 mm	
110 V - 240 V AC	
EQF level	

Automotive Electric Motors Trainer

Innovative laboratory trainer for basic knowledge of electrical machines. The types of electric motors and generators relevant in automotive engineering are set up in function and presented transparently.

Features

- Demonstrate the operation of the following electric motor types:
 - Permanent magnet motor
 - Series-wound motor
 - Asynchronous squirrel cage motor
 - Synchronous three-phase motor
- All operating values in the low voltage range of < 24V
- Drive unit for controlling all motor types with display and rotary controller

Equipment

- Drive unit with mounting flange and shaft for motor type assembly.
- Shaft with coupling for belt drive for external drive - Drilling machine with connection adapter included - enables generator function
- Speed sensor integrated, all electrical connections as 4mm safety sockets, 6 x lamps as load unit

- Components in practical storage case:
 - 3 x coil with pole shoe and 4mm connections, 2 x permanent magnet with pole shoe red and green, rotor with permanent magnet red and green.
 - Rotor with electromagnet, short-circuit anchor, centring ring as mounting aid, carbon brush holder transparent with 4mm connections.
 - Drive belt and socket spanner, measuring and connection cables



Permanent magnet motor



Series-wound motor



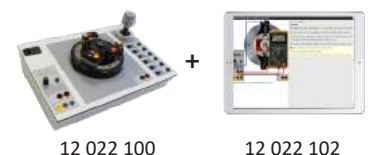
Asynchronous squirrel cage motor



3-phase synchronous motor

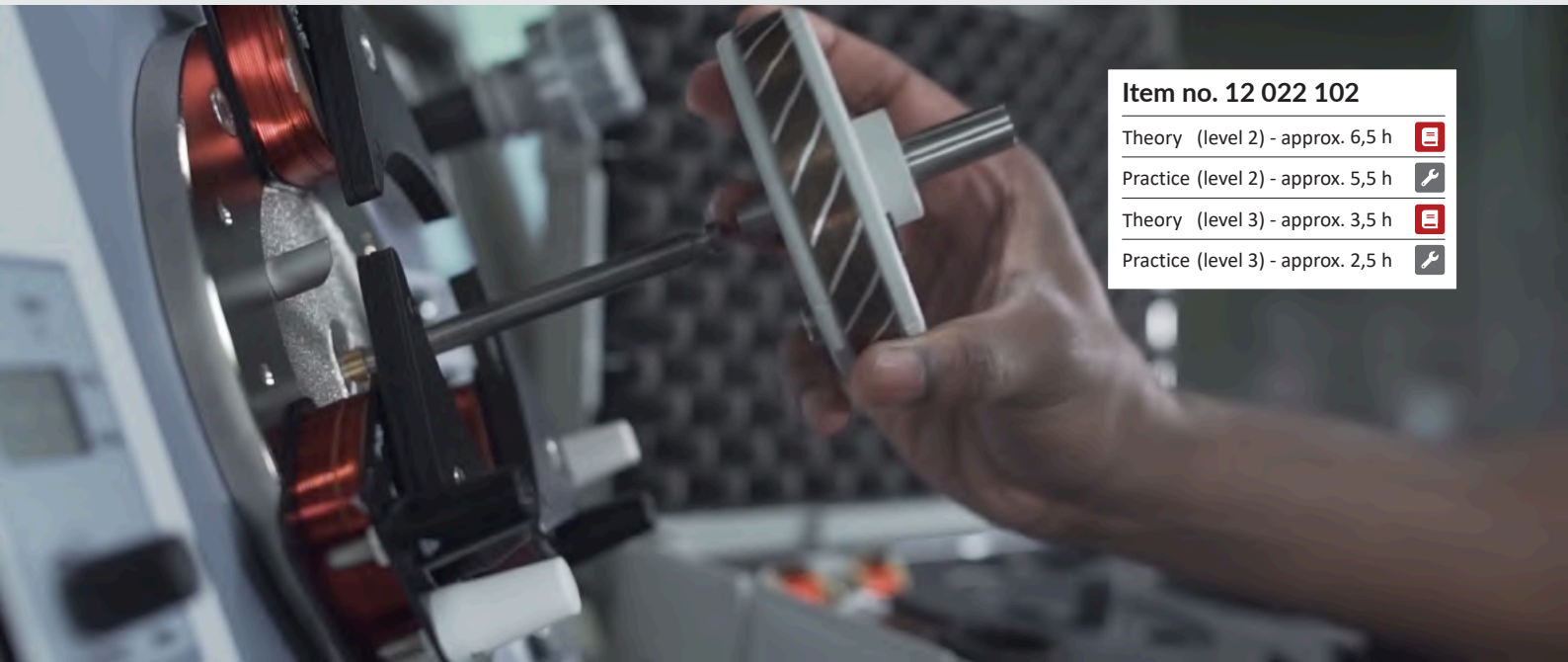
Also available as a training package: Item no. 14 025 030

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



12 022 100

12 022 102



Item no. 12 022 102	
Theory (level 2) - approx. 6,5 h	
Practice (level 2) - approx. 5,5 h	
Theory (level 3) - approx. 3,5 h	
Practice (level 3) - approx. 2,5 h	

Digital work orders Automotive Electric Motors Trainer

After completing the practical tasks, you will be able to: identify the type of voltage, indicate how the direction of rotation of an electric motor can be changed; identify the construction of different electric motors; explain how different electric motors work; carry out measurements on an electric motor and evaluate them.

Preliminary theory *

- Electric motor
- Lorentz force
- Magnetism
- Induction
- Permanent magnet motor
- Rotating magnetic field
- Permanent magnet synchronous motor
- Squirrel cage induction motor

Practical tasks

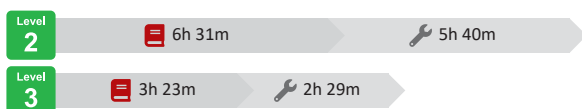
- Permanent magnet motor
- Series-wound motor
- Asynchronous squirrel cage motor
- Synchronous three-phase motor Motor
- Permanent magnet motor as generator
- Series-wound motor as generator
- Squirrel cage motor as generator
- Synchronous three-phase motor as generator



Try it out now!



Course layout



Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.



Item no. 12 020 310

Manual 30 pages



266 x 140 x 297 mm



10 V - 15 V DC (3 A)



EQF level

2 3

Automotive Inverter Trainer

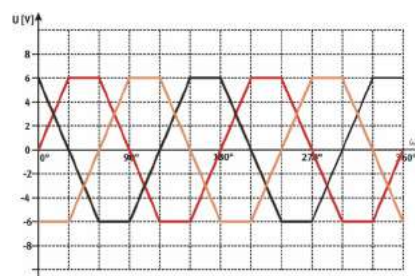
The inverter, also called power electronics, converts the DC voltage of the high-performance battery into an AC voltage for the electric motor. The innovative laboratory trainer enables the detailed study of this conversion and control of an electric motor.

Features

- Large, didactically sensibly designed motor and colour-printed, clear representation of the transistor circuit.
- Manual mode: individual switching on and off of the transistors in the inverter
- Automatic mode: precise regulation of the control until standstill
- LEDs in each of the three phases show the direction of current to and from the motor - and thus the magnetisation of the coils
- LEDs in each transistor show the status
- Voltage measuring points in the three phases incl. additional current measuring points with integrated shunt, measurement star point
- Low voltage for safe handling

Learning content

- gain knowledge about the interaction of the electronic components in the inverter and the electric motor.
- by operating the switches in the correct order, you will move the rotor step by step and work out the basic function.
- deepen your competence in setting up oscilloscopes optimally and evaluating the displays
- display PWM signals and sinusoidal currents in detail on the oscilloscope, also between individual phases







Equipment

- Laboratory trainer in desk housing for use on a table or in a DIN-A4 support frame
- 1 x signal generator with precision controller
- 1 x key switch for mode selection
- 6 x push buttons for IGBT transistors, 6 x two-colour LED for status indication
- 9 x measuring sockets, 4 x sockets for 12V power supply
- Detailed documentation and extensive worksheets for teachers and students

Recommended accessories

- Measuring cable BNC to 2mm for lab trainer 150cm
- Power supply TS10

Item no. 12 020 320

Manual 56 pages	
266 x 140 x 297 mm	
10 V - 15 V DC (3 A)	
EQF level	



Automotive DC/DC Converter Trainer

DC/DC voltage converters are the link between high-voltage batteries and three-phase machines. The innovative laboratory trainer for step-down and step-up conversion enables detailed investigation of this interaction.

Features

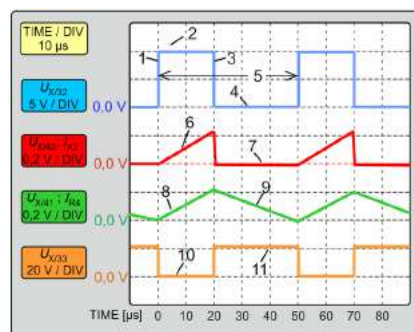
- Colour-printed, clear illustration of the two circuits for the function and structure of DC/DC converters
- LCD displays for indication of the respective input and output voltages
- Adjustable load resistors in both circuits
- Voltage measuring points before and after all components, incl. additional current measuring points on all components
- Finely adjustable signal generators
- Low voltage for safe handling

Learning content

- acquire knowledge about the interaction of electronic components in step-down and step-up converters
- recognise the electrical function sequences in modern voltage transformers
- examine circuits in gap mode (DCM) and non-gap mode (CCM), control oscillations with duty cycle and load resistance
- deepen your competence in setting up oscilloscopes optimally and evaluating the displays
- train the diagnostic possibilities with multi-channel oscilloscopes

Equipment

- Laboratory trainer in a desk housing for use on a table or in a DIN-A4 support frame
- 2 x signal generator with two controllers each
- 2 x rotary switches with three positions for load resistance
- 4 x LCD display for voltage indication at input and output
- 36 x measuring sockets, 4 x sockets for power supply
- Detailed documentation and extensive worksheets for teachers and students



Recommended accessories

- Measuring cable BNC to 2mm for lab trainer 150cm
- Power supply TS10



Item no. 79 406 120

Manual 156 pages	
Digital work orders	
354 x 165 x 149 cm	
EQF level	2 3 4

Training Vehicle Purely Electric

This all-electric training vehicle is fully functional and ideal for troubleshooting and diagnostic work. It also allows students to learn various measurements, tests and diagnostic procedures on the components of the high-voltage system, such as the electric drive, comfort system, high-voltage battery and others. The training vehicle is based on a Volkswagen e-up!

Features

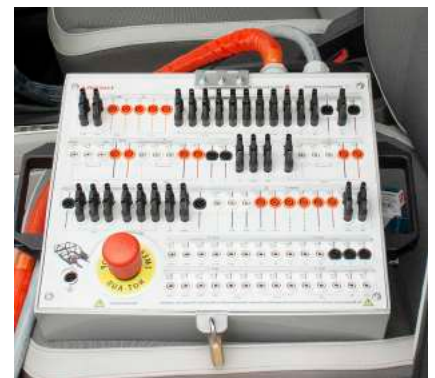
- Fully functional, prepared training vehicle VW e-up!
- Didactically valuable selection of faults and measuring points with a total of 22 or 39 faults and over 150 measuring points
- Measurements and fault circuits - also in the area of potential equalisation and insulation testing
- Measuring boxes in sturdy metal housing with handles and emergency stop as well as printed circuit diagram
- High-voltage measuring sockets carry the actual voltage, but are greatly reduced in current
- Access to all high-voltage measuring points behind lockable transparent protective cover

Equipment

- Integrated fault circuits
 - Fault box (drive / battery / charging): 30 switches (39 faults) or 16 switches (22 faults), depending on the desired version
- Integrated measurement options
 - Breakout box front: 75 x low-voltage measuring points (29 of them with jumper plug) / 17 x high-voltage measuring points / emergency stop
 - Breakout box rear: 55 x low-voltage measuring points (45 of which with bridge plug) / 10 x high-voltage measuring points / 5 x charging plug measuring points / emergency stop
 - 70 pin-outs in 4mm design on components, of which 10 x high-voltage measuring points

Additional accessories

- Digital work orders
- HV Accessory Set universal
- Metrahit H+E Car-Set
- VCDS Diagnostic System



Also available as training package: Item no. 14 025 150

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.





Item no. 79 406 102		
Theory (level 2) - approx. 3 h		📖
Practice (level 2) - approx. 8,5 h		🔧
Faults (level 2) - approx. 2,5 h		⚠️
Theory (level 3) - approx. 9,5 h		📖
Practice (level 3) - approx. 16,5 h		🔧
Faults (level 3) - approx. 7 h		⚠️
Theory (level 4) - approx. 5 h		📖
Practice (level 4) - approx. 4,5 h		🔧
Faults (level 4) - approx. 8 h		⚠️

Try it out now!



Demo



Video

Digital work orders Training Vehicle e-up!

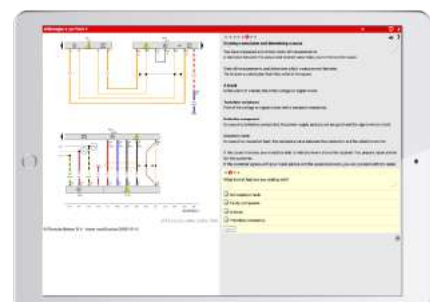
This comprehensive course covers all practical topics related to purely electric high-voltage vehicles.

📖 Preliminary theory *

- Working on hybrid vehicles, working under voltage
- Electric drive, Drive types, Electric vehicle
- HV cable, charging, charging modes
- HV system enabling, commissioning the HV system
- HV battery, battery balancing, battery management system
- DC/DC converter, inverter
- Interlock, charging connector, charging cable, charger, charging station, charging protocol, charging system
- Rotating magnetic field, permanent magnet synchronous motor
- Permanent insulation monitoring

🔧 Practical tasks

- Detect and identify, charging via a wallbox
- HV system: drive, comfort, charging, charging time calculation
- Guided troubleshooting Faults 1, 3, 5
- Disconnect, HV battery, DC/DC converter, climate control
- Interlock system A (power supply), interlock system B (pilot line)
- Overview charging systems, proximity pilot charging system, control pilot charging system, AC/DC charging system
- Faults 2, 4, 6, 12 - 14, 17 - 19
- Determination of the position of the electric motor, Permanent insulation monitoring
- Faults 7 - 11, 15, 16, 20 - 22



Course layout

Level 2	📖 2h 57m	🔧 8h 44m	⚠️ 2h 21m
Level 3	📖 9h 28m	🔧 16h 26m	⚠️ 6h 59m
Level 4	📖 4h 46m	🔧 4h 38m	⚠️ 7h 48m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.



Item no. 79 405 290

Digital work orders E

448 x 175 x 149 cm +

EQF level 2 3 4

Training Vehicle Plug-In Hybrid

This teaching system consists of the Toyota Prius 3 Plug-In training vehicle and the associated e-learning companion course. The digital work assignments deepen and complement the theory modules in a unique way. With this training system, previously acquired knowledge, skills and abilities around the topic of "electric HV drive" are practised and tested in practice through work assignments.

Learning content

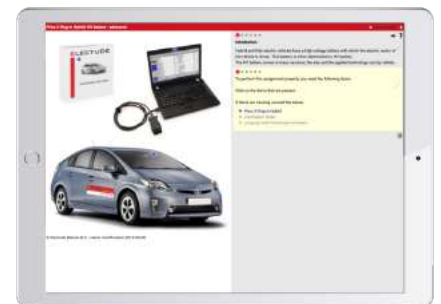
- Identify and classify components
- Work safety and de-energising HV battery, HV battery on dynamometer
- Drive types on the dynamometer Energyfluss, Energyfluss during electric driving, Energyfluss during recuperation, Energyfluss during combined driving.
- MG2 control, voltage and current charging process, charging system, vehicle charger, charging plug and charging protocol
- Guided troubleshooting, malfunctions and diagnosis

Equipment

- Break-out box for the PCM, touch-proof and short-circuit-proof!
- Break-out box for the HV battery and the BMS (Battery Management System), touch-proof and short-circuit-proof!
- Additional pin-out measuring sockets to support troubleshooting
- 10 x fault connections with work order and description
- 6 x touch-proof and short-circuit-proof measuring terminals on inverter
- Transparent shielding of the inverter and the HV-battery
- All additional HV measuring points are voltage-reduced by a factor of 10:1.

Required additional equipment

- Digital work orders
- HV Accessory Set
- Mongoose Diagnostic System



Only available as training package: Item no. 14 025 160

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



79 405 290



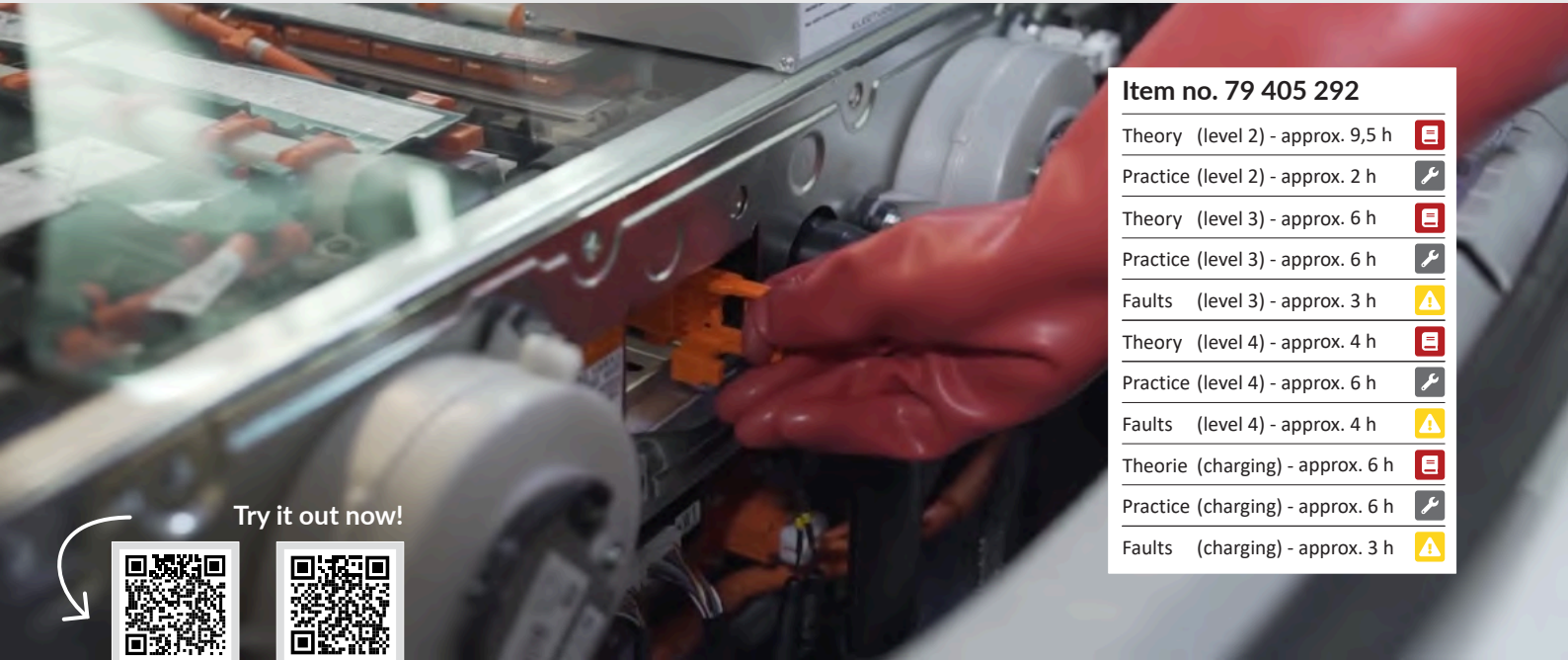
38 660 000



16 162 130



79 405 292



Item no. 79 405 292		
Theory (level 2) - approx. 9,5 h		
Practice (level 2) - approx. 2 h		
Theory (level 3) - approx. 6 h		
Practice (level 3) - approx. 6 h		
Faults (level 3) - approx. 3 h		
Theory (level 4) - approx. 4 h		
Practice (level 4) - approx. 6 h		
Faults (level 4) - approx. 4 h		
Theorie (charging) - approx. 6 h		
Practice (charging) - approx. 6 h		
Faults (charging) - approx. 3 h		

Try it out now!



Training Vehicle Plug-In Hybrid

This comprehensive course covers all practice-relevant topics on hybrid high-voltage vehicles with plug-in.

Preliminary theory *

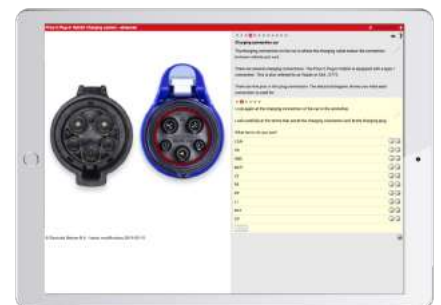
- Enabling the HV system, Working on hybrid vehicles, Full hybrid
- Permanent magnet synchronous motor, Hybrid vehicle with planetary gear, Rotating magnetic field, Commissioning the HV system
- Interlock, Short-circuit protection, Permanent insulation monitoring
- HV battery, HV cable, Battery management system, Battery ageing (SOH), Passive balancing, Temperature control of the HV battery
- Working under voltage, State of charge (SOC), Electric drive, Energy density, Energy flow in hybrid vehicles, Efficiency, Drive losses
- Charging: Charging system, charging

station, charging cable, charging modes, charging connector, charging protocol, charger, battery management system, efficiency, DC/DC converter

Practical tasks

- Identifying and classifying components, occupational safety and de-energising
- HV battery, HV battery on the dynamometer, drive types on the dynamometer
- Guided troubleshooting, faults 1 - 4
- Energy flow during electric driving, energy flow during recuperation, energy flow during combined driving
- Control MG2, voltage and current

- Malfunction 5 - 10
- Charging: Charging process, charging system, vehicle charger, charging plug and charging protocol, malfunction 11 - 16



Course layout

Level 2	9h 22m	2h 04m	
Level 3	5h 59m	6h 11m	2h 40m
Level 4	4h 05m	5h 53m	3h 56m
Charge	5h 42m	5h 52m	3h 27m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.



Item no. 48 010 050

Manual 30 pages



550 x 330 x 150 mm



EQF level

1 2

Assembly Kit High-Voltage Cables

This training system consists of a mounting plate and a complete, high-quality tool set. Everything fits into a practical carrying case. The work assignments contain numerous interesting hours of practical exercises. The students produce many different high-voltage cable connections themselves and then check them metrologically for equipotential bonding.

Learning content

- Identifying and allocating components
- Handling various tools
- Making HV cables and EMC cable glands yourself
- Stripping, crimping, screwing
- Checking and assessing the potential equalisation of the self-made connections



Equipment

- Carrying case incl. tool kit
 - Side cutters
 - Crimping pliers small
 - Crimping pliers large
 - Cable cutter large
 - Steel rule
 - Stripping tool
 - Torque spanner
 - Mounting sleeve
 - 4 x open-end spanner
- Mounting plate for use lying on the table, with rubber feet
- Mounting bracket for EMC cable glands, connection block for earth points
- 4 x various EMC cable glands
- 4 x various HV cables orange
- 5 x various earth connections
- 2 x pre-assembled connections with poor measured values

Required accessories

- Set of working material for 6 students
 - 48 010 061 in a bag
 - 48 010 062 in Systainer
- Metrahit H+E Car Set



Item no. 15 058 000

Manual 127 pages



400 x 200 x 120 mm



EQF level



Automotive Charging Test Adapter

Powerful test adapter for convenient, workshop-standard measurements of the charging system on high-voltage vehicles. Designed in a stable metal housing suitable for workshops, lockable. Mechanical-electrical locking ensures safe use. Safety measuring sockets with original voltage but greatly reduced current. All leads available as measuring points for voltage, current and signal measurement.

Learning content

- Charging modes, charging power
- Connectors and charging currents
- Checking the charging voltage
- Checking the charging current
- Testing the charging communication
- Insulation test of the charging equipment
- Checking the charging plug interlock
- Signals at the virtual neutral point

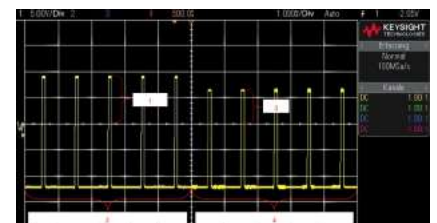


Equipment

- Design in stable metal housing suitable for workshop use with two lateral handles, lockable.
- Cable loops for current measurement for L1, L2, L3, N - accessible for current measuring clamp
- Original charging socket for charging cable 32A
- All plug pins led out as measuring sockets in safety design
- Artificial star point
- Mechanical-electrical interlock switch
- Cable with original charging plug 32A, min. 2m long

Additional equipment

- Charging cable type 2 mode 2 with ICCB
- Measuring set pro





Item no. 14 025 140

Theory (level 3) - approx. 1,5 h

Practice (level 3) - approx. 1 h

EQF level 3

Training Package T-Box Insulation Resistance

The T-Box Insulation Resistance consists of the box and the associated e-learning modules. The box contains a set of prepared HV cables and, on request, a Bosch FSA 050 insulation resistance meter. When insulating high-voltage, the correct insulation resistance of cables and components must be ensured for safe functioning.

Learning content

- Multimeter and insulation resistance tester
- The term insulation resistance
- Measuring insulation resistance according to workshop specifications
- What consequences could it have for the measurement result and the conclusions if the measurements are not carried out according to the instructions?
- What are the consequences for the wiring and therefore also for the customer if the insulation resistance is too low?

Preliminary theory *

- HV cable
- Work on hybrid vehicles
- Permanent monitoring of insulation

Equipment

- transport case
- Set of prepared HV cables

Required accessories

- Bosch FSA 050

Practical tasks

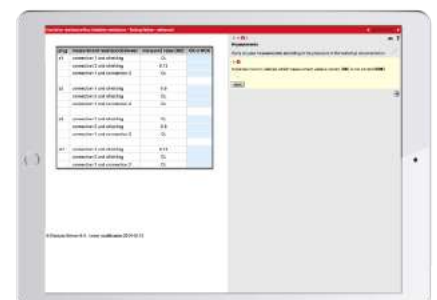
- Insulation resistance
- Find malfunction

Course layout

Level 3
 1h 18m
 51m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.



Selected cut-away models

Hybrid Transmission DQ 400E VW

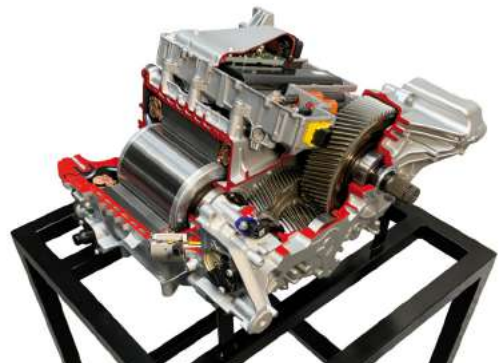
Good to identify are: Mechatronics, gear wheels, synchronisations, double clutch, parking lock, oil cooler, pressure accumulator, differential, oil pump and electric motor.



Item no. 79 001 362

Mercedes Benz EQC engine with gearbox

Easily visible are: Electric motor, gearbox, control unit, water cooling, parking lock, sensors, differential, high-voltage cable.



Item no. 79 001 368

Integrated starter-generator Mercedes Benz 48 V

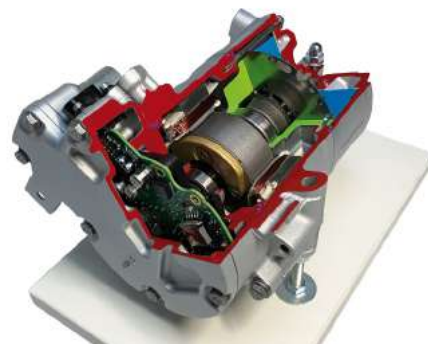
Good to see are: Rotor, stator, copper winding, water jacket, connections. It serves as a starter, generator and booster.



Item no. 79 001 369

Electric scroll compressor for e-mobility

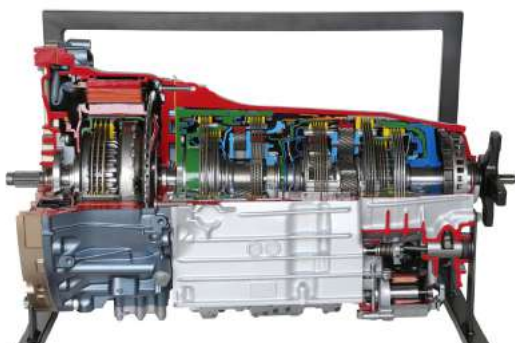
The following can be seen clearly: Electric motor, control, compressor screw, valve, connections.



Item no. 79 001 370

Mercedes-Benz 7-speed transmission (hybrid)

The following is visible: all seven hydraulic couplings, electric motor, planetary gear set, Ravigneaux and two simple planetary gear sets, disc springs, parking lock, hydraulic control, etc.



Item no. 79 001 351

You can find numerous other cut-away models on our homepage at www.thepra.de

Accessories E-Mobility

Power supply TS10

This power supply fits all THEPRA laboratory trainers. It offers a variable 4-15 V DC voltage output at I_{max} 6 A.



Item no. 12 050 010

Chain post set Pro

Consisting of 6 x chain stands with concrete base and one-piece tube in yellow with black stripes, 1 x chain length 25 m in black / yellow



Item no. 38 660 110

HV accessory set universal

Accessory set for safe work on high-voltage vehicles and teaching equipment. The case contains gloves, voltage testers, etc.



Item no. 38 066 050

Metrahit H+E Car-Set

Test case kit with: Metrahit 27 in protective rubber cover orange, test probes, 1 pair of test leads 2 m, 1 pair of Kelvin test leads with crocodile clips



Item no. 16 162 150

Digital multimeter Fluke 175

Universal digital multimeter with outstanding technical capabilities. Simple operation, TrueRMS true effective value.



Item no. 16 062 014

PicoScope 2-Channel Starter Set

USB oscilloscope 2-channel for car diagnosis. The set includes the oscilloscope, the software and common test leads.



Item no. 16 152 040

Diagnose Tool VCDS (Volkswagen)

Diagnostic system for VAG models from 1992 up to the current model series, with VCDS software, in practical storage case.



Item no. 38 079 135

Diagnose Tool Mongoose (Toyota)

Toyota approved global diagnostic tool, software licence required separately



Item no. 16 162 130

HV SAFETY 2000

Specially developed for the automotive sector. Guarantees the verification of all safety requirements on DC-HV circuits in the vehicle.



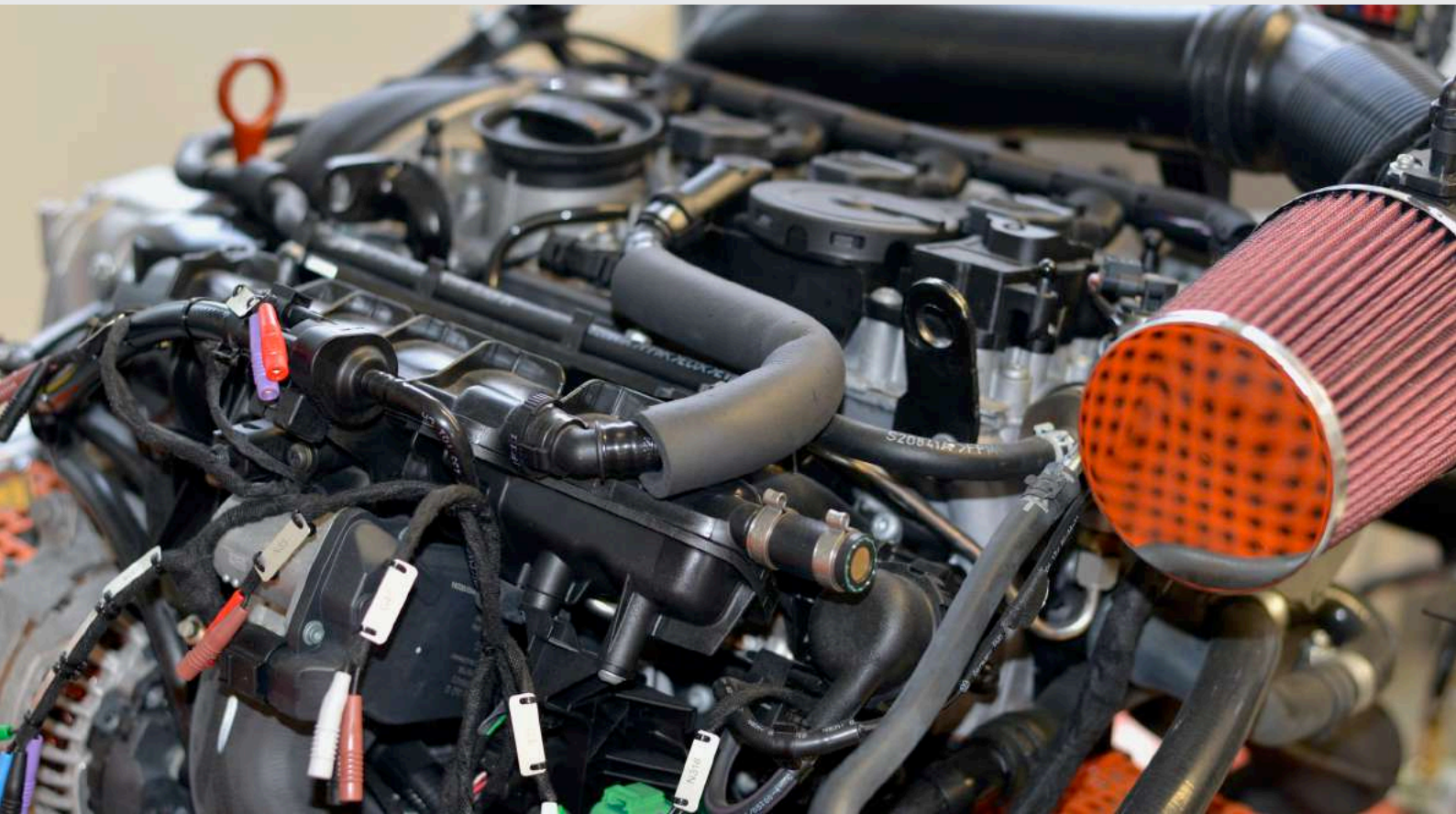
Item no. 16 162 300



Photo: Training package 14 025 150
Training vehicle e-up!

Chapter overview

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Motor Management

Starter Set T-Varia Motor management	78	System Orange - measuring on control units	96
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Simply switch between MPI, FSI and TDI



Item no. 14 020 300

Manual 105 pages	
Digital work orders	
71 x 110 x 178 cm	
13,8 V DC (40 A)	
EQF level	

Starter Set T-Varia Motor management

The basic equipment of the modular training systems for T-Varia Connect engine management. The ideal system for getting to know the complex interaction of electrical and electronic vehicle components in a practical way using original parts: engine management basics - error-free, low-noise, without emissions.

Features

- The T-Varia Connect System engine management enables the fully functional operation of MPI, FSI and TDI engine management systems: Simply preselect the operating mode and replace the actuators system panel!
- The engine control unit is error-free in every situation, the display provides additional measured values.
- The system allows operation with individual components, and thus a step-by-step build-up to the complete system.
- Wiring of all original car components according to the wiring diagram
- All connections in 4mm / 6mm safety version for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

The starter set contains

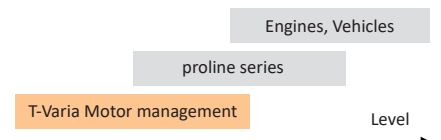
- T-Varia cart in aluminium design (item no. 11 010 020)
- T-Varia engine sensors (item no. 11 041 050)
- T-Varia engine management control unit (item no. 11 042 050)
- T-Varia engine drive unit (item no. 11 043 050)
- T-Varia engine management actuators MPI (item no. 11 044 050)
- Cable set, various lengths and colours (item no. 11 035 180)
- Power supply 3-15 V, 40 A (item no. 10 138 100)

Additional equipment

- T-Varia engine actuators FSI (item no. 11 044 060)
- T-Varia engine actuators TDI (item no. 11 044 070)

Classification of the system

The T-Varia engine management system is designed for thematic entry. There is no OBD plug, as no system diagnosis is trained.








Also available as a training package: Item no. 14 025 180

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



Item no. 11 041 050

Manual 11 / 105 pages	
Digital work orders	
71 x 110 x 178 cm	
13,8 V DC (40 A)	
EQF level	



T-Varia Engine Sensors

With this theme panel, you connect engine management sensors to the engine control unit according to the circuit diagram. Each sensor can be operated, controlled and measured individually. All sensors required for the intended operation of an MPI, FSI or TDI engine are included.

Features

- Wiring of all original vehicle components in accordance with the wiring diagram
- Each sensor can be operated, controlled and measured individually
- Each sensor is adjustable and provides correct signals
- All components required for the intended operation of an MPI, FSI or TDI engine are included
- Terminal designations with schematic printing
- Use of workshop standard gauges
- 23 x terminals in 4mm safety version, 1 x with jumper plug, for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear lid
- Original cooling water temperature sensor, potentiometer for signal adjustment
- Original intake air temperature sensor, potentiometer for signal adjustment
- Original intake manifold pressure sensor, potentiometer for signal adjustment
- Original wideband lambda sensor, potentiometer for signal adjustment
- Original hot-film air mass sensor, potentiometer for signal adjustment
- Original boost pressure sensor, potentiometer for signal adjustment
- Original fuel pressure sensor, potentiometer for signal adjustment

Learning content

- Working with circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Included in the starter set: Item no. 14 020 300

The ideal basic equipment for getting to know the complex interaction of electrical and electronic vehicle components in a practical way using original parts: The T-Varia Connect Starter Set Motor management .



14 020 300

Item no. 11 042 050

Manual 14 / 105 pages



Digital work orders



25 x 96 x 25 cm

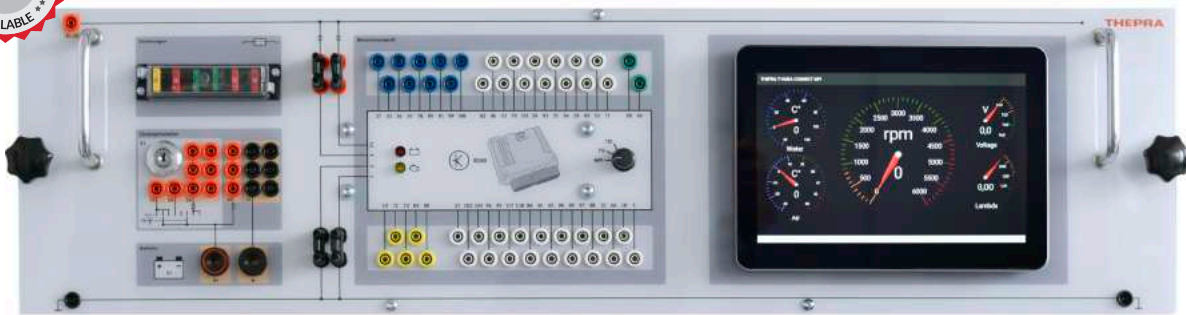


13,8 V DC (40 A)



EQF level

2 3



T-Varia Engine Control Unit

This system panel is the centre of the modular engine management system and is equipped with a programmable engine control unit. This enables the alternative operation of an MPI, FSI or TDI control unit by means of a switch.

Features

- Wiring of all original vehicle components according to wiring diagrams
- Programmable control unit with mode selector switch
- Optional operation of an MPI, FSI or TDI control unit
- Colour coding of the connections: Minus 5 volts (blue), plus 5 volts (yellow), signals (white), pulse 12 volts (red), minus 12 volts (black)
- Didactic arrangement: Inputs at the top, outputs at the bottom
- All important signals and data are shown "live" on the integrated 10 inch touch screen display. By swiping, you can choose between 4 different screens/arrangements

- 72 x connections in 4mm safety version for wiring and measuring, 2 x with 6mm for power supply
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- Engine control unit with selector switch for MPI, FSI, TDI
- Fuse box, ignition lock, 2 x indicator lights for ignition/fault









Included in the starter set: Item no. 14 020 300

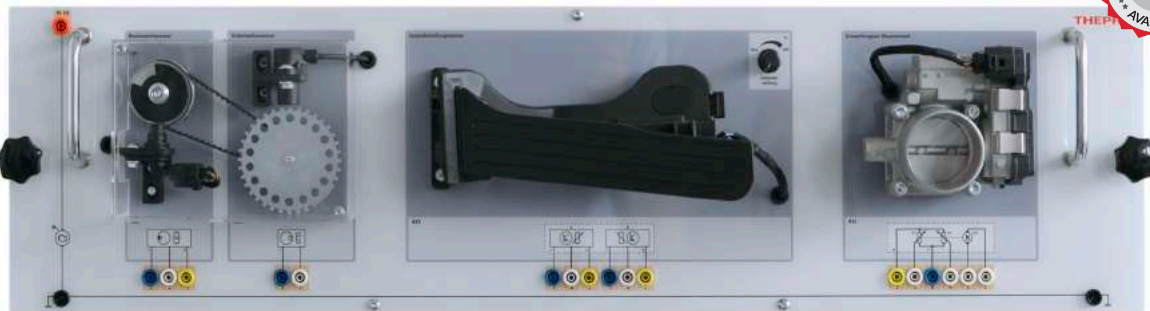
The ideal basic equipment for getting to know the complex interaction of electrical and electronic vehicle components in a practical way using original parts: The T-Varia Connect Starter Set Motor management .



14 020 300

Item no. 11 043 050

Manual 11 / 105 pages	
Digital work orders	
71 x 110 x 178 cm	
13,8 V DC (40 A)	
EQF level	 



T-Varia Engine Drive Unit

This system panel contains drive components of the modular engine management system that are connected to the engine control unit according to the circuit diagram. All components required for the intended operation of an MPI, FSI or TDI engine are included.

Features

- Wiring of all original vehicle components in accordance with the wiring diagram
- Original components connected to the engine control unit according to the circuit diagram
- All components for the intended operation of an MPI, FSI or TDI engine are included
- Rotating parts protected against contact
- Terminal markings with schematic printing
- 20 x terminals in 4mm safety version for wiring and measuring

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, as well as rear cover
- Original Hall sensor as camshaft sensor, original inductive speed sensor as crankshaft sensor
- Signal pulleys electrically driven via toothed belt
- Original accelerator pedal, potentiometer for optional value setting at the accelerator pedal, original throttle valve unit

Learning content

- Working with circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Selecting and using electrical measuring and testing equipment
- Measuring and evaluating electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Included in the starter set: Item no. 14 020 300

The ideal basic equipment for getting to know the complex interaction of electrical and electronic vehicle components in a practical way using original parts: The T-Varia Connect Starter Set Motor management .



14 020 300

Item no. 11 044 050

Manual 105 pages



Digital work orders



25 x 96 x 25 cm



13,8 V DC (40 A)



EQF level

2 3



T-Varia Engine Actuators MPI

With this theme panel, you connect actuators of the engine management MPI to the engine control unit according to the circuit diagram. The modular T-Varia system thus becomes a fully functional multipoint petrol injection system. Each actuator can be operated and measured individually.

Features

- Wiring of all original vehicle components in accordance with the wiring diagram
- Original components connected to the engine control unit according to the circuit diagram
- The modular T-Varia system becomes a fully functional multipoint petrol injection system
- Actuators can be operated and measured individually
- Terminal designations with schematic printing
- 31 x terminals in 4mm safety version for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Learning content

- Reading and working with automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and assessing electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, as well as rear cover
- Original injection valve MPI with 4 x LED, original double spark ignition coil
- 4 x original spark plugs, fuel pump with relay and LED
- Radiator fan with relay and LED, 4 x fuse

Available as a training package complete system: Item no. 14 025 180

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.

Alternatively as a training package to complement MPI: Item no. 14 025 185

If a complete system is already available, such as the T-Varia Connect engine management FSI or TDI. You will receive the system panel MPI as well as the matching digital work orders for the unit.



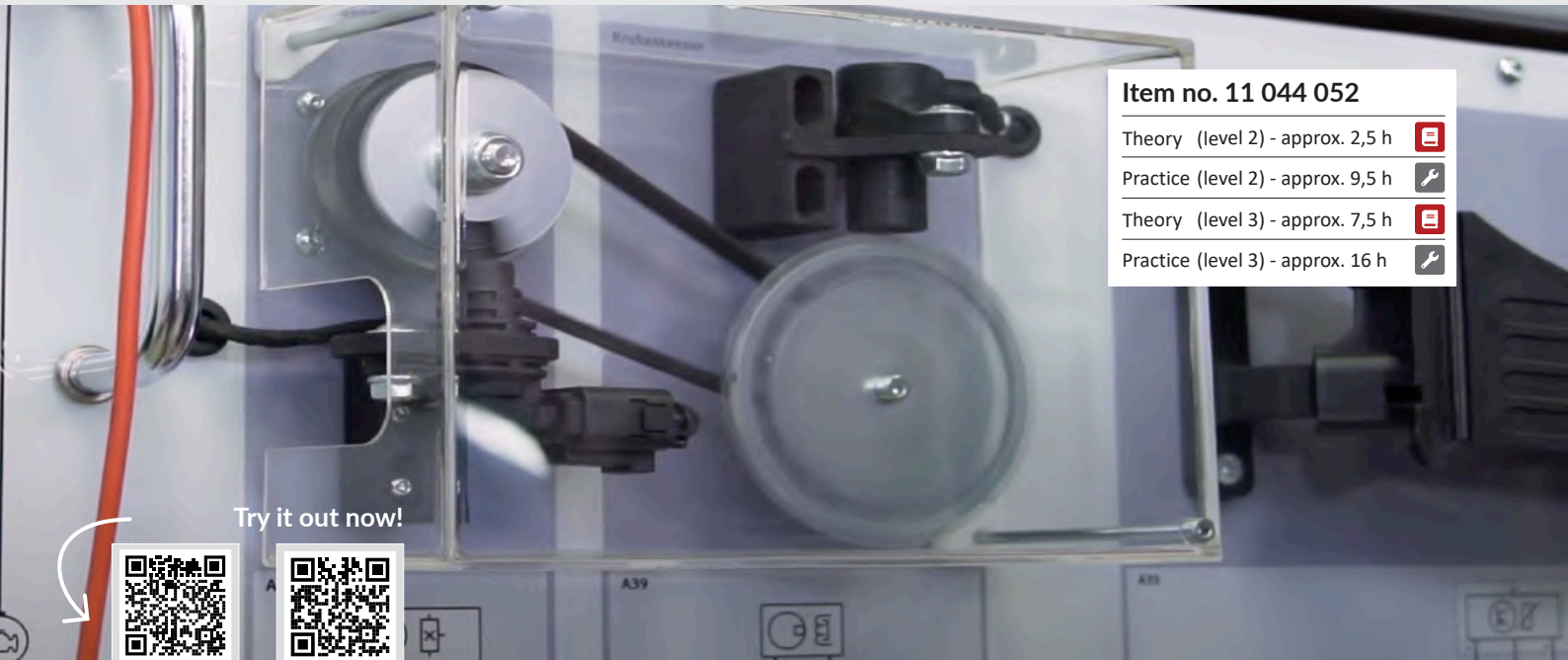
14 020 300

11 044 052



11 044 050

11 044 052



Item no. 11 044 052

Theory (level 2) - approx. 2,5 h	
Practice (level 2) - approx. 9,5 h	
Theory (level 3) - approx. 7,5 h	
Practice (level 3) - approx. 16 h	

Try it out now!



Digital work orders T-Varia Motor management MPI

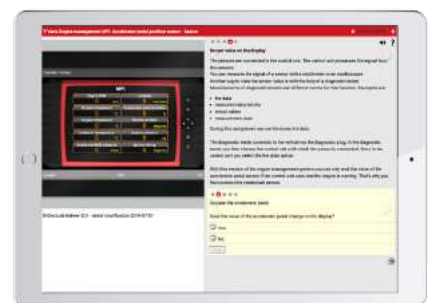
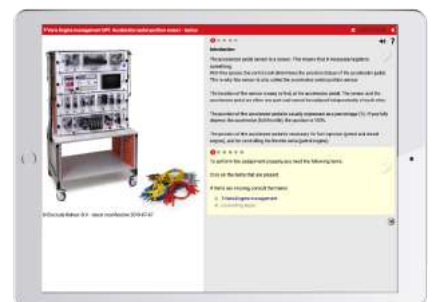
After completing the practical tasks, you will have a deeper insight into the various functions of a multi-point injection system MPI. You will learn to check the function of the sensors and actuators of an MPI system, to carry out measurements with a multimeter and oscilloscope and to analyse them.

Preliminary theory *

- Petrol engine
- MPI: overview, features, fuel circuit, operating conditions
- Inductive sensor, temperature sensor coolant, fuel pump
- Injector, Electronically controlled throttle valve
- Lambda, Lambda sensors, Wideband lambda sensor
- Camshaft position sensor, Intake air temperature sensor
- Intake manifold pressure sensor, accelerator pedal position sensor, throttle valve position sensor
- DIS: dormant high voltage distribution

Practical tasks

- Engine temperature sensor
- Crankshaft sensor
- Camshaft sensor
- Accelerator pedal sensor
- Intake manifold pressure sensor
- Intake air temperature sensor
- Throttle valve control unit
- Injection valve
- Ignition coil



Course layout

Level 2	2h 26m	9h 44m
Level 3	7h 27m	15h 46m

Licence: You acquire a user licence for any number of students and teachers with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

Item no. 11 044 060

Manual 71 / 105 pages



Digital work orders



25 x 96 x 25 cm

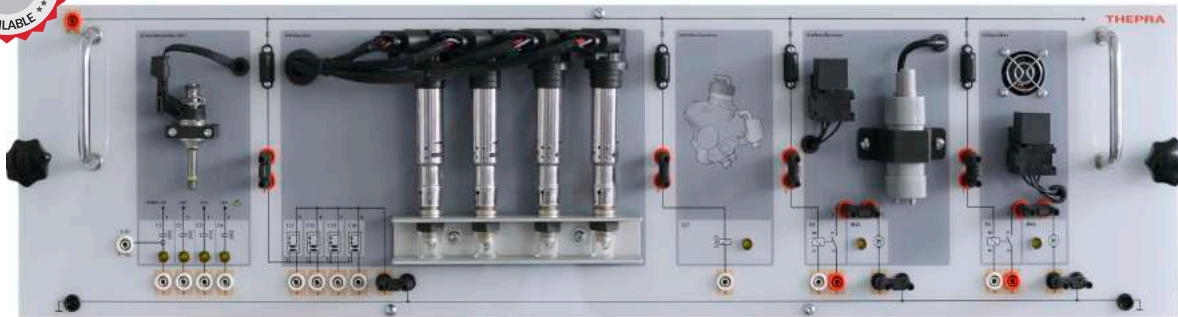


13,8 V DC (40 A)



EQF level

2 3



T-Varia Engine Actuators FSI

With this theme panel, you connect FSI engine management actuators to the engine control unit according to the circuit diagram. The modular T-Varia system thus becomes a fully functional FSI petrol direct injection system. Each actuator can be operated and measured individually.

Features

- Wiring of all original vehicle components in accordance with the wiring diagram
- Original components connected to the engine control unit according to the circuit diagram
- The modular T-Varia system becomes a fully functional FSI petrol direct injection system
- Actuators can be operated and measured individually
- Terminal designations with schematic printing
- 35 x terminals in 4mm safety version for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Learning content

- Reading and working with automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and assessing electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, as well as rear cover
- Original FSI injection valve with 4 x LED, 4 x original single spark ignition coil with 4 x LED
- 4 x original spark plugs, representation of high-pressure pump with fuel pressure control valve and LED
- Fuel pump with relay and LED, cooling fan with relay and LED, 4 x fuse

Available as a training package complete system: Item no. 14 025 190

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



11 044 062

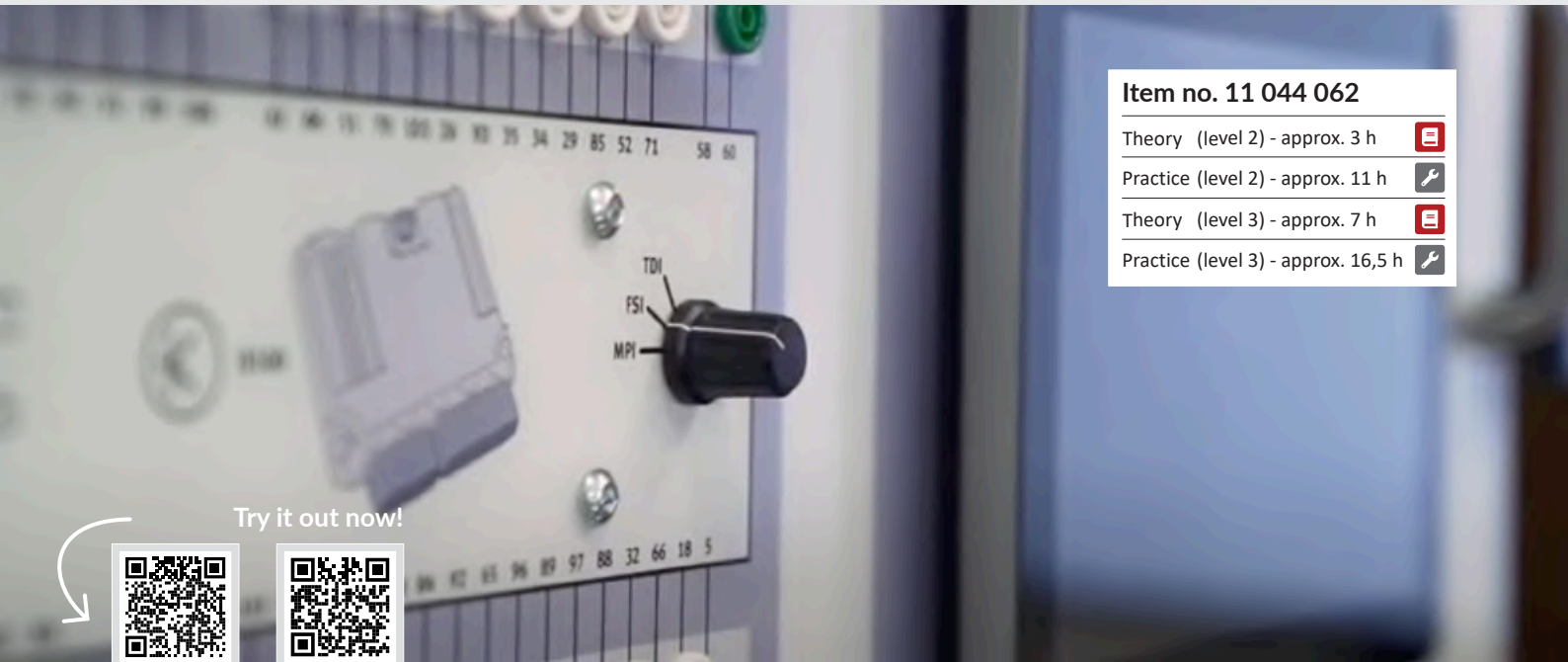
Alternatively as a training package to complement FSI: Item no. 14 025 195

If a complete system is already available, such as the T-Varia Connect engine management MPI or TDI. You will receive the system panel FSI and the matching digital work orders for the unit.



11 044 060

11 044 062



Item no. 11 044 062	
Theory (level 2) - approx. 3 h	
Practice (level 2) - approx. 11 h	
Theory (level 3) - approx. 7 h	
Practice (level 3) - approx. 16,5 h	

Try it out now!



Digital work orders T-Varia Motor management FSI

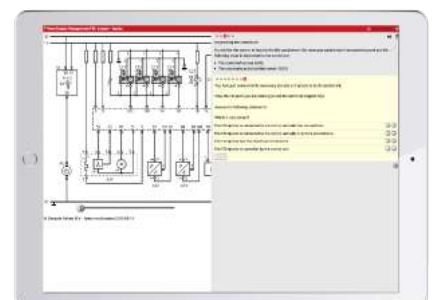
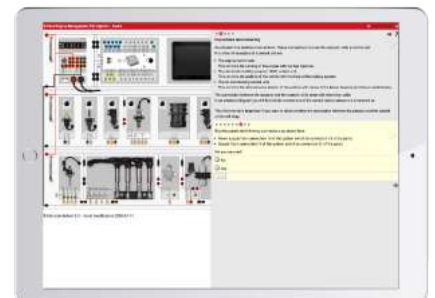
After completing the practical tasks, you will have a deeper insight into the various functions of an FSI injection system. You will learn to check the function of the sensors and actuators of an FSI system, to carry out measurements with a multi-meter and oscilloscope and to analyse them.

Preliminary theory *

- Petrol engine
- Coolant temperature sensor
- Fuel pump
- Lambda, lambda sensors, broadband lambda sensor
- FSI: Injection valve, characteristics, operating modes, fuel circuit
- Inductive sensor, camshaft sensor
- Temperature sensor, coolant
- Intake air temperature sensor
- Intake manifold pressure sensor
- Accelerator pedal value sensor, Throttle position sensor, Electronically controlled throttle valve

Practical tasks

- Injector
- Lambda probe
- Throttle valve control unit
- Crankshaft sensor
- Camshaft sensor
- Radiator fan
- Fuel pressure sensor
- Position sensor accelerator pedal
- Engine temperature sensor
- Electric fuel pump
- Intake manifold pressure sensor
- Intake air temperature sensor
- Ignition coil



Course layout



Licence: You acquire a user licence for any number of students and teachers with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

Item no. 11 044 070

Manual 110 / 105 pages



Digital work orders



25 x 96 x 25 cm

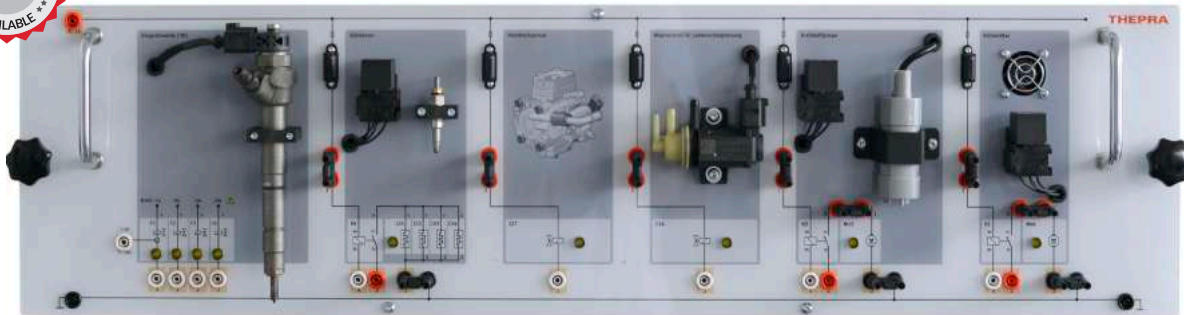


13,8 V DC (40 A)



EQF level

2 3



T-Varia Engine Actuators TDI

With this theme panel, you connect actuators of the TDI engine management system to the engine control unit according to the circuit diagram. The modular T-Varia system thus becomes a fully functional common rail diesel system. Each actuator can be operated and measured individually.

Features

- Wiring of all original vehicle components in accordance with the wiring diagram
- Original components connected to the engine control unit according to the wiring diagram
- The modular T-Varia system becomes a fully functional common rail diesel system
- Actuators can be operated and measured individually
- Terminal designations with schematic printing
- 36 x terminals in 4mm safety version for wiring and measuring
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions

Learning content

- Reading and working with automotive circuit diagrams
- Naming electrical and electronic components, assemblies and systems
- Testing and repairing electrical and electronic circuits
- Selecting and using electrical measuring and testing equipment
- Measuring and assessing electrical quantities and signals
- Documenting work results and evaluating them by comparing them with calculated values and manufacturer's specifications.

Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated bow handles for easy handling, and rear cover
- Original fuel injector TDI with 4 x LED, original glow plug with 4 x LED and relay
- Illustration of high-pressure pump with fuel pressure control valve with LED, original solenoid valve for boost pressure limitation with LED
- Fuel pump with relay and LED, radiator fan with relay and LED, 5 x fuse

Available as a training package complete system: Item no. 14 025 200

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.



11 044 072

Alternatively as a training package to complement TPI: Item no. 14 025 205

If a complete system is already available, such as the T-Varia Connect engine management MPI or FSI. You will receive the system panel TDI as well as the matching digital work orders for the unit.



11 044 070

11 044 072



Item no. 11 044 072	
Theory (level 2) - approx. 4 h	
Practice (level 2) - approx. 11,5 h	
Theory (level 3) - approx. 7 h	
Practice (level 3) - approx. 20,5 h	

Try it out now!



Demo



Video

Digital work orders T-Varia Motor management TDI

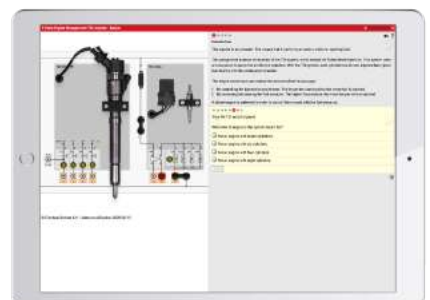
After completing the practical tasks, you will have a deeper insight into the various functions of a turbo diesel injection system TDI. You will learn to check the function of the sensors and actuators of a TDI system, to carry out measurements with a multimeter and oscilloscope and to analyse them.

Preliminary theory *

- Diesel engine Introduction, features, overview, operating conditions
- Fuel circuit, fuel feed pump, high-pressure pump
- Common rail diesel: diesel injector, rail pressure sensor, pressure control valve
- Glow-start system, glow plugs, glow plug control system
- Mass air flow sensor, coolant temperature sensor
- Camshaft sensor, inductive sensor
- Charging, intake manifold pressure sensor
- Wastegate solenoid valve
- Intake air temperature sensor
- Accelerator pedal sensor

Practical tasks

- Crankshaft sensor
- Camshaft sensor
- Position sensor accelerator pedal
- Engine temperature sensor
- Intake air temperature sensor
- Boost pressure sensor
- Mass air flow sensor
- Fuel pressure sensor
- Electric fuel pump
- Radiator fan
- Glow system
- Fuel pressure regulator
- Boost pressure control valve
- Injector



Course layout

Level 2	3h 48m	11h 20m
Level 3	6h 58m	20h 20m

Licence: You acquire a user licence for any number of students and teachers with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.

Item no. 11 015 550

Manual 39 pages



25 x 96 x 25 cm



13,8 V DC (60 A)



EQF level

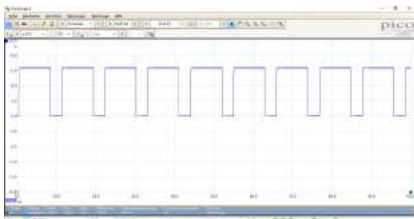


T-Varia Preheating with Pressure Sensor

The system panel pressure sensor preheating system is equipped with original components from the vehicle and contains three conventional glow plugs as well as a modern pressure sensor glow plug with pressure chamber. The system panel enables experiments and measurements on temperature, pressure and sensor voltage.

Features

- Functioning of the preheating system in modern diesel engine management
- Original glow control unit with electronic control of the glow current
- Original glow pins and pressure sensor glow pin
- Terminal designations with schematic imprint as well as control unit pin designation
- 13 x terminals in 4mm safety version, 2 x with jumper plug, for wiring and measuring
- Manual high-pressure pump can be connected
- Didactically prepared documents with tasks and worksheets as well as the corresponding solutions
- Also suitable for stand-alone operation



Equipment

- T-Varia system panel suitable for T-Varia equipment cart
- Design with coloured digital print behind Plexiglas, circuit diagrams and symbols, two chrome-plated handles for easy handling, as well as rear cover
- Ignition lock and pilot light
- Push-button for switching on the glow current and potentiometer for setting the glow current
- Digital colour display for pressure and sensor voltage, digital colour display for temperature in the pressure chamber
- Pressure chamber with pressure sensor glow plug and sight glass, pressure connection for the compressed air pump, pressure release valve, overpressure safety valve, pressure sensor and temperature sensor
- 3 x conventional glow plugs
- Glow control unit with 12 outgoing connections. The current for each glow plug can be interrupted or measured individually at the 4 bridges.
- High-pressure pump with pressure gauge

Learning content

- Preheating system in modern diesel engine management
- Experiments and measurements on temperature, pressure and sensor voltage, also with the oscilloscope
- Closed-loop control in the engine combustion chamber
- Measuring and evaluating electrical variables and signals
- Documenting work results and evaluating them by comparing them with calculated variables and manufacturer specifications



Manual high pressure pump

Item no. 38 040 250

Manual 179 pages



141 x 70 x 193 cm



110 V - 240 V AC



EQF level



Fuel Injection - EFI (Toyota) - proline

On this training and function stand, functions and processes, errors and measured values can be illustrated and examined without emissions, just like on the original engine. All original parts and required components are clearly arranged in the EVA principle on the colour-printed front panel.

Features

- The required power supply, wiring and configuration of the components are already integrated and preset in the system. The system can be used and put into operation directly.
- The unit is constructed as a compact system with original components of a Toyota 3-cylinder engine 1.0 EFI.
- Numerous operating conditions can be set, measured and evaluated. The system is ready for immediate use with a built-in transfer module with interfaces for error switching device and measured value decoupler to student measuring stations.
- Original components, Toyota injection technology
- Front panel with symbolic display in EVA principle: input - processing - output
- 2 large digital colour displays for indication of intake manifold pressure, fuel quantity
- Measurement of all relevant parts and components in the central circuit diagram measuring field with 52 measuring sockets

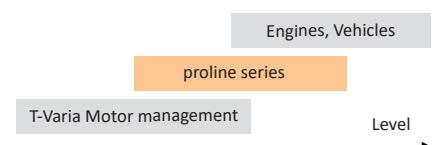
- Decoupler connection for student measuring stations, connection for error switching device (21 active switches for 42 errors)
- Fully diagnosable via OBD interface
- Detailed documentation and comprehensive worksheets for teachers and students.

Learning content

- EFI injection technology: name components of the entire engine management system and explain the interaction of the components.
- Work with original wiring diagrams and determine connection pins on components and control unit in relation to the problem.
- Determine set values depending on the operating situation
- Use standard workshop diagnostic tools for OBD
- Measure and evaluate sensor signals and actuator control voltages
- Measure CAN bus signals with oscilloscope and evaluate signal level

Classification of the system

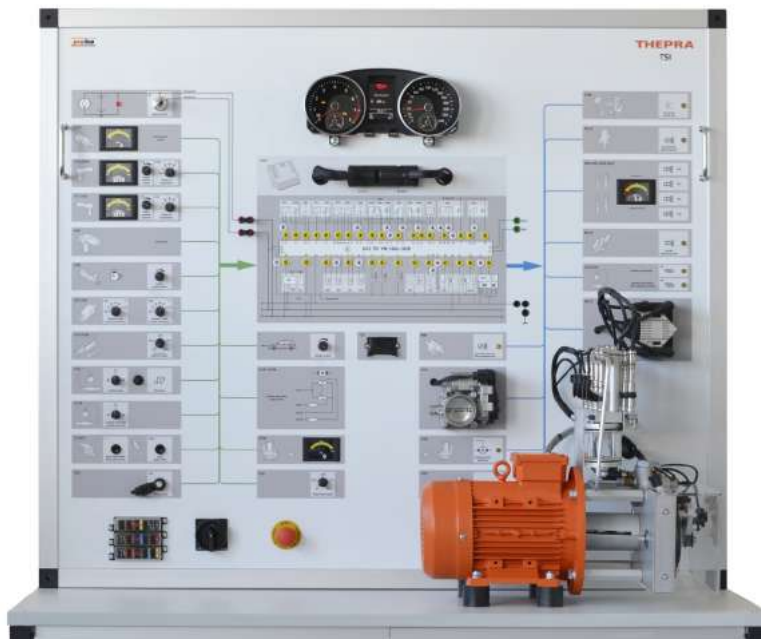
Systems from the proline series cover a wide range of content and are therefore a good addition for many facilities.



Additional equipment

- Universal fault switching device
- Diagnostic Tool Mongoose (Toyota)
- Student measuring stations





Item no. 38 072 250

Manual 198 pages



141 x 70 x 193 cm



400 V / 16 A



EQF level



Petrol Direct Injection - TSI (VW) - proline

On this training and function stand, functions and processes, errors and measured values can be illustrated and examined without emissions, just like on the original engine. All original parts and required components are clearly arranged in the EVA principle on the colour-printed front panel.

Features

- The required power supply, wiring and configuration of the components are already integrated and preset in the system. The system can be used and put into operation directly.
- The unit is designed as a compact system with original components of a VW petrol engine 1.2/1.4 TSI.
- Numerous operating conditions can be set, measured and evaluated. The system is ready for immediate use with a built-in transfer module with interfaces for error switching device and measured value decoupler to student measuring stations.
- Original components, original injection pressures
- Front panel with symbolic display in EVA principle: input processing output
- 5 large digital colour displays for indication of fuel pressure, boost pressure sensor, intake manifold pressure, boost pressure regulator, fuel quantity
- Measurement of all relevant parts and components in the central circuit diagram measuring field with 57 measuring sockets
- Compact unit design, mobile for laboratory and workshop use

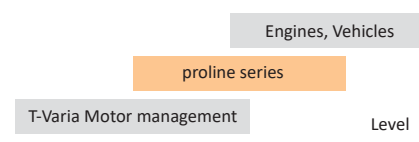
- Connection for decoupler for student measuring stations, connection for error switching device (23 active switches for 46 errors)
- Fully diagnosable via OBD interface
- Detailed documentation and comprehensive worksheets for teachers and students.

Learning content

- TSI injection technology: Name components of the entire engine management system and explain the interaction of the components.
- Work with original wiring diagrams and determine problem-related connection pins on components and control unit
- Determine set values depending on the operating situation
- Use standard workshop diagnostic tools for OBD
- Measure and evaluate sensor signals and actuator control voltages
- Measure CAN bus signals with oscilloscope and evaluate signal level

Classification of the system

Systems from the proline series cover a wide range of content and are therefore a good addition for many facilities.



Additional equipment

- Universal fault switching device
- VCDS diagnostic tool (Volkswagen)
- Student measuring stations



Item no. 17 036 250

Manual 243 pages



141 x 70 x 193 cm



400 V / 16 A



EQF level



Diesel Common Rail Piezo - TDI (VW) - proline

On this teaching and function stand with piezo injection technology, all characteristics, states, faults and measured values can be illustrated and examined as on the original engine. Test stand complete, mobile on laboratory trolley, with transfer module for student circuit diagram measuring stations and optional error switching device.

Features

- All original parts and required components are clearly arranged on the colour-printed front panel in the EVA principle. The required power supply, wiring and configuration of the components are already integrated in the system and preset. The system can be used and put into operation directly.
- The unit is constructed as a compact system functional with original components of a VW diesel engine 1.6/2.0 TDI.
- Numerous operating conditions can be set, measured and evaluated. The system is ready for immediate use with a built-in transfer module with interfaces for error switching device and measured value decoupler to student measuring stations.
- Original components, TDI piezo injection technology, original injection pressures
- Front panel with symbolic display in EVA principle: input - processing - output
- 7 large digital colour displays for displaying fuel temperature, air mass, boost pressure sensor, lambda sensor, exhaust gas pressure, boost pressure regulator, fuel quantity

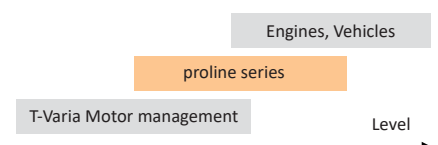
- Measuring of all relevant parts and components in the central circuit diagram measuring field with 77 measuring sockets.
- Decoupler connection for student measuring stations, connection for error switching device (25 active switches for 50 errors)
- Fully diagnosable via OBD interface
- Detailed documentation and comprehensive worksheets for teachers and students.

Learning content

- TDI injection technology: Name components of the entire engine management system and explain the interaction of the components.
- Work with original wiring diagrams and determine problem-related connection pins on components and control unit
- Determine set values depending on the operating situation
- Use standard workshop diagnostic tools for OBD
- Measure and evaluate sensor signals and actuator control voltages
- Measure CAN bus signals with oscilloscope and evaluate signal level

Classification of the system

Systems from the proline series cover a wide range of content and are therefore a good addition for many facilities.

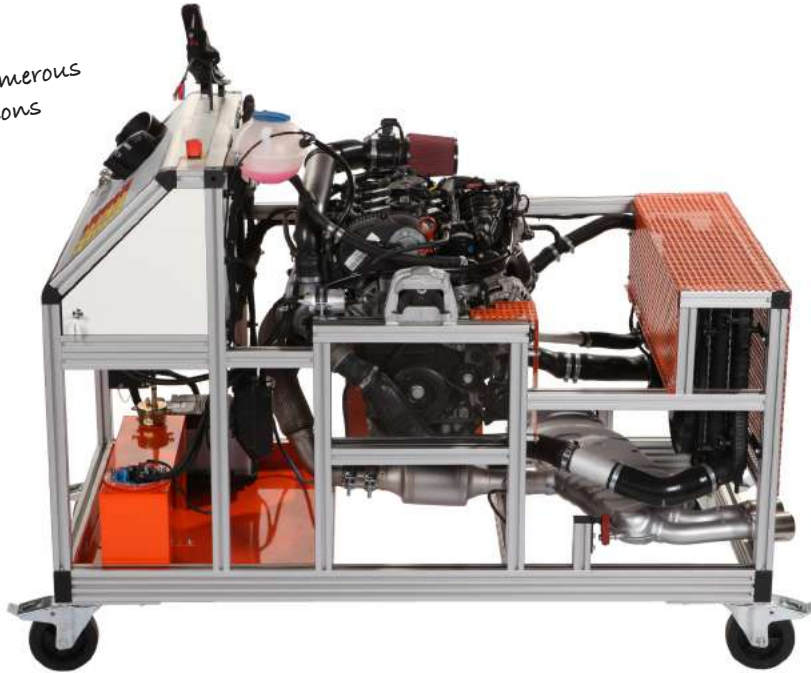


Additional equipment

- Universal fault switching device
- VCDS diagnostic tool (Volkswagen)
- Student measuring stations



Available in numerous configurations



Item no. 79 301 270

Manual 80 - 190 pages



169 x 88 x 152 cm



Vehicle battery 12 V



EQF level

2 3 4

Training Engines

Individual engine training stand VW engine OBD, built on a frame made of aluminium profile with large swivel castors and all original components. Rotating or hot engine parts are protected accordingly. THEPRA training engines are always configured as desired and include detailed documentation.

Features

- Engine type freely selectable: MPI, TSI, TDI with Euro 5 or 6
- Error packages to choose from: 12 switches / 24 errors or 22 switches / 44 errors
- Determine the measuring possibilities at the control unit: parallel measuring sockets (up to 196 pieces) or serial measuring sockets with jumper plug (up to 2 x 196 pieces)
- Determine the measurement options on sensors / actuators: up to 20 pin-outs in the colours of the circuit diagram or up to 80 pin-outs in the colours of the circuit diagram
- Optional: component simulation 5-fold for different sensors with key switch to choose between original and simulation
- Optional: measuring sockets on relays, up to 20 pin-outs
- Detailed documentation for fault circuit and diagnosis, circuit diagrams, self-study programme

Equipment

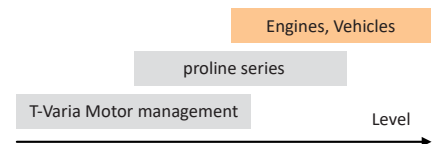
- The engine is completely equipped with all necessary original functional components as a compact system. The motor has a low mileage.
- Built on a frame made of aluminium profile with 4 large lockable castors. The frame has additional reinforcements and allows easy retrofitting of a dynamometer / eddy current brake.
- Control panel with side-locking doors. A pull-out table is integrated which is suitable for testers or notebooks. The table top has a printed circuit diagram of the system and is laminated with a protective film.
- The front panel has a coloured digital print behind Plexiglas.
- The motor has a residual bus simulation, whereby the motor control unit is completely fault-free.

Accessories





- Diagnostic Tool VCDS (Volkswagen)
- Cover made of woven and coated tarpaulin
- Dynamometer eddy current brake

Classification of the system

The focus of the content of training engines is troubleshooting and system diagnosis.



Item no. 40 015 300

Manual 46 / 89 pages	
141 x 70 x 193 cm	
110 V - 240 V AC	
EQF level	



Dynamometer Eddy Current Brake

Eddy current brake for training engine, mobile with protective grid, including drive shaft with special coupling, control panel, electronic measurement data acquisition with software. The unit enables fully automatic power measurement with software profiles and remote control for operation in a separate room.

Features

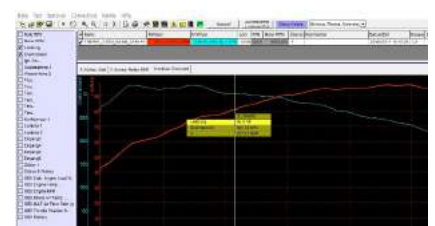
- Engine dynamometer especially for teaching purposes.
- Eddy current brake for power measurements on training engines with up to 1000 Nm torque.
- Mobile with protective grid, including drive shaft with special coupling for low-vibration running.
- Electronic measurement data acquisition with PC-controlled software
- The compact design allows the unit to be quickly disconnected from one engine and operated on another compatible engine.
- The unit allows fully automatic power measurement with software profiles.
- Remote control with emergency stop for operation in a separate room
- Detailed documentation and comprehensive worksheets for teachers and students.

Equipment

- Complete dynamometer system for use with a compatible THEPRA training engine.
- 1000 Nm retarder system Eddy current brake built into mobile frame with protective grille.
- The magnetic effect consumes the motor force, the rotating torque is converted into a static torque and measured. In the process, the energy is converted into heat.
- Mounting flange on the engine fly-wheel Drive shaft with special coupling
- Interface for PC connection and Windows software for data acquisition (English)
- Electronic data acquisition and recording software

Learning content

- Assembly and disassembly of sophisticated mechanical systems
- Speed and torque measurement in different engine operating conditions.
- Power measurement with software profiles.
- Power calculation with the measured values.



Various thematic focuses available



Item no. 79 405 100

Manual 70 - 200 pages



169 x 88 x 152 cm



Vehicle battery 12 V



EQF level



Training Vehicles Conventional

Individual training systems made from used vehicles with low mileage. Reconditioned for training purposes and available in numerous versions. THEPRA training vehicles are always configured as requested and include detailed documentation.

Features

- Engine type freely selectable: MPI, TSI, TDI with Euro 5 or 6
- Numerous error packages with main topics to choose from:
 - Engine fault package I → 24 faults
 - Engine fault package II → 44 errors
 - Fault package comfort I → 20 errors
 - Fault package comfort II → 20 errors
 - Fault package lighting → 20 errors
 - Fault package CAN bus → 20 errors
 - Training vehicle assistance systems → 50 faults
 - Individual fault packages
- Breakout boxes on control units matching the main topic, e.g. engine, on-board network, ABS, gateway: with parallel measuring sockets or serial measuring sockets with jumper plugs.
- Measuring options on sensors / actuators matching the fault packages: pin-outs in the colours of the wiring diagram
- Detailed documentation on fault circuit and diagnosis, circuit diagrams, self-study programme

Equipment

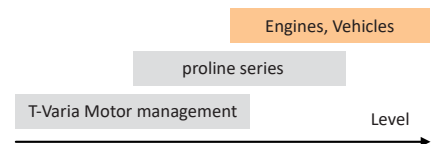
- Fully functional, prepared themed training vehicle. The basic vehicle has low mileage.
- Prepared for training purposes, numerous covers removed, easy access to all essential components.
- Complete with air conditioning, ABS/ESP system, CAN network, SRS AIRBAG system (inactive) etc. The control units are faultless.
- High-quality workshop-quality design of the breakout boxes. Front panels with coloured digital printing behind Plexiglas
- Measuring sockets in safety design, pin-out measuring sockets additionally labelled with laser engraving
- Special versions available, e.g. as a space-saving half-vehicle or with viewing cut-outs in the bodywork

Recommended accessories

- Diagnose Tool VCDS (Volkswagen)

Classification of the system

The focus of the content orientation of training vehicles is troubleshooting and system diagnosis.



Item no. 38 300 320

Manual 10 pages



30 x 40 x 33 / 43 cm



EQF level

2 3 4



Y-cable Adapter Sets - measuring on sensors / actuators

The Y-cables can be connected between the sensor / actuator and the engine harness connector so that the engine management system can continue to function without interference. With the 18-pin breakout box, safe parallel measurements of the signals from and to the sensor or actuator can be carried out.

Features

- Available for a large number of vehicles
- Individual vehicle sets on request
- Continued trouble-free operation of the vehicle - no error codes in the control unit due to disconnected plugs
- Precise measurements possible without damaging wires or risking damage to contacts

Equipment

- Complete sets in practical storage cases with foam inserts
- 18-pole breakout box for parallel measurements
- Extension cable 1.5 m
- The number of Y-cables supplied varies depending on the vehicle

Y-cable adapter set Volkswagen

Item no. 38 300 320 - Complete set with 21 pieces of Y-cables to the connectors commonly used by VW, breakout box, extension cable and storage case.

Y-cable adapter set Opel

Item no. 38 300 325 - Complete set with 16 pieces of Y-cables to the connectors commonly used by Opel, breakout box, extension cable and storage case.

Y-cable adapter set Toyota

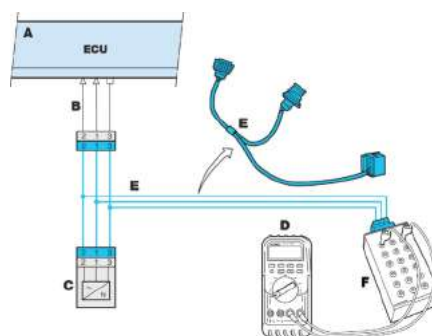
Item no. 38 300 326 - Complete set with 19 pieces of Y-cables to the connectors commonly used by Toyota, breakout box, extension cable and storage case.

Y-cable adapter set Universal 2 and 3 Pin

Item no. 38 300 321 - Complete set with 29 pieces of Y-cables to commonly used connectors (2 and 3 pin), breakout box, extension cable and storage case.

Y-cable adapter set Universal 4 to 14 Pin

Item no. 38 300 322 - Complete set with 29 pieces of Y-cables to general connectors (4 to 14 pin), breakout box, extension cable and storage case.



Available for numerous vehicles and control units



Item no. 38 300 000

Manual 20 pages



36 x 21 x 6 cm



EQF level

2 3 4

System Orange - measuring on control units

The universal measuring system on the motor vehicle - also suitable for retrofitting existing vehicles. The connection to control units via connection adapters enables workshop-compatible testing with pin boxes on modern electronic systems in the motor vehicle (engine management, ABS, etc.).

Features

- Practical measurement with the aid of the original circuit diagram.
- Practical fault switching. With breaker box with contact resistance, load resistance and short-circuit on all control unit contacts.
- Versions: 100, 150 or 200 PIN
- Up to 12 pin boxes can be connected simultaneously as student measuring stations
- Connection adapters are equipped with universal connectors. This means you can use all your vehicles and engines, including future ones, with just one fault or breaker box.

A complete measuring system consists at least of

- Interruption box 100, 150 or 200 pin with support mask
- Pin box, connected to interruption box via intermediate cable with support mask
- Connection adapter suitable between desired control unit and interruption box

Interruption box

Item no. 38 300 180 → 100 Pin
Item no. 38 300 200 → 150 Pin
Item no. 38 300 210 → 200 pin

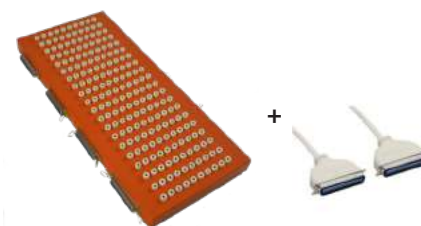
The convenient measuring and error switching box. With universal plug-in connectors and closable by cover. Interruption by means of jumper plugs. Additional insertion of: Transient and load resistance, short-circuit



Pinbox

Item no. 38 200 040 → 100 Pin
Item no. 38 200 041 → 150 pin
Item no. 38 200 042 → 200 Pin

The pin box is used for measuring and connected to the interruption box with intermediate cables.

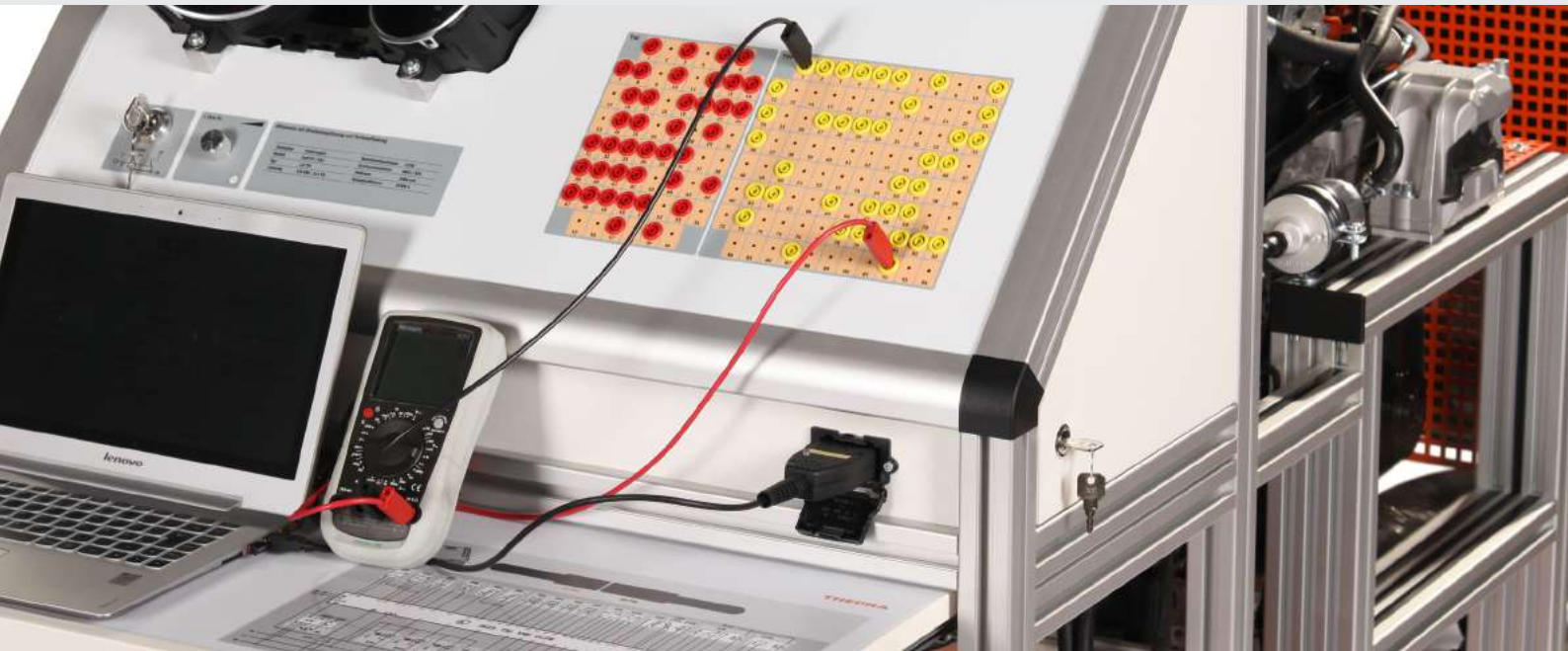


Connection adapter

Item no. 38 210 000 → vehicle-specific

Specially manufactured Y-cable, according to the original wiring diagram of the specified vehicle, with the appropriate connections for plugging in between the control unit and the wiring harness. Incl. the vehicle-specific support masks.





Motor Management Accessories

Monitor holder

For lateral mounting on large units. Tilt-able, 3x joints for lateral swivelling, telescopic function.



Item no. 11 010 025

Digital multimeter Fluke 175

Universal digital multimeter with outstanding technical capabilities. Simple operation, TrueRMS true effective value.



Item no. 16 062 014

OBD-Breakout-Box

Fast test of wiring system and ground circuits, identification of communication link protocols, oscilloscope connection for signal acquisition.



Item no. 16 162 123

Diagnose Tool VCDS (Volkswagen)

Diagnostic system for VAG models from 1992 up to the current model series, with VCDS software, in practical storage case.



Item no. 38 079 135

Diagnose Tool Mongoose (Toyota)

Toyota approved global diagnostic tool, software licence required separately



Item no. 16 162 130

PicoScope 2-Channel Starter Set

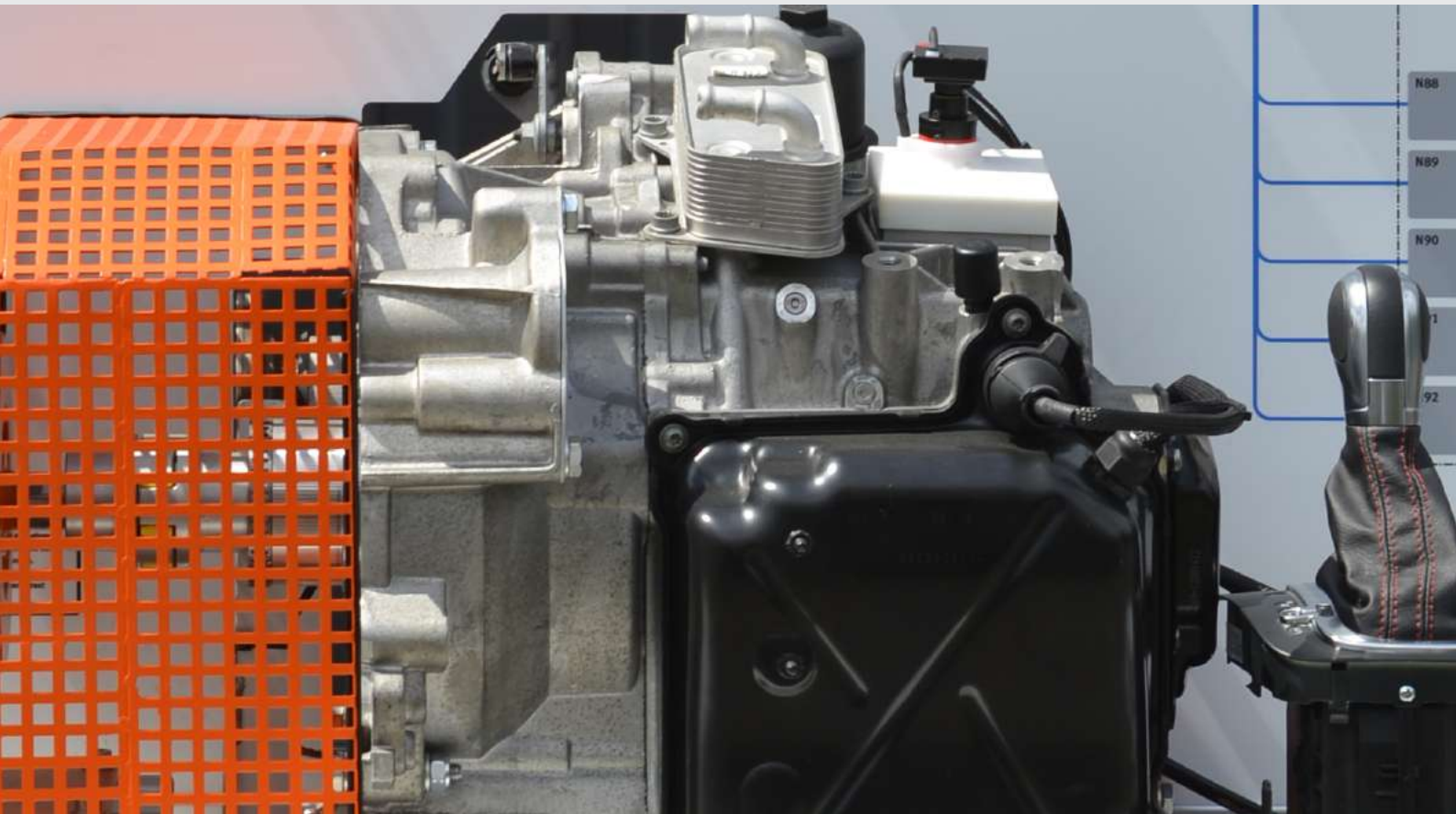
USB oscilloscope 2-channel for car diagnosis. The set includes the oscilloscope, the software and common test leads.



Item no. 16 152 040

Chapter overview

Automotive Electrics and Electronics	3
Networked Systems, Safety and Comfort	35
E-Mobility	59
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Training Packages General Basics	109



Transmission, Brakes and Chassis

Automotive Wheel Sensors Trainer	100
Digital work orders Automotive Wheel Sensors Trainer	101
Dual Clutch Gearbox - DSG (VW) - proline	102
Vehicle Dynamics Control - ABS/ESP (VW) - proline	103
EBS Air Brake System - Truck	104
EBS Air Brake System - Trailer	105
Front Axle Model	106
Chassis Trainer	107



Item no. 12 024 100

Manual 81 pages	
Digital work orders	
266 x 120 x 297 mm	
10 V - 15 V DC (3 A)	
EQF level	3 4

Automotive Wheel Sensors Trainer

Different types of MRE sensors are used on modern vehicles and assistance systems for speed detection. This laboratory trainer enables the detailed examination and evaluation of three different MRE sensor types.

Features

- Large, multi-pole ring, printed in colour with rim design
- Three different MRE sensor types: simple MRE wheel sensor, MRE wheel sensor with detection of direction of rotation and air gap monitoring, MRE wheel sensor with coded signal
- Clockwise and counter-clockwise rotation with rotary control and precise control of the actuation until standstill
- Measuring points on all sensors
- Low voltage for safe handling
- Extensive digital worksheets available for Electude e-learning system

Equipment

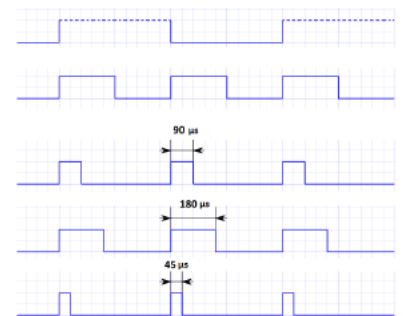
- Laboratory trainer in desk housing for use on a table or in a DIN-A4 support frame
- 1 x multipole ring with precision controller for electrical control
- 3 x MRE wheel sensor of various types
- 6 x measuring sockets, shunt, 4 x sockets for power supply with 12V

Recommended accessories

- Power supply TS10

Learning content

- gain knowledge about different MRE sensor types
- assign different signals
- evaluate different signals
- deepen your competence in setting up oscilloscopes optimally and evaluating the displays



Also available as training package: Item no. 14 025 080

With a training package, you can get started immediately. You will receive the desired learning system with all accessories as well as the appropriate digital work orders for the device.





Item no. 12 024 102

Theory (level 3) - approx. 1 h



Practice (level 3) - approx. 3 h



Theory (level 4) - approx. 0,5 h



Practice (level 4) - approx. 2 h



Digital work orders Automotive Wheel Sensors Trainer

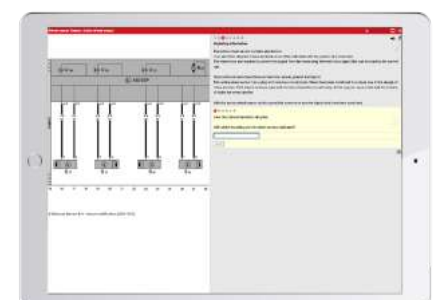
After working through the practical exercises, you will be able to recognise and distinguish between active wheel sensors, explain how active wheel sensors work and their area of application, check active wheel sensors and analyse the measurement results.

📖 Preliminary theory *

- Wheel sensor inductive
- Wheel sensor MRE
- Wheel sensor with coded signal

🔧 Practical tasks

- Active wheel sensor
- Active wheel sensor with direction of rotation and air gap detection
- Wheel sensor with coded signal
- Signal formation with current



Test it now!



Demo

Course layout

Level 3 52m 3h 04m

Level 4 36m 1h 58m

Licence: You acquire a licence for use for as many students and teachers as you wish with a term of 10 years. This can be extended individually after expiry. The software is activated on your Electude e-learning domain.

* A separate licence may be required for the preliminary theory.



Item no. 75 030 250

Manual 118 pages



141 x 70 x 193 cm



400 V / 16 A



EQF level



Dual Clutch Gearbox - DSG (VW) - proline

Training and function stand Direct shift gearbox with wet clutch, shift unit and integrated camera. On this training system, all features, conditions, faults and measured values can be illustrated and examined as on the original transmission.

Features

- The required power supply, wiring and configuration of the components are already integrated and preset in the system. The system can be used and put into operation directly.
- The unit is designed as a compact system with original components of a VW direct shift gearbox.
- Numerous operating conditions can be set, measured and evaluated. The system is ready for immediate use with a built-in transfer module with interfaces for error switching device and measured value decoupler to student measuring stations.
- Front panel with symbolic representation in EVA principle: input processing output
- Measurement of all relevant parts and components in the central circuit diagram measuring field with 25 measuring sockets
- Connection for decoupler for student measuring stations, connection for error switching device (10 active switches for 20 faults)

- Compact device design, mobile for laboratory and workshop practice
- Fully diagnosable via OBD interface
- Detailed documentation and extensive worksheets for teachers and students.

Learning content

- Basics of dual clutch transmission and power transmission system
- Gearshifts in different operating situations
- Functionality in relation to power flow, transmission ratio and direction of rotation
- Work with original wiring diagrams and determine problem-related connection pins on components and control unit
- Determine setpoints depending on the operating situation
- Record CAN bus signals with oscilloscope and evaluate signal level
- Use standard workshop diagnostic tools for OBD
- Measure and evaluate sensor signals and actuator control voltages

Additional equipment

- Universal fault switching device
- VCDS diagnostic tool (Volkswagen)
- Student measuring stations



Item no. 36 035 250

Manual 150 pages



141 x 70 x 193 cm



400 V / 16 A



EQF level



Vehicle Dynamics Control - ABS/ESP (VW) - proline

On this training and function stand, functions and processes, faults and measured values can be illustrated and examined as on the original brake system with driving dynamics control. The fully functional braking system brakes the individual wheels depending on the operating and control status.

Features

- All original parts and required components are clearly arranged on the colour-printed front panel in the EVA principle. The required power supply, wiring and configuration of the components are already integrated in the system and preset. The system can be used and put into operation directly.
- The unit is built as a compact system functional with original components of a VW Golf VI.
- Numerous operating conditions can be set, measured and evaluated. The system is ready for immediate use with a built-in transfer module with interfaces for error switching device and measured value decoupler to student measuring stations.
- Skid simulation with and without brake intervention, steering intervention of the ESP in the electromechanical steering with axle-parallel drive can be very clearly displayed.
- Driving speed continuously adjustable from 0-60km/h
- Diagnostic capability via OBD interface
- 10 large digital colour displays for steering angle, brake pressure, brake force and wheel speeds

- Measuring of all relevant parts and components in the central circuit diagram measuring field with 20 measuring sockets.
- Decoupler connection for student measuring stations, connection for fault switching device (8 active switches for 16 faults)
- Detailed documentation and extensive worksheets for teachers and students.

Learning content

- Vehicle dynamics control: name components of the entire brake system and explain the interaction of the components.
- Work with original circuit diagrams and determine problem-related connection pins on components and control unit.
- Determine target values depending on the operating situation
- Use standard workshop diagnostic tools for OBD
- Measure and evaluate sensor signals and actuator control voltages
- Measure CAN bus signals with an oscilloscope and evaluate signal level
- Make and save screenshots of all signals, all control voltages and the CAN data bus with a digital oscilloscope.

Additional equipment

- Universal fault switching device
- VCDS diagnostic tool (Volkswagen)
- Student measuring stations





Item no. 36 020 000

Manual 80 pages



87 x 262 x 197 cm



110 V - 240 V / 50 - 60 HZ



EQF level

2 3

EBS Air Brake System - Truck

Ready-to-use and mobile functional model incl. voltage-stabilised 24 volt switching power supply, self-sealing safety air couplings on all components, all required hose connections, breakout box of the control unit as well as fault circuit.

Features

- The construction of the engine car air brake system consists exclusively of original components from WABCO. To demonstrate the EBS control processes, the functional model has four electrically driven wheel units to simulate the front and rear axles. An integrated fault circuit with ten practice-oriented faults offers the possibility of reproducing realistic operating situations and practising troubleshooting.
- The modular system design allows a step-by-step familiarisation with the field of commercial vehicle air brake systems. The flexible connections of the components ensure the greatest possible freedom in the design of learning situations and action-oriented teaching of the learning content. The different coloured compressed air lines support a clearly structured experimental set-up.
- The system has an OBD diagnostic interface for connecting suitable diagnostic devices. Equipped with four large pressure manometers and original test connections, the test steps of the function and pressure safety test can be clearly displayed in accordance with Appendix VIII § 29 StVZO.

- The original WABCO diagnostic program, WABCO test equipment and WABCO presentation programs are available as accessories.
- Detailed documents with worksheets and the corresponding solutions

Equipment

- EBS E air brake systems with original WABCO components
- Integrated fault circuit with 10 practical faults
- Measuring points on components with fault circuit
- 4 x large pressure gauges for function and pressure safety testing (SP)
- Variable test connections with T-piece for function and pressure safety testing (SP)
- OBD diagnostic connection
- Compressed air connection: Compressor with at least 10 bar and sufficient litre capacity (L/min) required




Learning content

- Carry out maintenance, diagnosis and repair work on brake systems and networked systems.
- Identifying braking systems, analysing functions and interaction with other systems
- Isolating faults in brake systems
- Evaluating the self-diagnosis of electronic brake energy control systems and networked systems
- Linking control units, analysing data exchange
- Documenting measured values, signals and error logs
- Using the possibilities of workshop-standard diagnostic and information technology
- Carrying out a function and pressure safety test SP in accordance with Appendix VIII § 29 StVZO

Recommended accessories

- EBS Air Brake - Trailer
- Wabco Diagnostic Set
- Wabco Test Case

Item no. 36 020 100

Manual 39 pages	
87 x 147 x 197 cm	
via Truck	
EQF level	2 3



EBS Air Brake System - Trailer

Trailers with EBS system WABCO: Supply and brake line with spiral flex pipes and coupling heads, dual-circuit brake systems according to EC, Electronic Braking System EBS, Electronically Controlled Air Suspension ECAS, original WABCO trailer diagnostic connection, trailer supply cable with EBS plug.

Features

- WABCO system - Functional model ready for immediate use and driving, self-sealing safety air couplings on all components, all required hose connections.
- The trailer air brake system consists exclusively of original WABCO components. To demonstrate the EBS control processes, the functional model has two electrically driven wheel units to simulate the trailer axle.
- The flexible connections of the components ensure the greatest possible freedom in the design of learning situations and action-oriented teaching of the learning content. The different coloured compressed air lines support a clearly structured experimental set-up.
- The system has a WABCO trailer diagnostic interface for connecting suitable diagnostic devices. Equipped with two large pressure manometers and original test connections, the test steps of the SP function and pressure safety test can be clearly displayed in accordance with Appendix VIII § 29 StVZO.
- The trailer EBS and ECAS systems are fully functional and diagnosable. The full functions of the trailer functional model are only guaranteed in conjunction with the towing vehicle.

- Detailed documents with worksheets and the associated solutions

Equipment

- Supply and brake lines with spiral flex pipes and coupling heads
- Dual-circuit brake systems according to EC
- Electronic braking system EBS
- Electronically controlled air suspension ECAS
- Original WABCO trailer diagnostic connection
- Trailer supply cable with EBS connector
- Optional with Wabco Smart Board



Learning content

- Carry out maintenance, diagnosis and repair work on brake systems and networked systems.
- Identifying brake systems, analysing their functions and interaction with other systems
- Evaluating the self-diagnosis of electronic brake energy control systems and networked systems
- Documenting measured values, signals and error logs
- Using the possibilities of workshop-standard diagnostic and information technology
- Observing manufacturer-specific instructions for replacing worn and defective components
- Carrying out a functional and pressure safety test SP in accordance with Appendix VIII § 29 of the German Road Traffic Licensing Regulations (StVZO).

Accessories

- Wabco Smart Board





Item no. 20 010 400

Manual 68 pages



79 x 157 x 150 cm



EQF level

2

Front Axle Model

Front axle function model for adjustment work with rack and pinion steering. The training stand has angle indicators that can be positioned at various points. All original components have been reworked in such a way that problem-free adjustment is guaranteed.

Features

- Axle geometry made understandable in a simple way
- Teaching, demonstration and student training device for adjustment work with rack-and-pinion steering
- Precise design for reproducible and exact adjustments
- When the front axle is correctly adjusted, the lifting and lowering of the inside and outside of the bend is clearly visible.
- The settings can be read off in angular degrees on clearly arranged gauges
- Detailed documents with worksheets and the corresponding solutions

Learning content

- Adjustment of the rack and pinion steering gear
- Adjusting the track
- Adjustment of the spread
- Adjusting the wheel camber
- Adjustment of caster

- Adjustment of toe difference angle (steering trapezoid). Measuring the toe difference angle. The steering levers can be adjusted independently of each other individually.



Equipment

- Original rack-and-pinion steering gear with steering wheel
- Mobile on sturdy aluminium profile frame
- Lifting mechanism with vertical guide for gentle parking position
- Free angle indicator with scale and spirit level for insertion in 6 positions
- Angle scale with pointer on both wheels
- Precise mechanical adjustment elements
- Heavy duty wheels with reinforced axle



Item no. 79 300 220

Manual 53 pages



406 x 173 x 152 cm



EQF level

2



Chassis Trainer

The chassis is built with complete running gear on the basis of a VW Golf and is didactically prepared. The axle components have all adjustment possibilities such as: Camber, caster, toe, spread, wheel offset, driving axle angle. The rear axle is equipped with eccentric discs and adjustment markings.

Features

- Original suspension of the Volkswagen Golf 6 in the Sport version.
- Vehicle measurement protocol: The Chassis-Trainer can be adjusted and measured on a conventional wheel alignment stand by specifying the correct vehicle type
- Teaching, demonstration and student training device for adjustment work on the wheel alignment stand or with mobile wheel alignment equipment
- Precise design for reproducible and exact settings on freely accessible chassis
- Accident simulation with supplied damaged axle control arm
- Detailed documentation with work-sheets and the corresponding solutions

Equipment

- Original design according to vehicle type VW Golf 6 with original components
- Stable, welded basic construction of the tubular steel frame made of square section tubing for a torsion-resistant structure
- 4 x steel rims with new tyres
- Mechanically adjustable driver's seat
- Electromechanical steering with steering wheel
- Front brake system with brake booster, handbrake
- Freely accessible adjustment points
- Push handle for manoeuvring

Learning content

- Axle geometry, measurement and vehicle adjustment
- Interaction of the track setting elements
- Interaction of individual adjustment values
- Adjustment of:
 - Forward travel, caster, camber, toe, spread, wheel offset, axle angle
- Axle control arm repair after accident
- Vehicle measurement protocol



Chapter overview

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Training Packages General Basics

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Training Package T-Box Planetary Gear	114



Item no. 14 025 090

17 x 27 x 7 cm	
Theory (level 2) - approx. 0,5 h	
Practice (level 2) - approx. 1,5 h	
EQF level	2

Training Package T-Box Vernier Caliper

The T-Box Vernier Caliper consists of the box and the associated e-learning modules. The box contains a ruler, a caliper and three measuring objects. Tolerances are getting smaller and smaller, knowledge about the measuring accuracy of the measuring tools is very important.

Learning content

- Use the caliper gauge
- Read the caliper correctly
- Compare and assess the accuracy

Equipment

- Carrying case with matching foam insert
- Manual caliper gauge
- Steel ruler
- 3 x measuring objects with various tolerance deviations

Preliminary theory *

- Caliper gauge

Practical tasks

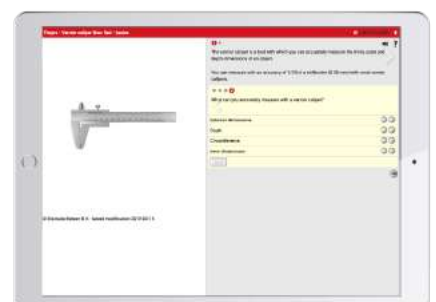
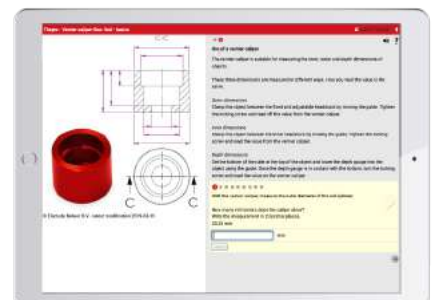
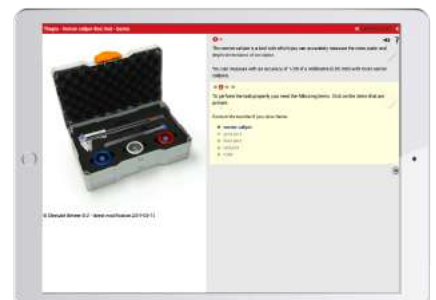
- Measuring the grey object
- Measuring the blue object
- Measuring the red object

Have you tried it yet?



Course layout

Level **2** 31m 1h 31m



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* A separate licence may be required for the preliminary theory.

Item no. 14 025 130

17 x 27 x 7 cm	
Theory (level 2) - approx. 0,5 h	
Practice (level 2) - approx. 1,0 h	
Theory (level 3) - approx. 0,5 h	
Practice (level 3) - approx. 3,5 h	
EQF level	2 3



Training Package T-Box Micrometer

The T-Box Micrometer consists of the box and the associated e-learning modules. The box contains a micrometer screw, a calibration block, setting spanners and three measuring workpieces. Manufacturing tolerances are getting smaller and smaller and accurate measurement with measuring tools is becoming more and more important.

Learning content

- Be able to use a micrometer screw correctly.
- Being able to describe the influence of temperature on the measurement results.
- Be able to read a micrometer screw correctly.
- compare and assess the accuracy

Preliminary theory *

- Outside micrometer

Equipment

- Carrying case with matching foam insert
- Outside micrometer
- Calibration block, adjustment key
- 3 x measuring objects with various tolerance deviations

Practical tasks

- Introduction
- Measuring the grey object
- Measuring the blue object
- Measuring the red object
- Conclusion

Have you tried it?

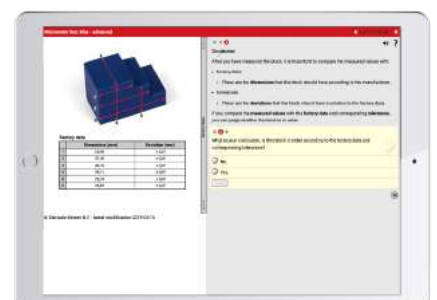
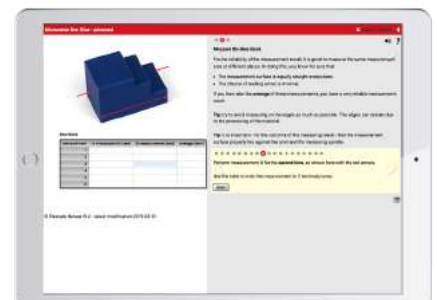
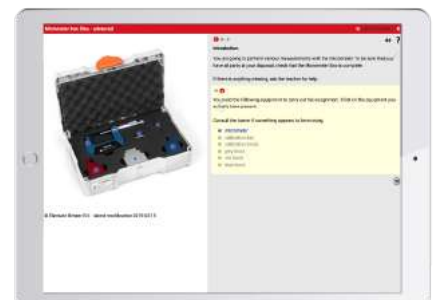


Course layout

Level 2	25m	1h 02m
Level 3	35m	3h 23m

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Item no. 14 025 280

17 x 27 x 7 cm



Theory (level 2) - approx. 1,5 h



Practice (level 2) - approx. 1,5 h



EQF level

2

Training Package T-Box Protractor

The T-Box Protractor consists of the box and the associated e-learning modules. The box contains a hair square, a protractor and three measuring objects. Tolerances are becoming smaller and smaller, knowledge about the measuring accuracy of the measuring tools is very important.

Learning content

- Use the beveled square, right angle and flatness
- Reading the beveled square correctly
- Use the protractor and read correctly
- Compare and judge the accuracy

Preliminary theory *

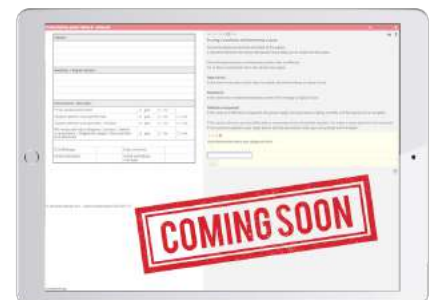
- Protractor
- Beveled square

Equipment

- Carrying case with matching foam insert
- Protractor
- Precision control square with two bevelled edges
- 3 x measuring objects with various tolerance deviations

Practical tasks

- Measuring the red object
- Measuring the grey object
- Measuring the blue object



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Item no. 14 025 100

17 x 27 x 7 cm



Theory (level 2) - approx. 1,0 h



Practice (level 2) - approx. 1,5 h



EQF level

2



Training Package T-Box Viscosity

The T-Box Viscosity consists of the box and the associated e-learning modules. The box contains three cylinders of lubricating oil and a stopwatch. The aim of this course is to grasp the meaning of the term viscosity and to distinguish the properties of lubricating oil.

Learning content

- Viscosity
- Lubricating oil properties

Equipment

- Carrying case with matching foam insert
- Manual stopwatch
- 3 x measuring cylinders transparent, filled with various automotive lubricating oils and one steel ball each

📖 Preliminary theory *

- Engine oil EU
- Lubricating oil properties

🔧 Practical tasks

- Basics
- Examining the lubricating oils in the red, black and white cylinder
- Conclusion

Have you tried it?



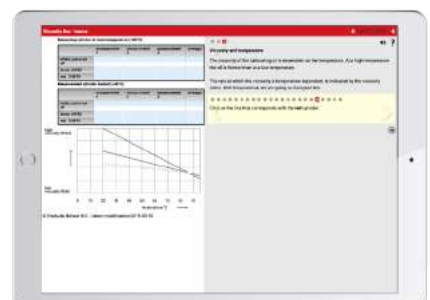
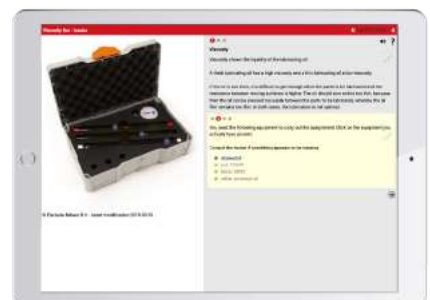
Video



Demo

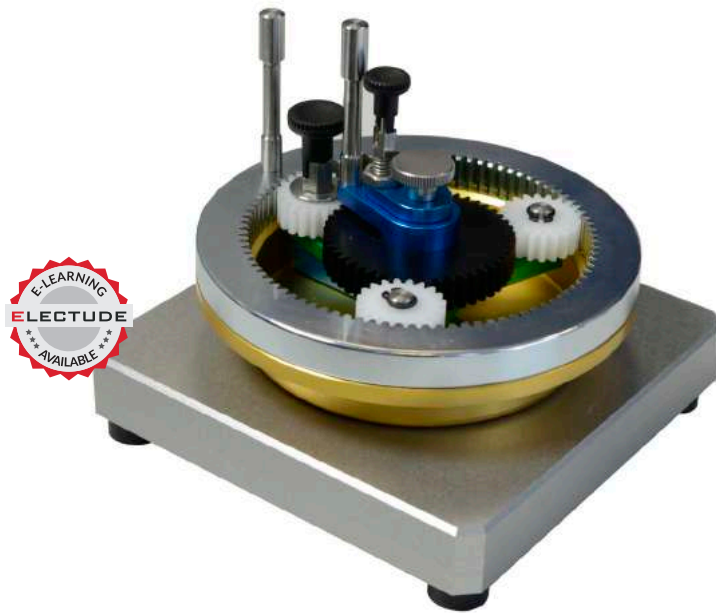
Course layout

Level **2** 📖 1h 16m 🔧 1h 33m



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Item no. 14 025 290

Manual 26 pages	
17 x 27 x 7 cm	
Theory (level 2) - approx. 1,5 h	
Practice (level 2) - approx. 1,5 h	
EQF level	

Training Package T-Box Planetary Gear

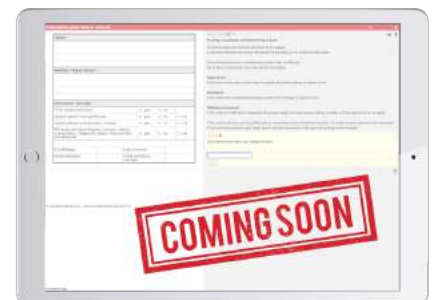
The T-Box planetary gearbox consists of the box and the associated e-learning modules. The box contains a high-quality planetary gearset. Ring gear, sun gear and planetary gears can each be locked and driven.

Learning content

- the function of planetary gears
- name the individual parts
- explain the possible gear steps
- calculate the transmission possibilities
- explain the advantages of this system
- explain the transmission possibilities for high speeds

Equipment

- Carrying case with matching foam insert
- High-quality planetary gear



Preliminary theory *

- The function of planetary gears

Practical tasks

- Function
- The gears
- Gear ratios



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Internet