



ASE L3



**Hybrid and electric vehicles
The one stop solution for HEV/EV training**

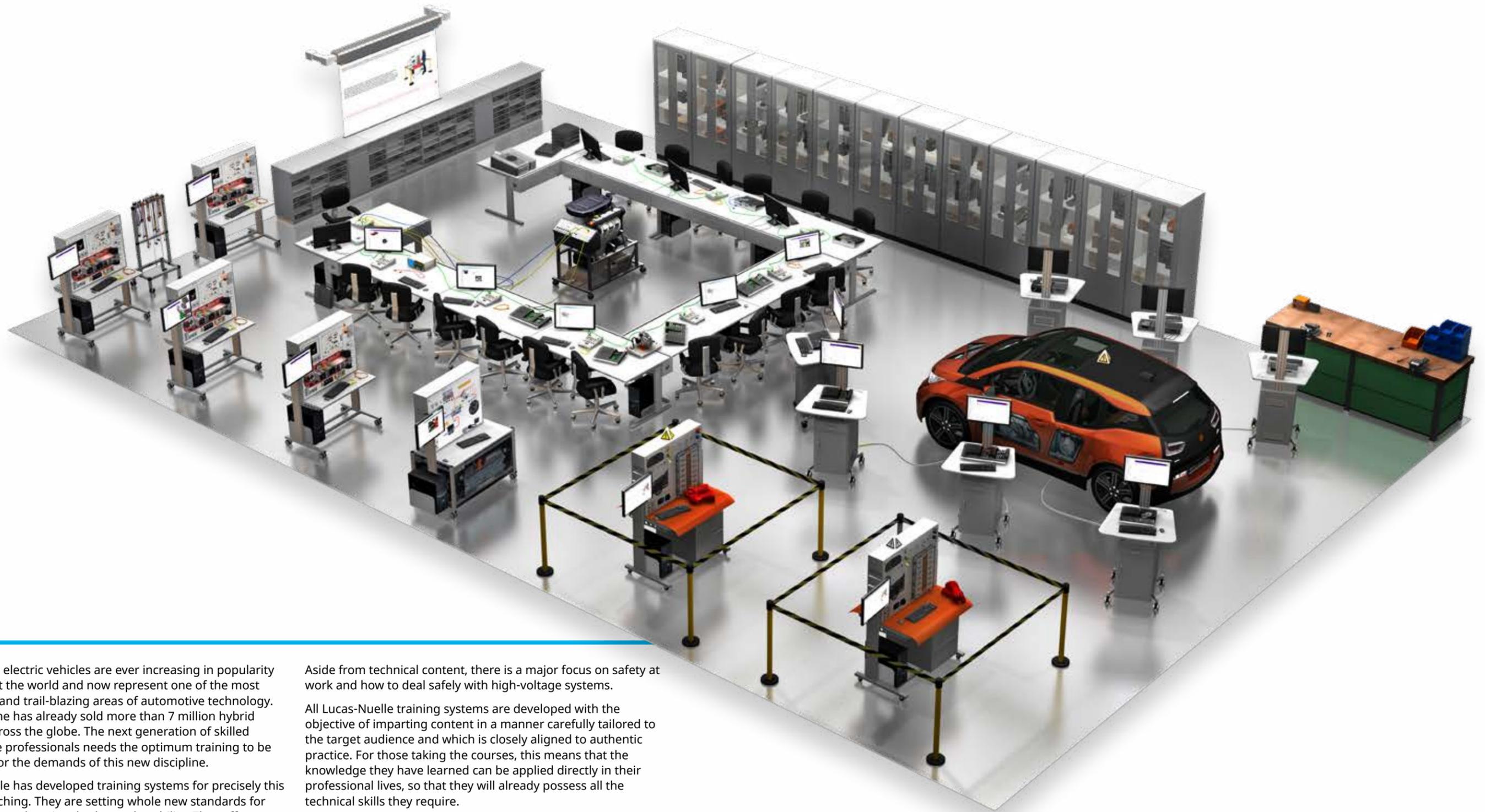
TRAINING SYSTEMS FOR ELECTRIC AND HYBRID VEHICLES



FACTS AND FIGURES

- Training is based on ASE L3
- Real high voltage systems
- Including all existing isolation procedures
- Complete training solution for HEV/EV

ELECTRIC VEHICLE TRAINING – A NEW LEVEL



Hybrid and electric vehicles are ever increasing in popularity throughout the world and now represent one of the most innovative and trail-blazing areas of automotive technology. Toyota alone has already sold more than 7 million hybrid vehicles across the globe. The next generation of skilled automotive professionals needs the optimum training to be prepared for the demands of this new discipline.

Lucas-Nuelle has developed training systems for precisely this kind of teaching. They are setting whole new standards for functionality, educational value and usability. They offer users the opportunity to experience all the facets of working with electric and hybrid vehicles. This starts with how electric drive systems work and how they are controlled in motor vehicles, but then goes deeper into the various drive configurations employed in hybrids and in wholly electric vehicles. All these topics are handled in a way which reflects authentic modern practice but still makes the subject understandable.

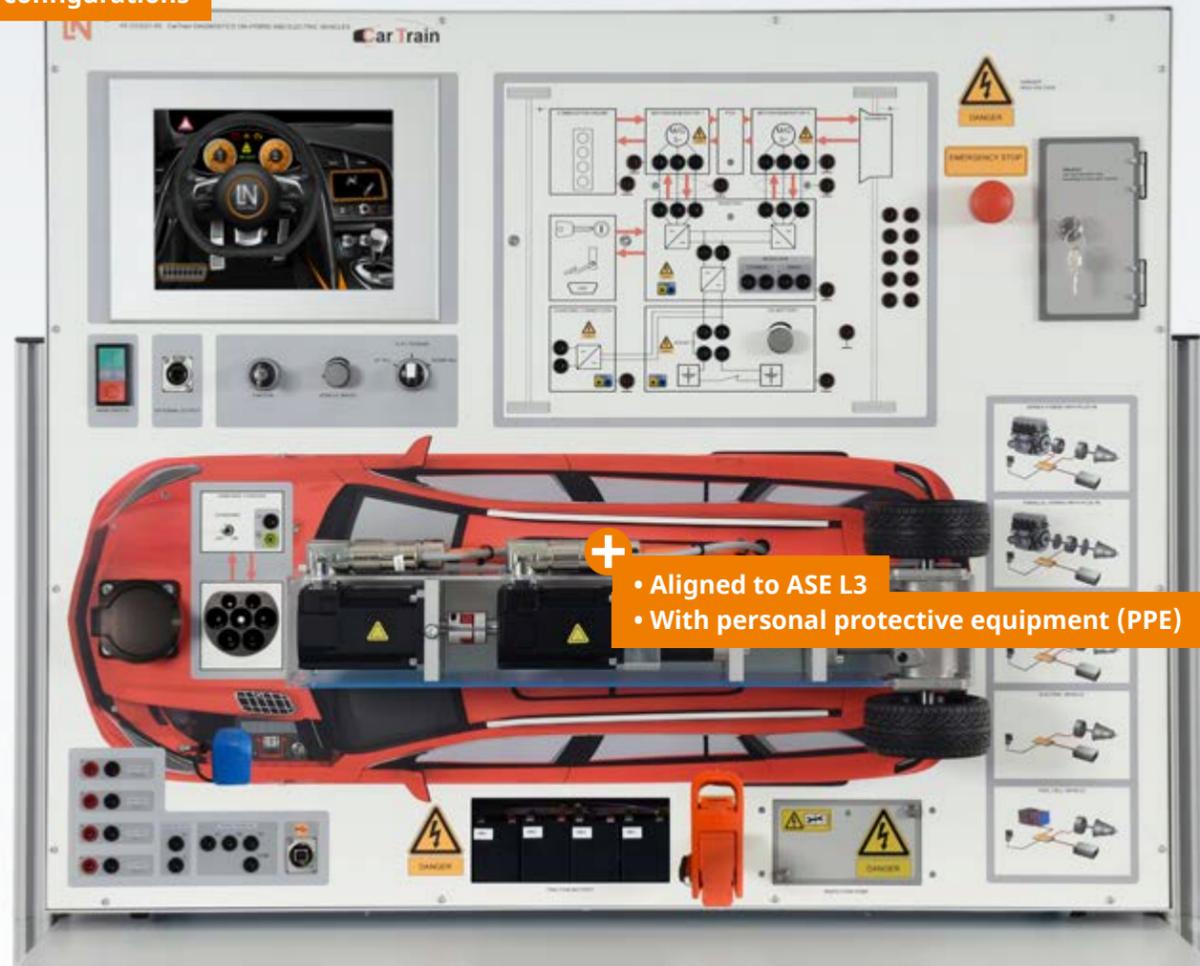
Aside from technical content, there is a major focus on safety at work and how to deal safely with high-voltage systems.

All Lucas-Nuelle training systems are developed with the objective of imparting content in a manner carefully tailored to the target audience and which is closely aligned to authentic practice. For those taking the courses, this means that the knowledge they have learned can be applied directly in their professional lives, so that they will already possess all the technical skills they require.

Training to the very latest state of the art!

CARTRAIN HYBRID AND ELECTRIC VEHICLES (ASE L3 TRAINER)

+
5 different
drive configurations



+
• Aligned to ASE L3
• With personal protective equipment (PPE)

CARTRAIN
SYSTEM

This is the only electric vehicle training system which combines 5 different drive configurations and includes all the necessary terminals for making measurements on a high-voltage system.

Compared to the previous version, the new CarTrain has the following advantages: The high-speed CAN as a communication bus is directly integrated into the control of the HV system. You can easily understand the different drive modes and energy flows via the integrated touch screen. The system operates using the same high voltage which is present in real vehicles. This means that students can practice how disconnection of real high-voltage systems is accomplished.

Benefits

- Touchscreen displays the energy flow
- Over 30 measuring points in high-voltage system
- Real high voltage systems
- Complete isolation procedure
- HV fault simulation



Order no. CO3221-6X8

CARTRAIN DIAGNOSIS AND REPAIR OF A HIGH VOLTAGE BATTERY

+
Includes troubleshooting



CARTRAIN
SYSTEM

Ever more manufacturers carry out repairs on high-voltage batteries themselves. This is a whole new challenge which requires specific understanding of the system. This training equipment makes it possible to work on a real high-voltage battery directly. Trainees can carry out measurements inside the battery, work upon it at cell level and even remove and replace actual cells.

An extensive system which is nevertheless easy to use. Fault simulation capability enables study of many potential problems. While trainees work out the right ways to carry out diagnostics, they also gain practical skills for the latest workshop challenges.

Training contents

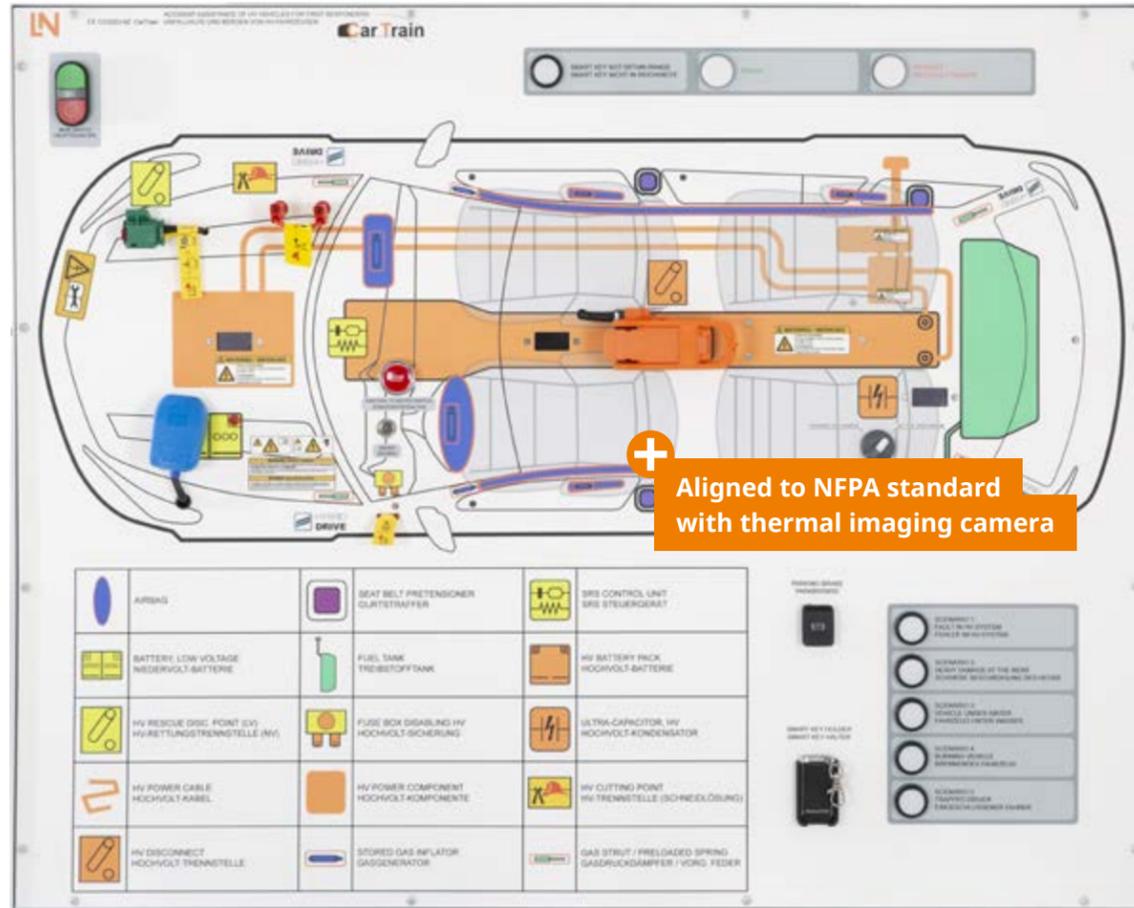
- Structure and analysis of a real high-voltage battery
- Diagnostic work on HV battery including fault simulation
- Disconnection via LV service plug, fuse or HV service plug
- Various measurements including high voltage and temperature sensors
- Charging infrastructure (AC, CCS DC)
- Disconnection as carried out in practice using high voltage diagnostic tester
- Dealing with damaged HV batteries
- Optional: Cell swap with external cell balancing

Order no. CO3221-6S (Optional: Cell balancer CO3221-7H)

CARTRAIN FIRST RESPONDER TRAINER FOR ELECTRIC VEHICLES



Includes troubleshooting



CARTRAIN
SYSTEM

The growing number of electric vehicles on the road presents a new challenge, especially for emergency and rescue services.

Lucas-Nuelle has developed a unique training concept for first responders. This makes it possible to carry out the new tasks with seasoned professionalism and assurance. Integrated accident scenarios perfectly round out this training package.

Training contents

- Hands on training for first responders
- Immobilizing of the vehicle
- Using rescue cards
- All HV isolation procedures
- Accident scenarios like submerged vehicles
- Getting to know special risks

Order no. CO3223-6Z7

CARTRAIN AC AND ELECTRIC DRIVE IN A HV SYSTEM



Combined equipment for the topics of hybrid drive trains and high voltage air conditioning in vehicles. Trainees can use the set to learn about the aspects of servicing, diagnostics and repair of high-voltage networks and air conditioning.

Benefits

- Secured but real high voltage
- Simulation of various operating modes
- High-voltage air conditioning compressor
- Contactless measurement
- Fault simulation
- Fully functioning high-voltage air conditioning system featuring original components
- High voltage battery with original maintenance plug interlock
- Original insulation monitor

Order no. CO3221-6P7

MEASUREMENT AND DIAGNOSIS ON THE ELECTRIC DRIVE

+ Practical Insulation and Resistance Measurement



The electric motor is one of the central elements of an HV system. Due to the high currents flowing through the electric motor, it is exposed to high thermal stress and various malfunctions or defects can occur. The HV specialist must therefore be able to detect and eliminate these possible malfunctions.

The trainee can carry out a practical insulation measurement or check the resistances of the stator. The modules also offer the possibility to analyse the differences between a star or delta connection of a motor. In addition to these possibilities, further measurements can be carried out on the various modules, which further improve the understanding of the subject and the trainee's own diagnostic skills.

Training contents

- Structure of an electrical machine
- Differences between synchronous and asynchronous motors
- Differences between star (Y) and delta (Δ) circuits
- Insulation measurement on electrical machines
- Resistance measurement on electrical machines
- Inductance measurement of the coils

Order no. CO3223-7G

PORTABLE CHARGING STATION



- ### +
- Optional add-on for the CarTrain Hybrid and Electric Vehicles
 - CarTrain Diagnosis and Repair of a HV Battery

A real charging station: This training system provides an educationally modified version of an authentic charging station. In conjunction with the CarTrain electric vehicle set, it is possible to understand how communication between vehicles and charging stations proceeds.

Of course, the system encompasses all the necessary safety precautions. One other capability is the option of remote control via a smart electricity grid. In addition, you can even charge real electric vehicles.

Training contents

- Charging of high-voltage vehicles
- Sequence of charging procedure
- Safety concepts
- Analysis of communication between charging station and vehicle
- Function of CP and PP contacts

Order no. CO3221-6Q8

UNITRAIN – BASIC KNOWLEDGE TRAINING



UniTrain Electric drives in cars, trucks and two-wheelers

With the UniTrain training system for electric drives, trainees get the perfect and safe HV drive systems and learn the three key components of the key components "electric motor", "inverter" and, in particular the "HV battery" with its numerous safety functions. safety functions.

In practical exercises and various diagnostic tasks with fault simulation, they acquire practical knowledge and essential diagnostic skills.

Training contents

- Construction and operation of synchronous and asynchronous motors
- Operation of invertors
- Energy regeneration
- Interlock
- Inverter control
- Synchronous and asynchronous motors
- Practical measurements and fault diagnosis

Order no. CO4204-6N



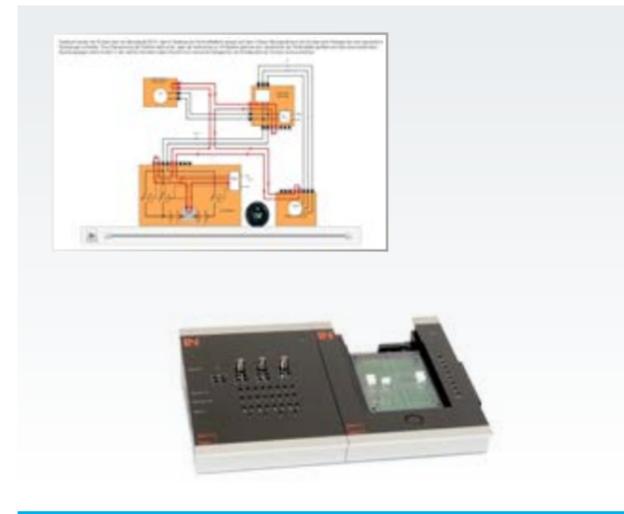
UniTrain DC/AC conversion

Batteries can only store and supply direct current. However, in order to drive an electric traction motor, an alternating current is required. This course provides a host of experiments to demonstrate how conversion from one form to the other can be achieved.

Training contents

- Electrical induction
- Current and voltage ratio
- Generation of a pulse-wide modulated voltage
- Conversion of direct voltage into alternating voltage

Order no. CO4204-6L



UniTrain Interlock in HEV and EV

An interlock is a safety mechanism designed to ensure the safety of drivers and workshop mechanics dealing with electric vehicles. The interlock separates the high-voltage battery from the rest of the vehicle as soon as wires are wrongly disconnected or in the event of malfunctions. Trainees learn all about interlock systems with the help of experiments featuring interactive assistance.

Training contents

- Electrical circuitry for interlocks
- Interlock signals
- Investigation of an interlock by measurement
- Simulation of faults commonly encountered in practice

Order no. CO4205-1H



UniTrain HV Battery with Smart Relays

This training system focuses on the high voltage disconnection relays of the battery unit. The system monitors the hybrid system and only connects to the high voltage when it is considered "safe and secure". The accompanying Labsoft course explains this complex system.

Training contents

- Design and function of battery disconnection unit
- Fault finding
- Perform the isolation procedure
- Measuring the HV start up and shutdown sequence
- Difference between conventional and smart HV relays

Order no. CO4205-1Z

UNITRAIN – BASIC KNOWLEDGE TRAINING



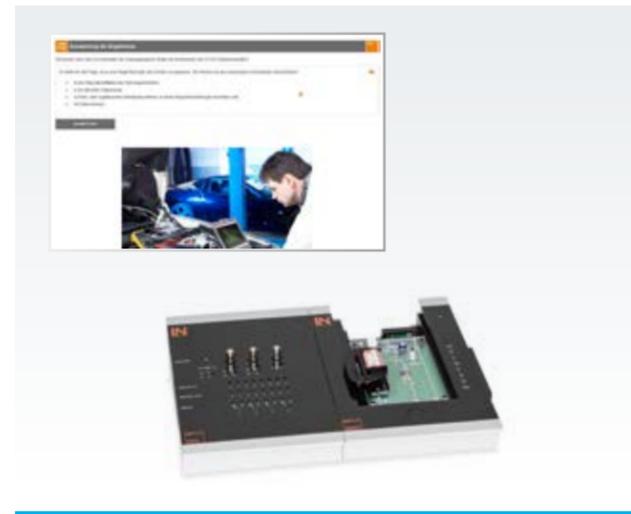
UniTrain Safe handling of HV systems

This training system focuses on safety when working on high voltage systems and the dangers of electricity passing through the human body.

Training contents

- Fundamentals of safety when working with high voltage vehicles
- Effects of faults encountered in practice
- Using a model to measure the current passing through a human body

Order no. CO4205-1M



UniTrain DC/DC converters in HEV and EV

The inverters in electric and hybrid vehicles, as well as many other circuit applications, require DC voltages at multiple different levels. Here students can investigate various options for conversion of DC voltages from one level to another.

Training contents

- 1 course on step-up conversion (from lower voltage to higher)
- 1 course on step-down conversion (from higher voltage to lower)
- Safe handling thanks to safety low voltage
- Practical experience of voltage conversion
- Function and design of DC-DC converters
- Measurement of input and output voltages

Order no. CO4205-1K/CO4205-1L



UniTrain Fuel cells

Internal combustion engines still produce large quantities of CO₂. That is why it is essential for engineers to seek out alternative drive concepts. One such concept involves the use of electric traction motors in conjunction with a fuel cell. This training system allows trainees to learn about this fascinating technology and gain an understanding of how it works.

Training contents

- Fuel cell application in motor vehicles
- Function of a fuel cell
- Design of a fuel cell
- Fundamentals of the chemical process
- Properties of fuel cells
- Recording characteristics
- Efficiency of a fuel cell

Order no. CO4204-6M



UniTrain Photovoltaics

The term photovoltaics means a direct conversion of (sun) light into electrical energy by means of solar cells. The energy obtained in this manner can be supplied to ancillary consumers to enhance driving comfort, e.g. to provide extra cooling for a vehicle's interior in extremely bright sunshine. With our UniTrain photovoltaics system, students very quickly grasp the fundamentals of this technology.

Training contents

- Use of photovoltaic system in motor vehicles
- Design of a photovoltaic cell
- Open-circuit voltage
- Short-circuit current
- V-I characteristic
- Power of a photovoltaic cell
- Series-connected photovoltaic cells
- Parallel-connected photovoltaic cells
- Direct operation
- Storage operation

Order no. CO4205-6N8

PREPARING FOR HV - UNDERSTANDING THE FUNDAMENTALS OF ELECTRICS AND ELECTRONICS



Welcome to the exciting world of electronics in vehicles! Our comprehensive training system provides an excellent introduction to this fascinating field. With pre-fabricated circuits, getting started is as easy as plugging in a few jumpers.

We understand the importance of using and handling measuring instruments in conjunction with customer vehicles, and special attention has been paid to ensure that our training system addresses these concerns. With our emphasis on practical application and hands-on experience, you'll be well-equipped to tackle the challenges of working with electronics in vehicles.

Training contents

- Hands on measurement of voltage, current and resistance
- Fuses in circuits
- Different circuits with symbols ready to use
- Understanding electrical principles
- Developing diagnostic skills

Order no. CO4205-1D

LABSOFT – THE MULTIMEDIA LEARNING PLATFORM

Further information is available at lucas-nuelle.com

FACTS AND FIGURES

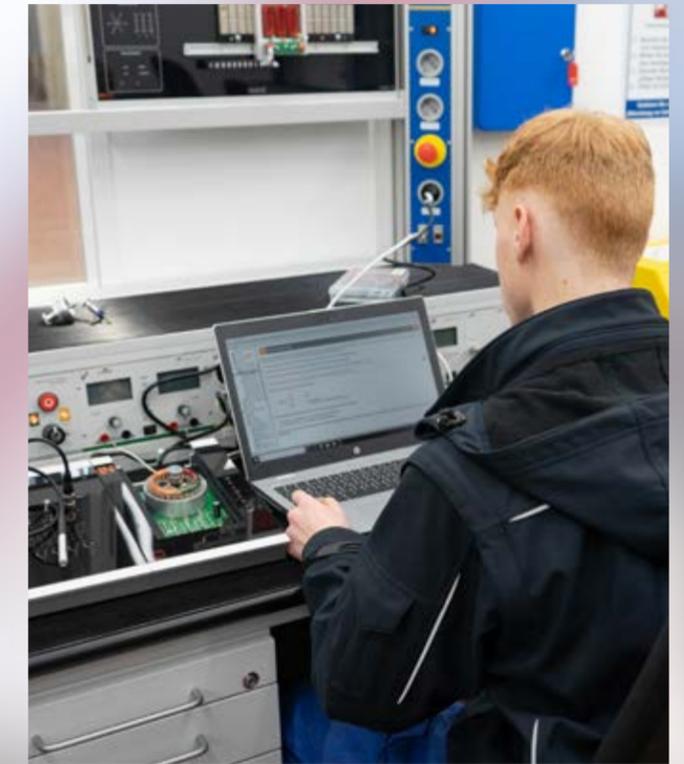
- HTML-based multimedia courses
- All languages supported by HTML
- Animations and graphics
- Theory and diagnostic exercises in a single training unit
- Documentation of results
- Questions for testing knowledge
- Access to all virtual instruments
- Log-in with user data
- Choice of languages
- Choice of courses
- Saving of individual platform configurations



Understanding energy flows in HEV



Learning the fundamentals of electrics with UniTrain



Operating an electric drive



Measuring of the absence of high voltage



HV training for fire fighters



Opening a HV battery for repair



LUCAS-NUELLE INC.

3909 Midlands Road, Suite A
Williamsburg, VA 23188

Phone: 757-808-5696

lucas-nuelle.com
sales@lucas-nuelle.com