



**Lucas-Nuelle presents new and state-of-the-art trainers for**

- **Hybrid and Electric Vehicles**
- **High Voltage Commercial and Heavy Duty Vehicles**
- **ADAS and Networked Systems**



# HYBRID AND ELECTRIC VEHICLES / TRUCKS



CO3221-6S

**CarTrain - Diagnosis and Maintenance of a High Voltage Battery**

**Training contents**

- Measurement of voltage in HV system
- Measurements on BMS
- HV system relay
- High-voltage capacitors
- High-speed CAN bus
- Pre-load phase
- Active/passive discharge
- Measurements on interlock system
- Measurements on temperature sensors
- Measurements of supply voltage



CO3221-6X8

**CarTrain - Hybrid and Electric Vehicles**

**Training contents**

- Isolation procedure and voltage measurement
- Measurements of real high voltage to understand electric motors
- Fault finding and diagnostics with real world faults such as insulation resistance measurement
- Resolver/motor positioner
- Energy flows in series, parallel, series-parallel, fuel cell and pure electric vehicles
- High voltage capacitors found in EVs
- Charging connections
- Integration of Tasks can even be done on existing vehicles if available



CO3221-7E

**TruckTrain - Diagnosis and repair of a High Voltage Battery**

**Training contents**

- Isolation procedure and voltage measurement
- Measurements of real high voltage to understand electric motors
- Fault finding and diagnostics with real world faults such as insulation resistance measurement
- Resolver/motor positioner
- Energy flows in series, parallel, series-parallel, fuel cell and pure electric vehicles
- High voltage capacitors found in EVs
- Charging connections
- Integration of Tasks can even be done on existing vehicles if available



CO3221-7D8

**TruckTrain - High Voltage Commercial and Heavy Duty Vehicles**

**Training contents**

- Servicing vehicles and systems and complying with safety measures according to valid DGUV standards
- Analysis of HV systems / Training in electrical safety
- Isolation/disconnection of a HV system according to manufacturer specifications
- Performing fault and malfunction diagnosis of HV systems and HV components
- Perform equipotential bonding and insulation measurement on vehicle and document findings
- Putting HV systems back into operation in accordance with vehicle manufacturer's specifications



# HYBRID AND ELECTRIC VEHICLES / TRUCKS

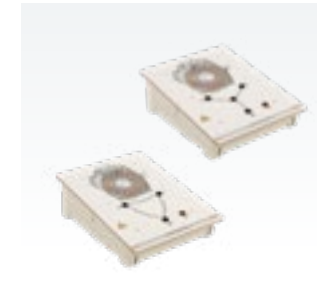


CO4204-6N

**UniTrain - Electric Drive in cars, Commercial Vehicles and Two-wheelers**

**Training contents**

- Benefits of hybrid systems
- Serial and parallel hybrid systems
- Combined hybrids
- Design of electrical machines (asynchronous and synchronous machines)
- Fundamentals of inverters (three-phase converters)
- Fundamentals of frequency converters
- Three-phase power supply
- Measurement of DC, AC and three-phase voltages
- Investigation of energy and power flows
- On-board power supply for hybrid vehicles



CO3223-7G / SO2803-3A

**Measurements and Diagnosis on an Electric Drive Motor**

**Training contents**

- Measurements and Diagnosis on an Electric Drive Motor
- Isolation test
- Resistance of the stator coils
- Measurement in the star connection
- Measurement in the delta circuit
- Inductance measurement
- Analysis of different electric motors
- Synchronous motor
- Asynchronous motor
- IT network



CO4205-1T

**UniTrain - 48-Volt sub-system for On-board network**

**Training contents**

- Benefits of a 48-V sub-system in an on-board network
- Design of a 48-V sub-system
- Possible dangers from electricity
- Disconnection / isolation of a 48-V system using a tester
- Manual disconnection of a 48-V system
- Diagnostics in 48-V systems



CO3221-6Z

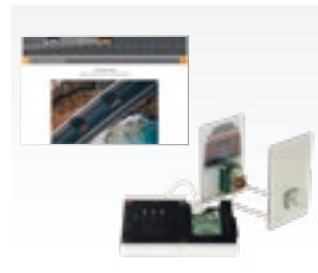
**CarTrain - First Responder Trainer for Advanced Electric Drive Vehicles**

**Training contents**

- Identify hybrid and electric vehicles upon reaching the scene of an accident.
- Identifying HV components in the HV vehicle involved in the accident
- Understanding the real-world hazard potential of HV vehicles (respect, but don't fear!)
- Hazard assessment before beginning recovery
- Procedures for rescuing people from HV vehicles
- Application of personal protective measures against electric body flow
- Securing the vehicle key/shutting off the vehicle electrical system
- Use of rescue cards



# ADAS & NETWORKED SYSTEMS



CO4205-1V

## UniTrain - ACC - Adaptive Cruise Control

### Training contents

- Carrying out the calibration of the radar sensor
- Calibration by laser
- Adjustment of the sensor by the trainee
- ACC system control strategy
- Networking and structure of the ACC system
- Fundamentals of radar technology



CO4205-1C

## UniTrain - Rear view camera with parking assistance

### Training contents

- Design and function of driver assistance system
- Incorporating the camera into the overall system
- How ultrasonic sensors work
- Purpose of driver assistance system
- Learning diagnostic techniques
- Finding out limitations



CO4205-1U

## UniTrain - Gesture control and capacitive sensors in vehicles

### Training contents

- Fundamentals of capacitive touch sensors
- Input, processing, output principle (IPO)
- Switching thresholds of touch sensors
- Analog and digital voltage outputs
- Control of seat heating
- Fundamental of capacitive gesture control
- Opening a tailgate with a gesture
- Networking in vehicles - CAN bus
- Diagnostics
- Transmitting and receiving messages



CO4205-1E

## UniTrain - LIDAR

### Training contents

- Fundamentals of driver assistance systems
- Significance for self-driving vehicles
- Physical principles of light and lasers
- Safety regulations when handling and operating lasers
- Design and function of lidar systems in vehicles
- Calibration of lidar system by means of a calibration board
- Diagnostics for CAN bus, power supply and actuators
- Measuring techniques and reflection properties
- Signal processing and detection of surroundings

# ADAS & NETWORKED SYSTEMS



CO4204-7K

## UniTrain - CAN

### Training contents

- Reasons for using bus systems in vehicles
- Topology and components of CAN bus systems as used in vehicles
- Differences between low-speed and high-speed CAN
- Electrical properties of a CAN bus
- Data rate, identifiers, addressing and arbitration (low-speed and high-speed CAN)
- Structure of a message frame in a CAN message
- Analysis of CAN messages using CAN monitor and an oscilloscope
- Editing and transmitting CAN messages from a PC
- Troubleshooting



CO4205-1S

## UniTrain - CAN FD

### Training contents

- Features of CAN-FD bus systems
- Diagnostics as performed in practice at real workshops
- Measurements on a genuine CAN-FD network
- Diagnostic software for read-outs from the CAN-FD bus
- Select from various pre-set data rates edit and transmit CAN messages via PC
- Troubleshooting



CO4204-6G

## UniTrain - Comfort systems and keyless entry

### Training contents

- Comfort settings in vehicles
- Active safety
- Door-locking systems
- Central locking
- Radio remote control
- Keyless access to vehicles
- Capacitive pushbuttons
- Fundamentals of antenna technology
- How central locking works via a CAN bus and how such a system can be expanded to implement keyless systems



CO4205-1W

## UniTrain - Active Lane Assist

### Training contents

- Servicing vehicles and systems and complying with safety measures according to valid DGUV standards
- Analysis of HV systems / Training in electrical safety
- Isolation/disconnection of a HV system according to manufacturer specifications
- Performing fault and malfunction diagnosis of HV systems and HV components
- Perform equipotential bonding and insulation measurement on vehicle and document findings
- Putting HV systems back into operation in accordance with vehicle manufacturer's specifications



Partner of **SkillsUSA**



+ Art.-No CO3221-6X8 | CarTrain - Hybrid and Electric Vehicles ASE L3 Trainer





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