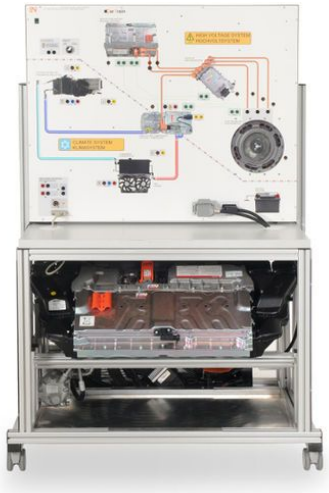
Item No.: CO3221-6P

CarTrain "High Voltage and Air Conditioning Training System"



The training system for high-voltage and air-conditioning systems from the well established CarTrain range leads trainees further into the specific features of high-voltage electrical systems in vehicles. The system teaches specific diagnostic skills along with theoretical and practical know-how needed for appropriate diagnosis and customer-oriented service in and around electric vehicles. In order to achieve this objective, the training system focuses on the subject of high-voltage drives, systems for intrinsic safety and high-voltage air-conditioning systems.Trainees get the chance to make measurements directly on the traction motor without any contact, which is a huge benefit to safety. It is also possible to acquire an understanding of the pilot line or insulation monitor by carrying out measurements on them. Where the system really adds value is based on the fact that it includes an authentic, operational high-voltage air-conditioning system. This makes it possible to see the individual components of the system and to carry out the kind of servicing on them commonly done in modern repair shops. Trainees can record communication between system components on both the CAN bus and the LIN bus. Moreover, the training system is designed in such a way that the risk of hazards can be eliminated at all times.

Includes

- Non-brand-specific training system
- Combined apparatus for the topics of hybrid drives and high-voltage air conditioning systems in motor vehicles, set up on its own mobile experiment trolley
- Fully operational high-voltage air conditioning system made with original vehicle components
- Fully operational power electronics for controlling built-in working drive motor
- Interactive training course on DVD with LabSoft browser, course software and additional virtual instruments, instructions and test questions. All test questions can be evaluated by means of a software module.

The following original vehicle components are built into the system:

- High-voltage battery compartment with built-in power supply for high-voltage air-conditioning compressor
- High-voltage air-conditioning compressor
- Service maintenance plug
- Pilot contact
- Coaxial air-conditioning cable (of suitable length)
- High-pressure air-conditioning pipe (of suitable length) with service connection
- Low-pressure air-conditioning pipe (of suitable length) with service connection
- Condenser with drier
- Fan for condenser
- Control unit for condenser fan
- Evaporator
- Air piping
- Evaporator fan
- Expansion valve

The system also includes the following components:

- Control electronics for controlling electrical components via USB computer connection
- Temperature sensor for air inlet temperature
- Temperature sensor for air outlet temperature
- Temperature sensor for condenser temperature

- Condensation collecting tray

The following measurements and checks can be made via 4-mm safety sockets:

- Measurement of pilot line
- Screening tests
- Checking of insulation resistance
- Measurement of the functioning of an insulation monitor
- Measurement of voltage on the driving motor
- Measurement on DC link circuit of inverter
- Measurement of bodywork ground
- Measurement of CAN signals for controlling high-voltage air-conditioning compressor
- Measurement of LIN signals for fan control
- Measurement of PWM signal for controlling condenser fan
- Measurement of 12-V on-board network voltage
- Measurement of voltage from air inlet temperature sensor for high-voltage battery cooling
- Measurement of voltage from air outlet temperature sensor for high-voltage battery cooling
- Measurement of voltage from condenser temperature sensor

The system features built-in measurement and display instrumentation and allows the following measurements to be evaluated graphically:

- Measurement of time traces for output current and voltage and graphic display in a timing diagram with 16 selectable channels
- Measurement, calculation and graphic display of time traces of RMS values, mean values and AC components of current and voltage
- Measurement, calculation and graphic display of current and voltage spectra
- Voltmeter, 0 – 400 V=/~
- Measurement of currents up to 10 amps

The training system features the following power supplies:

- 3-phase converter for selecting type of modulations for output voltage via the power electronics and for controlling the drive motor
- Analog function generator for sine waves, triangular waves, square waves, logic levels, positive DC voltage and negative DC voltage
- Internal pulse generator

The training system features the following function modules:

- Fully operational, authentic motor emulating original components, designed for safety to prevent any contact
- Built-in insulation monitor as used in the car industry with light to indicate insulation faults
- Driving mode switch for switching between various driving situations
- Pilot line with 5 externally accessible safety points
- Fault circuitry with 13 faults which can be switched on or off as needed

Designed to convey the following training contents:

- Implementing safety regulations for electrical systems
- Implementing safety regulations for air-conditioning systems
- Understanding customers’ problems
- Developing a test routine
- Diagnosing malfunctions in the high-voltage and air conditioning systems with the help of manufacturers’ documentation and diagnostic equipment
- Working with circuit diagrams

- Understanding interactions in the system on the basis of circuit diagrams and function plans
- Recognising how a fault affects the system as a whole and establishing means of rectification
- Evaluating measurements
- Isolating intrinsically safe high-voltage systems
- Maintaining air-conditioning systems
- Regulations and fundaments for high-voltage systems
- Regulations and fundaments for air-conditioning systems
- Isolating high-voltage systems
- Safety regulations for electrical equipment
- Safety regulations for air-conditioning systems
- Environmental protection
- Servicing work
    - Checking test instruments
    - Service information
    - Carrying out servicing of a high-voltage system
    - Carrying out servicing of an air-conditioning system
    - Deactivating and reactivating high-voltage systems
    - Deactivating and reactivating air-conditioning systems
    - Carrying out repairs on a high-voltage system
    - Carrying out repairs on an air-conditioning system
- Diagnostic work
    - Carrying out diagnostic work and troubleshooting on a high-voltage system
    - Carrying out diagnostic work and troubleshooting on an air-conditioning system
- Design and function of components in a high-voltage system
    - Three-phase motor
    - Inverter/power electronics
    - High-voltage battery
- Design and function of components in a high-voltage air-conditioning system
    - Air-conditioning compressor
    - Condenser
    - Evaporator
    - Expansion valve
    - Piping
- Investigation of components by measurement

Operating voltage and current:

- Input voltage:
  230 V AC, 50Hz, 16A
- Output voltages:
  DC-link voltage 300 V DC
  Drive motor voltage 0-350 V AC
  On-board network voltage 12.5-13.8 V DC

Please note, for countries with 230V power supply or above, a single phase power point is sufficient. For countries with 110V to 208V power supply, a three phase connection is required!

Control of inverter:

- Clock frequency for inverter selectable between 1, 4 and 8 kHz

Dimensions:
Length 1075 mm, width 700 mm, height 1650 mm

Weight:
166 kg