LUCAS-NÜLLE

CARTRAIN „DIAGNOSTICS AND MAINTENANCE FOR HIGH-VOLTAGE BATTERIES

Safe handling and diagnostics as performed in practice

2nd Edition

WORKING WITH AN AUTHENTIC HV BATTERY

Working directly on a real high-voltage battery and inside it: The system is set up to be just like a high-voltage battery in a standard production vehicle. With this training system, trainees can make measurements and diagnoses inside the high-voltage battery, working down to the level of individual cells and even replacing them.

Wide-ranging yet easy to use, fault simulation prepares students for numerous things which can go wrong in the real world. While trainees are working out the best way to diagnose problems for themselves, they gain skills which will stand them in good stead for modern-day challenges in a mechanic‘s repair shop.

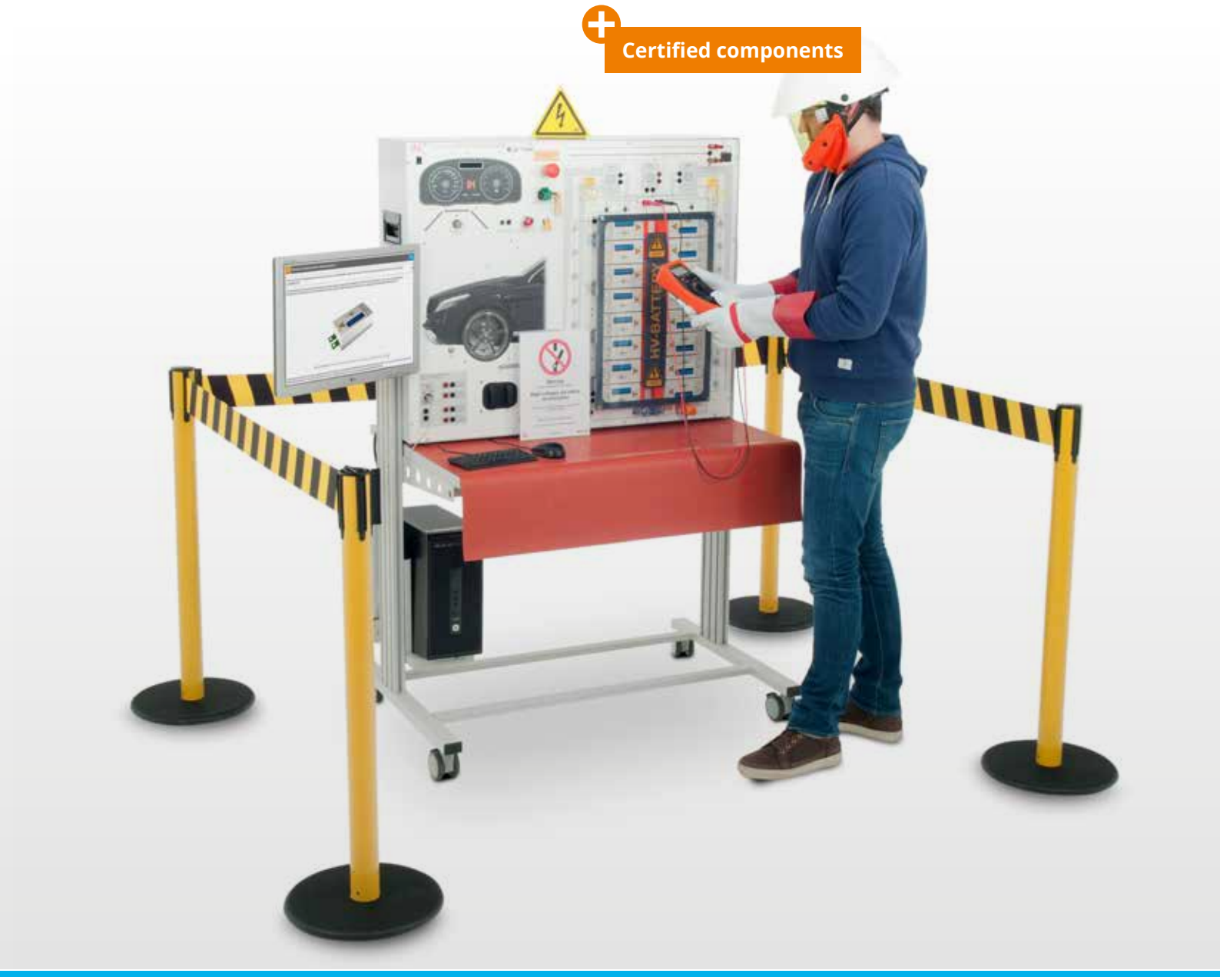
Training topics	**ÜLU**
11N/S/P, 12S/13S/14S	K4/15 und K6/15

Order no. CO3221-6S

Training contents

- Authentic high-voltage battery
  - 16 Lithium ion cells
  - 8 Temperature sensors
  - Cells and sensors can be dismantled
  - Air cooling
  - Interlock
- Disconnection of high-voltage systems
  - Diagnosis-based disconnection and isolation
  - Disconnection by removal of service and maintenance plug
  - Disconnection for rescue personnel
- Measuring options
  - CAN bus interconnection of BMS 1-3
  - High-voltage battery disconnecting relay
  - High-voltage level and cell voltages
  - Interlock
- Charging infrastructure
  - AC charging types 1 and 2
  - CCS DC charging

MAKING THE WORKING AREA SAFE



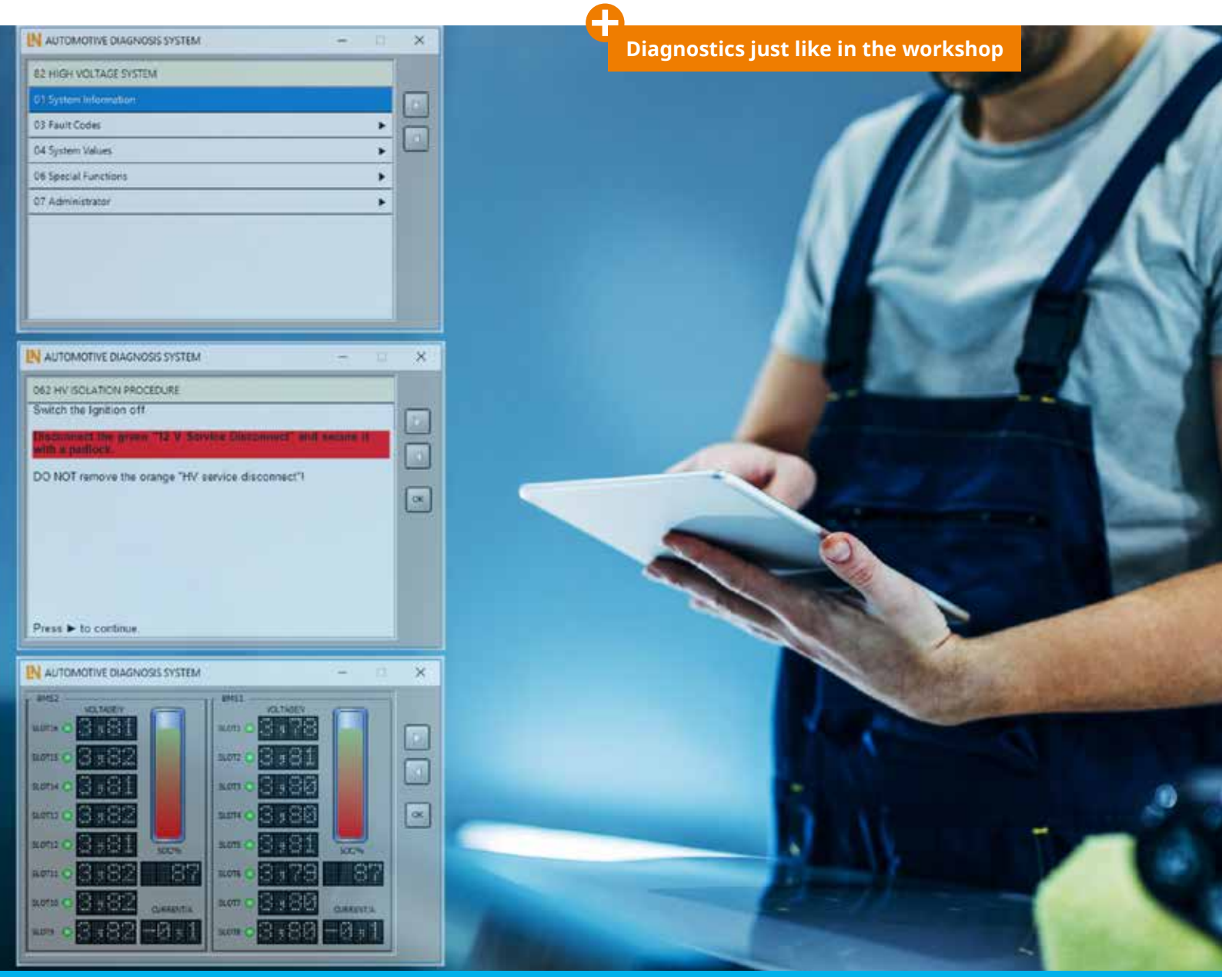
When it comes to diagnostics on hybrid and electric vehicles, safety is absolutely paramount, especially when diagnostics or repairs need to be made on the battery itself.

In order to learn the necessary safety requirements and implement them accurately, the training system teaches the use of an overall, prescribed safety concept for work on high-voltage batteries.

Your benefits

- Personal protective equipment (PPE)
  - Practical application of protective equipment
  - Checking protective equipment
  - Certified components
  - Suitable for use with vehicles
- Safety zones
  - Setting up a safety zone
  - Certified components
  - Suitable for use in workshops
- Classification of high-voltage batteries
  - Operable condition
  - Critical condition

BUILT-IN HV DIAGNOSTIC TESTER



The built-in diagnostic tester makes it possible to train and learn diagnostic procedures as used in real vehicle workshops.

For all diagnostic work, the key fault codes and actual values are provided, giving trainees essential diagnostic skills and teaching them how to handle measurements on high-voltage systems.

To perfect the authenticity of the practical work, the diagnostic tester includes a function for guiding students through the disconnection and isolation procedure for a high-voltage system. This procedure is standard nowadays for numerous vehicles.

Training contents

- Built-in high-voltage diagnostic tester
  - Measurement of cell voltage
  - Measurement of internal resistance of cells
  - Reading and deleting DTCs (diagnostic trouble codes)
  - Measurement of battery currents
  - Establishing „state of charge“
- Guided disconnection
  - Disconnection as handled in practice via diagnostic tester
  - Built-in voltage measurement for verification
  - Hands-on description of procedure

DIAGNOSTICS ON HV BATTERIES

Safe training system

In conjunction with safety clothing and equipment plus the high-voltage diagnostic tester, the training system provides unique diagnostic capability closely aligned to authentic practice.

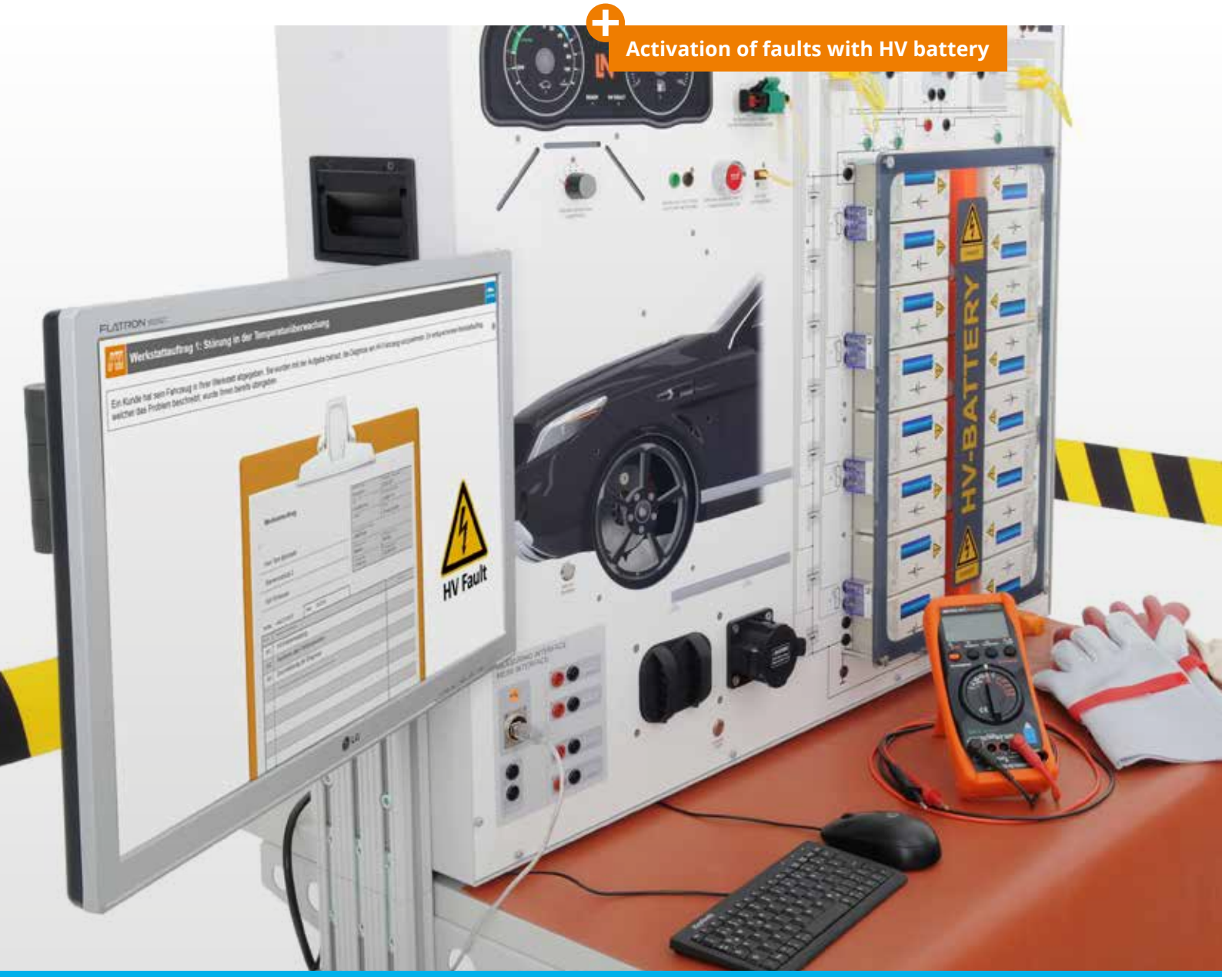
In addition to the guided diagnostics, trainees can carry out a variety of measurements directly on the training system itself.

Measurements on the interlock system and the battery management system (BMS) for the high-voltage battery are a very special part of the training content. Focus is placed on the HC system relay and switching the high-voltage system on and off.

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

SIMULATION OF HV FAULTS COMMON IN WORKSHOPS



Diagnostics of faults which can be specifically activated allows students to gain skills which will be of use to them in a real vehicle workshop.

The training system meets the most severe demands as regards safety. Trainees and the system itself are both protected in the event of any incorrect operation.

As soon as a diagnostic case from the digital course is opened, the fault in question is automatically activated.

Then it is up to the trainees to document their own diagnostic procedures in detail. The work can be evaluated at a later date without further ado.

Diagnostic contents

- Over 50 different diagnostic cases
- BMS faults
  - Temperature sensors
  - CAN bus
  - HV system relay
  - Battery cooling
- Interlock faults
  - Cover for HV battery
  - Service and maintenance plug
- Disconnection faults
  - Procedure
- HV battery faults
  - Lithium ion cells
  - Insulation resistance
  - Capacitors

DIGITAL COURSE FOR ULTRA-MODERN EDUCATION

Let a whole class work simultaneously on just one vehicle

The measurement expansion package allows multiple trainees to carry out measurements and diagnoses on one and the same vehicle at the same time.

Up to six different signals are fed into the vehicle's signal interface and are then made available at the students' workplaces. The number of student measuring stations can be increased as needed. This makes it possible for a whole group of trainees to work on the same vehicle at once.

Features

- Built-in signal interface
- Includes 6 external student measuring stations
- Parallel transmission of signals
- Custom extensibility
- Can be combined with training platform
- Built-in CAN interface

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