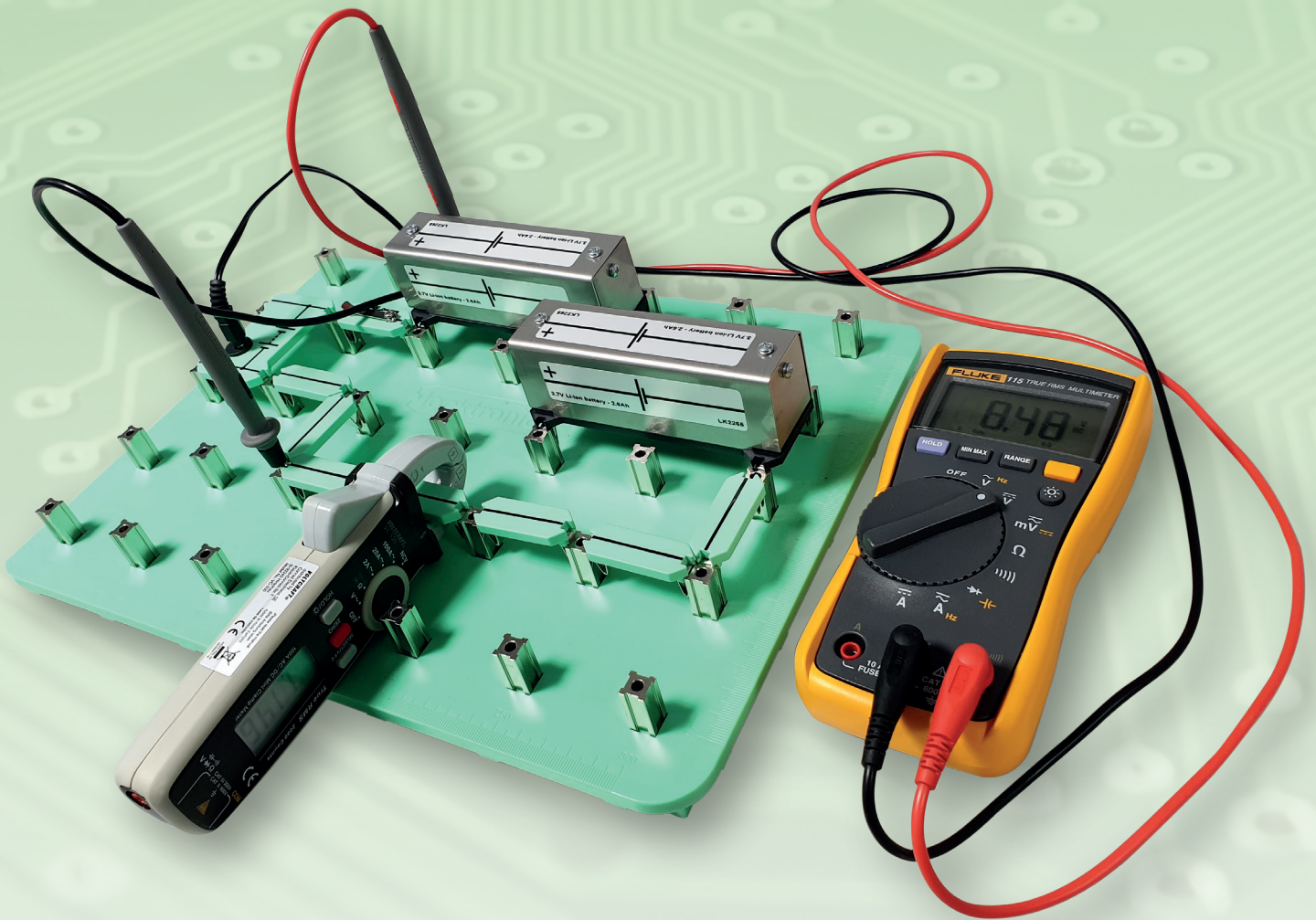


locktronicsTM

Automotive Training Range



MATRIX

www.matrixtsl.com



The Locktronics automotive range has been designed to meet the requirements of automotive engineering course standards set by the IMI, City & Guilds and BTEC. The range is split into three levels, basic, intermediate and advanced and is ideal for automotive technicians to gain a good understanding of electrics, circuits and circuit fault finding, moving through to more complex solutions for understanding of ECUs and CAN bus in vehicles. Locktronics is used and endorsed by many of the world's most prestigious automotive manufacturers as a platform for simplifying automotive electrics to complete novices and advanced technicians alike. The courses at each level consist of the following:

Level 1
Basics of automotive electricity

Level 2
Automotive fault finding
Automotive motors, generators & charging systems

Level 3
Automotive ECU architecture and logic
Batteries and high voltage systems.

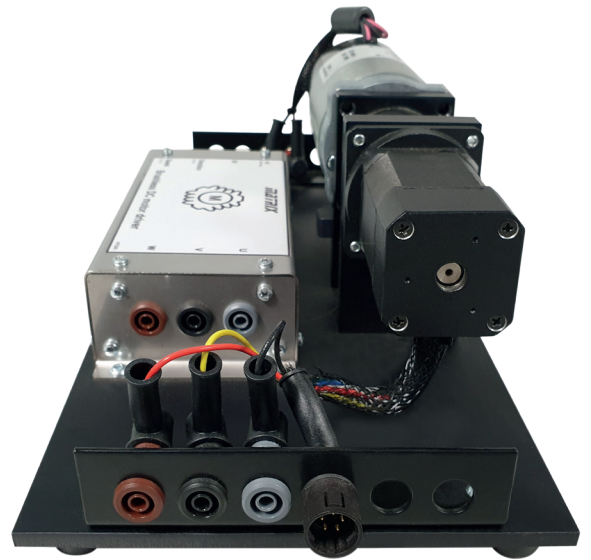


All courses are supplied with targeted curriculum written by experts in their field and come with worksheets and lesson plans to aid student and teachers. All curriculum are available freely from the matrix website in our learning centre.

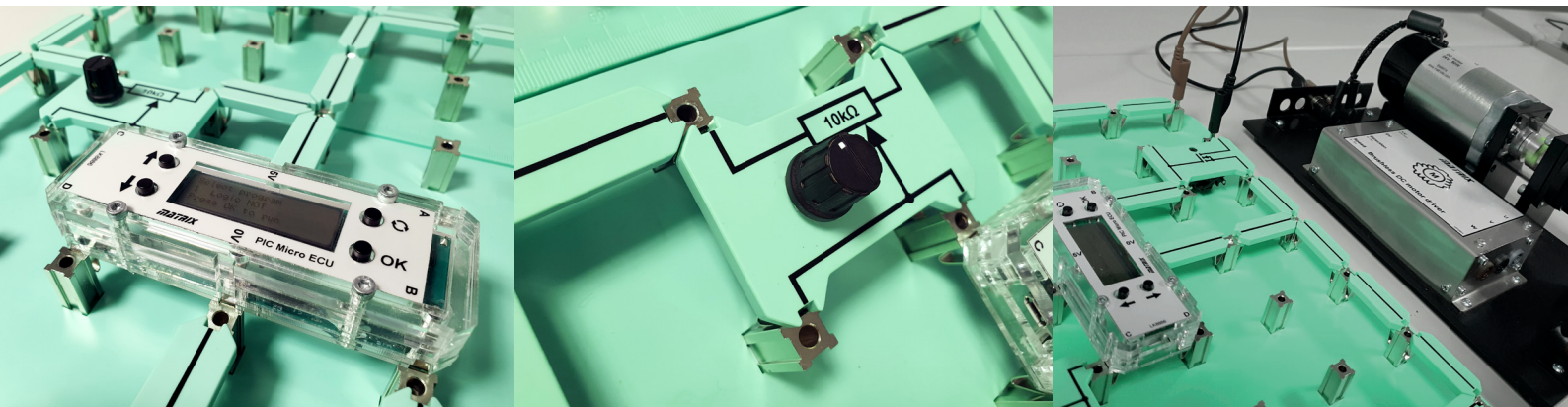
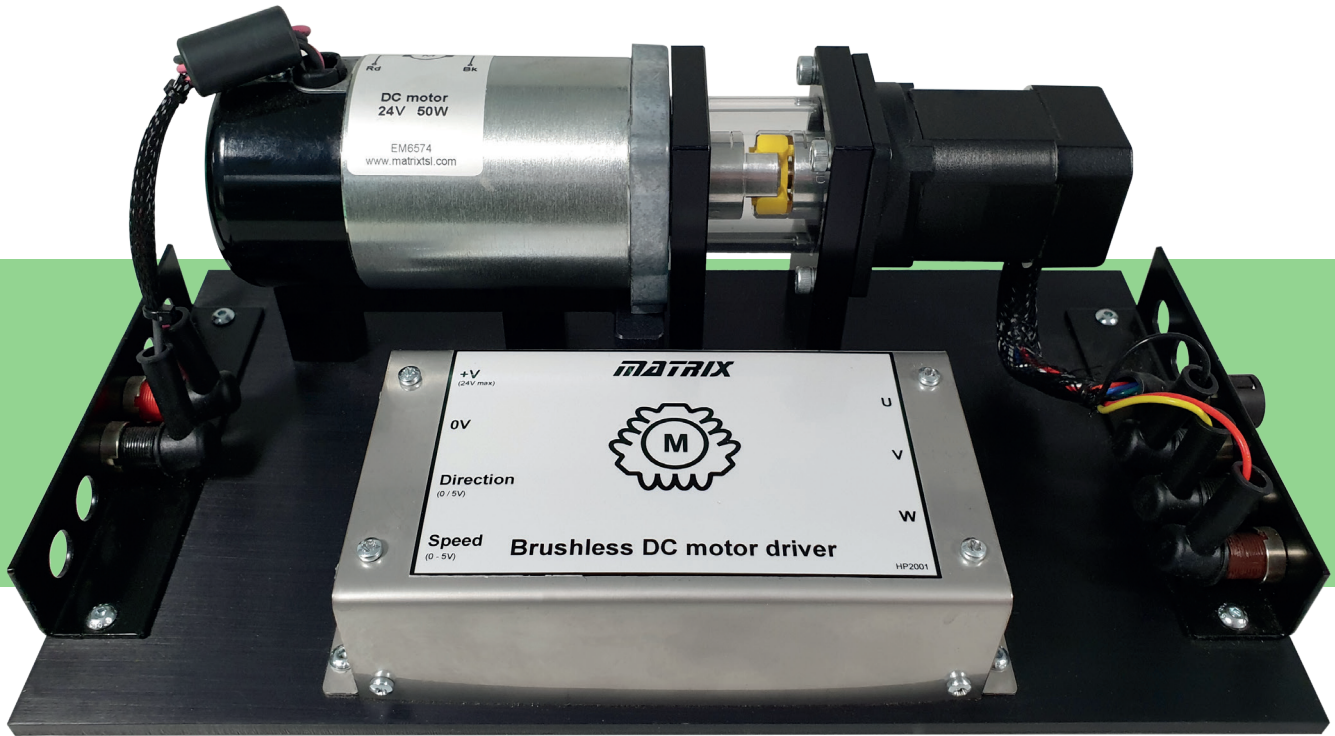
Matrix DC Motor / Brushless DC Motor Pair

The HP2001 DC motor/brushless motor pair allows students to study the concepts of motors and generators. The HP2001 consists of a 24V DC motor coupled to a 24V brushless three phase motor with integral brushless motor driver module. The two motors are coupled together but the rotating parts are contained under a clear plastic tube so that no rotating parts are exposed. The system can be driven both ways: A DC voltage between 0V and 24V can be applied to the DC motor and the Brushless DC motor then generates three phase electricity. Conversely the Brushless motor can be driven with 24V and a single analogue voltage control signal and the DC motor acts as a DC generator.

*This permanently coupled Brushless motor and DC motor on a platform is required for study of the following kits:
 LK2410 Automotive motors, generators & charging systems
 LK5281 Automotive high voltage battery circuits*

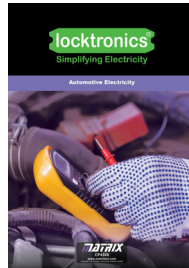
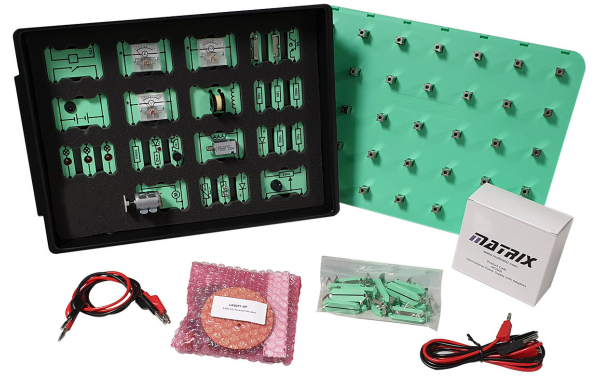


Ordering information	DIN	ANSI
Matrix DC Motor / Brushless DC Motor Pair	HP2001	



Basics of Automotive Electricity

This level 1 course allows students to understand the key concepts that underpin automotive electricity. Each worksheet provided includes an introduction to the topic under investigation, step by step instructions for the investigation that follows and a summary of the significance of the results. A pattern that is followed through all of the Locktronics worksheets used to deliver the courses in our automotive range.



Ordering information	DIN	ANSI
Basics of Automotive Electricity	LK2240	LK2240A
Corresponding curriculum	CP4388	
Instruments Required		
Multimeter	LK1110	

Key Features and Curriculum Topics

- Ohm's law
- Voltage power
- Current –DC
- Resistance
- Magnetism
- Electromagnetism
- Electrical units and symbols
- Electrical terminology
- DC motors
- Switches
- Solenoids and principles of relays
- A complete solution to learning
- Includes carriers, baseboard and power supply
- Includes worksheets with teacher's notes

Automotive Fault Finding

This kit teaches students and automotive technicians the techniques of fault finding in an automotive context. Students are provided with a series of clear worksheets which take them through a series of practical exercises using Locktronics components and base boards. The worksheets start with instruction on using multimeter's and current clamp meters for testing each type of component and making basic measurements. Students are then guided through debugging circuits using multimeter's and clamp meters using techniques like fault grids



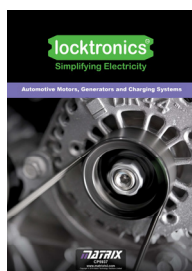
Ordering information	DIN	ANSI
Automotive Fault Finding	LK8170	LK8170A
Corresponding curriculum	CP0687	
Instruments Required		
Matrix DC Motor / Brushless DC Motor Pair	HP2001	
Automotive Current Clamp	HP2222	
Fluke Automotive Multimeter	HP1324	

Key Features and Curriculum Topics

- Use of multimeter's and clamp meters
- Current, voltage, resistance, capacitance, continuity
- Voltage drop
- Testing resistors, potentiometers, bulbs, switches, relays, thermistors, batteries
- Open circuit faults
- Short circuit faults
- Ground faults, and corrosion
- Fault finding techniques and fault grids
- Fault finding projects
- A complete solution to learning
- Includes carriers, baseboard and power supply
- Includes worksheets with teacher's notes

Automotive Motors, Generators & Charging Systems

This kit allows students to investigate the technology behind motors and charging systems. Students start by understanding the basics of motor construction and then carry out a range of experiments that helps them understand how charging systems in vehicles work. A key theme of this pack is introducing the use of oscilloscopes and triggering oscilloscopes for simple signals: AC, DC pulse width modulated and single pulse. Suitable for Level 2 students and technicians. A full workbook of exercises is provided. This kit relies on the HP2001 DC/Brushless DC motor pair which is ordered separately.



Ordering information	DIN	ANSI
Automotive Motors, Generators & Charging Systems	LK2410	LK2410A
Corresponding curriculum	CP5937	
Instruments Required		
Matrix DC Motor / Brushless DC Motor Pair	HP2001	
Automotive Current Clamp	HP2222	
Fluke Automotive Multimeter	HP1324	
Automotive Oscilloscope	HP8279	

Key Features and Curriculum Topics

- Current – AC, DC, RMS
- Motor principles
- Generator principles
- DC permanent magnet motor, Brushless three phase motor, Three phase generator
- Half and full wave rectification
- Three phase rectification
- Charge systems in vehicles
- DC power supplies and ripple
- Zener diodes
- DC motor control using Pulse Width Modulation
- Oscilloscope triggering
- Generating high tension
- Fault finding in high tension systems

Automotive ECU Architecture and Logic

This kit allows students to investigate Electronics Control Unit circuits using a pre-programmed micro ECU. Students start by building a fully functioning ECU with inputs, a relay and a transistor output and carry out the bulk of learning with it. Students construct a circuit around the ECU, select one of 14 programs on the ECU and work through the workbook provided. The workbook includes a number of fault finding exercises so that students can understand how faults in ECU circuits can be diagnosed and interpreted. Suitable for Level 3 students and technicians. A full workbook of exercises is provided.



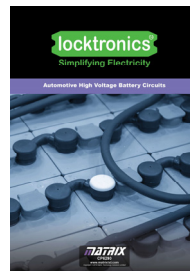
Ordering information	DIN	ANSI
Automotive ECU Architecture and Logic	LK1800	LK1800A
Corresponding curriculum	CP8408	
Instruments Required		
Matrix DC Motor / Brushless DC Motor Pair	HP2001	
Automotive Current Clamp	HP2222	
Fluke Automotive Multimeter	HP1324	
Automotive Oscilloscope	HP8279	

Key Features and Curriculum Topics

- ECU operation and structure
- Logic functions
- Pulse width Modulation
- Inputs and switches
- Sensors – light, temperature, Hall effect
- Transistor and relay outputs
- Simple actuators – motors and solenoids
- Fibre optics
- Fault finding in ECU circuits

Batteries and High Voltage Systems

The kit includes a number of small lead acid and lithium-ion batteries that can form various batteries with different voltage and current capabilities. Students construct circuits around these batteries and understand the battery circuits used in modern electric vehicles including charging systems, voltage up converters and down converters, battery management systems. Students build batteries of different voltage and current capabilities and measure and characterise battery performance and test batteries. Various fault components are included so that students can understand fault finding in battery systems. Students will also require the Matrix DC motor / Brushless DC motor pair (available separately, see HP2001). Suitable for Level 3 students and technicians. A full workbook of exercises is provided.



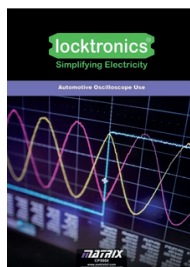
Ordering information	DIN	ANSI
Batteries and High Voltage Systems	LK5281	LK5281A
Corresponding curriculum	CP6290	
Instruments Required		
Matrix DC Motor / Brushless DC Motor Pair	HP2001	
Fluke Automotive Multimeter	HP1324	
Automotive Oscilloscope	HP8279	

Key Features and Curriculum Topics

- Lead Acid battery technology
- Lithium Ion battery technology
- Testing of batteries
- Battery construction
- Building large batteries from small batteries
- Charging systems
- Battery management systems
- Voltage converters
- Powering DC motors
- Powering three phase motors
- Three phase generators
- Fault finding in battery systems
- Electric vehicle project

Automotive Waveform Generator

The Matrix LK9155 Oscilloscope trainer has been designed to allow automotive technicians to be trained to use an oscilloscope to capture and diagnose automotive waveforms. The unit is capable of generating several basic waveforms, sine, triangle, square wave, as well as a number of pre recorded waveforms from a 2018 VW Passat. The unit also generates CAN bus signals – high and low. The unit can be used with traditional oscilloscope probes or with 4mm 'banana plug' wires and connectors. The unit is housed in a rugged plastic case. Students are asked to practice triggering the oscilloscope using the small buttons to select a number of automotive waveforms and to take measurements from those waveforms. Finally students are tasked with capturing CAN bus signals and decoding them. Teacher's notes are provided.



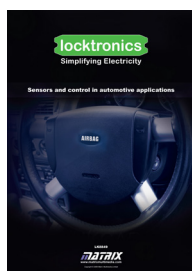
Ordering information	DIN	ANSI
Automotive Waveform Generator	LK9155	
Corresponding curriculum	LK5950	

Key Features and Curriculum Topics

- CAN bus signals – high and low
- Sine, Triangle and Square Waveform
- Capturing CAN bus signals and decoding
- Triggering Waveforms
- Graphical LCD display
- Rugged Case
- Desk Mounted

Sensors and Control in Automotive Applications Solutions

This solution provides an introduction to the role of an Electronic Control Unit. Students use a number of prewritten programs for the MIAC Electronic Control Unit (ECU) to enable them to construct a wide variety of Input - Process - Output circuits using sensors and actuators typically found in vehicles. Curriculum, including experiments and teachers notes, is available from our resources page. The solution includes component carriers, baseboard, a power supply and storage trays.



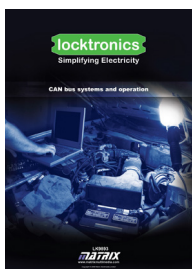
Ordering information	DIN	ANSI
Sensors and Control in Automotive Applications Solutions	LK9834-2	LK9834-2A
Sensors and Control with Engineering Panel	LK6491-2	LK6491-2A
Corresponding curriculum	LK8849	

Key Features and Curriculum Topics

- DC motors with speed control
- Stepper motors
- Temperature sensor
- Light sensor
- Potential dividers and their use
- Transistors as switches
- Use of relays
- ECU action and function
- Automotive control systems
- Sensor and actuator waveforms and signals
- Sensor and motor faults
- A complete solution to learning
- Includes carriers, baseboard and power supply
- Includes worksheets with teacher's notes

CAN Bus Systems and Operation Solution

This kit allows a fully functioning CAN bus system, mimicking vehicle operation, to be set up using 4 MIAC Electronics Control Units representing Instrument panel, Front ECU, Powertrain control, and Rear ECU. A fifth MIAC is used for system diagnosis, releasing faults and viewing CAN bus messages. Students are tasked with setting up a fully working CAN bus system, inserting faults and using hardware and software tools to understand fault diagnosis procedures and practice. The solution includes component carriers, baseboard, power supplies and storage trays. Curriculum, including experiments and teachers notes which can be found in our online resources.



Ordering information	DIN	ANSI
Can Bus Systems and Operation Solution	LK7629	LK7629A
CAN Bus Systems and Operations with Engineering Panel	LK2839	LK2839A
Corresponding curriculum	LK9893	

Key Features and Curriculum Topics

- Advantages of CAN
- ECU action and function
- CAN message structure
- Start up routines
- Wiring in CAN bus systems
- Intelligent design
- CAN bus diagnosis
- Scan tool use in fault diagnosis and release
- Make and diagnose a CAN bus system
- Includes OBD socket
- Full CAN bus curriculum and teachers notes
- Includes 5 educational ECUs
- Includes power supply



Automotive Training Range

For more information, do not hesitate to contact us

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