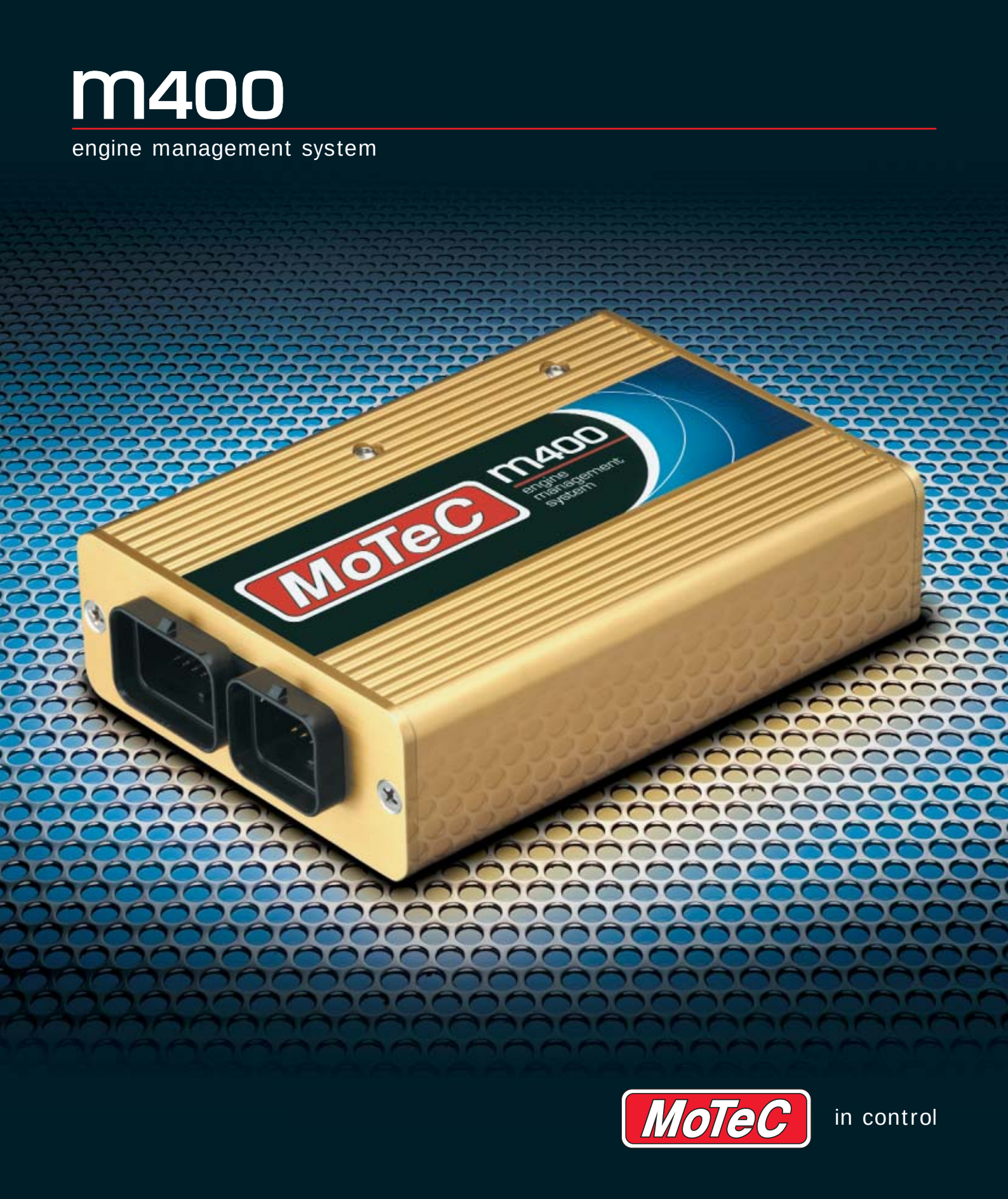
m400

engine management system



MoTeC in control

THE COMPANY

MoTeC was founded in 1987 with the aim of providing world class products, superior customer service and the most advanced technology available.

A strong commitment to delivering the best possible solutions, state-of-the-art hardware and user friendly software has earned ***MoTeC*** international recognition as a leader in engine management and data acquisition systems.

As automotive technology continues to evolve, ***MoTeC*** reinforces its dedication to research and development with an innovative range of products and sophisticated software, all backed by an outstanding package of total customer support and an exceptional two year product warranty.

ENGINE MANAGEMENT

The main function of a programmable Engine Management System or Engine Control Unit (ECU) is to provide full control of a fuel injected engine over all possible operating conditions. Precise allocations of fuel and ignition timing can be assigned to any given load/rpm site for optimum engine performance.

The ECU receives a constant flow of information from a number of vital sensors and processes this data using programmable calibrations and compensations. Adjustments are then made to the fuel delivery and ignition timing to maintain correct engine operation. The number of tuning sites can be defined by the user, allowing extra scope for fine tuning.

MoTeC engine management systems not only provide superior control of ignition and injection, but also offer the ability to control many additional engine functions such as Variable Cam Control and Turbo Wastegate Control.

THE *MoTeC* DIFFERENCE

MoTeC products are engineered with an uncompromising approach to quality, using only the best components and manufacturing processes to ensure optimum performance, reliability and longevity.

ENVIRONMENTAL PROTECTION

From boats to desert racing and everything in between, engine management systems can be exposed to extreme conditions, making it important to provide as much protection as possible to the internal components.

For that reason, all ***MoTeC*** ECUs are robotically assembled and dipped in liquid silicone, ensuring the components and circuit board are fully encapsulated. This military grade coating protects the surface mounted technology from environmental contamination such as moisture and dust, while improving resistance to vibration.

Sealed connectors with gold plated contacts enhance connection reliability, reducing the chance of erroneous sensor readings which can lead to engine damage.

TRUE 32 BIT PROCESSOR WITH TIME CO-PROCESSOR

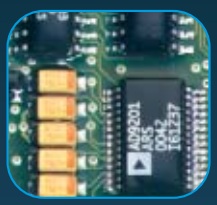
MoTeC's powerful processor delivers smooth, responsive engine operation, fast update of all calculations and the computing power to perform auxiliary functions such as Continuously Variable Cam Control and Drive by Wire. Dedicated timer channels for each injector and coil improve fuel pulse width and ignition timing accuracy.

UPDATABLE SOFTWARE

Fully updatable software allows ***MoTeC*** ECUs to be upgraded at any time with the latest features as they become available. These updates can be downloaded free of charge from the ***MoTeC*** website.

PROGRAMMABLE CURRENT PEAK & HOLD INJECTOR DRIVERS

The injector drive can be precisely calibrated to the injector manufacturer's requirements to deliver the most reliable and effective operation of the injector under all conditions.



SWITCHMODE INJECTOR DRIVERS

Sophisticated electronics and control software allow the injectors to be held open with a lower current, reducing power draw from the system and generating less heat within the ECU, resulting in greater reliability. This technology also provides the ability to drive low ohm injectors for maximum performance, accommodating injectors as low as 0.1 ohm.

ADVANCED DIAGNOSTICS

MoTeC's diagnostics monitoring system helps to detect and locate faults within injectors, wiring and sensors, allowing problems to be fixed quickly. The optional logging function further enhances the system's diagnostic capabilities.

DATA LOGGING

With the Logging upgrade enabled, the M400 offers 512k of internal, high speed logging at up to 200 samples per second per channel. Users can select up to 64 parameters from a possible 350 and can individually define the logging rates for each item. The M400's Flash Logging Memory stores logged data indefinitely, even with no power to the ECU.

DIGITAL SIGNAL PROCESSING OF CRANK & CAM SIGNALS

MoTeC ECUs are suitable for use with a wide range of factory trigger systems, including those found in many late model vehicles. ***MoTeC***'s compatibility with OEM sensors, including magnetic, hall and optical, reduces installation cost and time. Crank and cam sensor voltages can be recorded, allowing trigger levels to be individually set for magnetic sensors.

Programmable filtering reduces the effects of noise and possible false triggering, while advanced diagnostics assist the user by warning of false signals that may cause problems if left unresolved.

MoTeC

THE M400 SYSTEM

Developed with the same advanced technology as our revolutionary M800 and M880 models, the ***MoTeC*** M400 reflects the demand for sophisticated electronics to control today's highly evolved engines.

Offering four injector drivers and four ignition outputs, the M400 is a fully programmable management system ideal for engines up to four cylinders with sequential injection and multi-coil ignition. It is also well suited to twin rotary applications.

Eight auxiliary outputs provide control for aftermarket devices and systems normally managed by the factory computer. These can be allocated as required to functions such as 3D boost control, nitrous injection, intercooler spray bars, idle speed, shift lights, warning alarms and many more.

The ***MoTeC*** M400 system includes a 32 Bit microprocessor as standard plus Narrowband Lambda control and Wideband Lambda control using an external meter. Optional features such as Continuously Variable Camshaft Control and Drive by Wire Throttle Control provide the flexibility to suit a wide range of modern vehicles.

CONTINUOUSLY VARIABLE CAM CONTROL

The M400 provides the capability to control fully variable camshaft timing using factory trigger wheels and sensors. Each cam can be independently adjusted in 0.5 degree increments based on RPM and load. This allows users to optimise engine tuning across a wide range of operating conditions to achieve better high end performance and low speed torque. Other benefits include enhanced idle, fuel economy and emissions control.

DRIVE BY WIRE THROTTLE CONTROL

Drive by Wire technology uses an electronic throttle instead of the traditional mechanical system, interpreting pedal input from the driver via sensors while controlling a throttle actuator. The M400 caters for this high-tech function, employing sophisticated software and hardware that is compatible with most OEM Drive by Wire units.

M400 UPGRADES

For additional functionality, users can request password enabled upgrades such as Data Logging and Advanced Functions which includes Traction Control, Launch Control, High/Low Injection, Overrun Boost Enhancement (Anti-Lag) and Gear Change Ignition Cut for flat shifts.

HIGH SPEED INTERNAL WIDEBAND LAMBDA

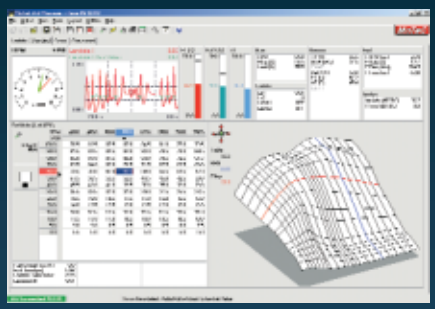
While the standard system utilises Narrowband Lambda control and Wideband Lambda using an external meter, the M400 can be upgraded with a professional internal Wideband Lambda meter for maximum tuning accuracy.

M400 SOFTWARE

MoTeC software is designed with an emphasis on usability, enabling you to quickly optimise the set up of your vehicle. All software is menu driven and has extensive help screens, making it user friendly for the beginner and a powerful tool for experts.

ECU MANAGER TUNING SOFTWARE

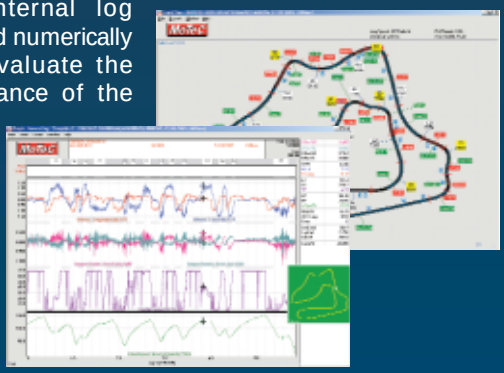
The **ECU Manager** software is designed for set up, tuning and diagnostics of the engine management system. Tuning can be carried out online (with the ECU connected) or offline. Users can view sensor and status readings, output settings, compensations and diagnostic errors. It also features Quick Lambda (automated fuel adjustment), user definable screen layouts, 3D graphing of calibration tables, site target, output testing, multiple file comparisons, table interpolation, table export, table maths and online help.



INTERPRETER SOFTWARE *(Logging option must be enabled)*

MoTeC's **Interpreter** software provides advanced tools for analysing logged data quickly and efficiently. Data collected from the ECU's internal log memory can be viewed numerically or graphically to evaluate the health and performance of the vehicle and to assess driving technique.

Users can monitor various parameters in order to make improvements to performance and maintain vehicle reliability.



MoTeC SUPPORT & TRAINING

MoTeC is committed to delivering the highest level of customer service. Our team of support personnel and trained dealers will provide expert technical assistance and advice on the most suitable ***MoTeC*** system for your application. Comprehensive information is also available at the ***MoTeC*** website (including downloadable diagrams, software and application notes).

To help customers make the most of their engine management and data acquisition systems, ***MoTeC*** conducts product training sessions and seminars with worldwide experts. Visit the ***MoTeC*** website for details.

INPUTS

Ref and Sync Trigger

- Magnetic Sensors (Programmable Trigger Levels)
- Hall Sensors
- Optical Sensors

6 Temperature Inputs

User Programmable as

- Engine Temperature
- Air Temperature
- Oil Temperature
- Other sensors configurable

8 Voltage Inputs

User Programmable as

- Throttle Position Sensor
- Map Sensor
- Mass Air Flow Sensor
- Gear Position
- Other sensors configurable

1 Lambda Sensor Input

User Programmable as

- Narrow Band
- Wideband (External meter)
- Professional Internal Wideband (Optional)

4 Digital Inputs

User Programmable as

- Wheel Speeds
- Dual RPM Limit
- Overrun Boost Activation
- Other sensors configurable

POWER

COMMUNICATIONS

- CAN for diagnostics, tuning, logging retrieval and communication with other devices

OUTPUTS

4 Fuel Injector Drivers

- Programmable Current Outputs
- Up to 4 sequential high or low ohm injectors

4 Ignition Drivers

- Up to 4 outputs for multi coil applications

8 Auxiliary Outputs

Programmable as

- Drive by Wire
- Continuously Variable Cam Control
- Turbo Waste Gate Control
- Intercooler Spray Bar Control
- Idle Speed Control
- Nitrous Injection
- Auxiliary Valves
- Stepper Motor Control
- Driver Warning Lights
- Shift Lights
- Tacho signal
- Fuel Pressure Control
- DC Servo Control
- Thermatic Fan Control
- Other devices as required

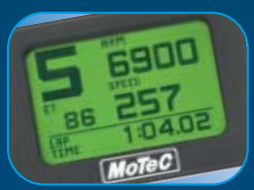
Sensor Power Supply

- Separate Engine and Auxiliary Sensor Supplies

ALSO AVAILABLE FROM *MoTeC* - visit www.motec.com.au for details

ECUs:
Other ***MoTeC*** engine management systems available include:
M4, M48, M600, M800 and M880.

ADVANCED DASH LOGGER:
The ADL is a fully programmable data logger, device controller and display unit.



MINI DIGITAL DISPLAY:
The MDD is a compact satellite display unit designed for use with ***MoTeC*** 's ADL or ECUs.

PROFESSIONAL LAMBDA METER:
MoTeC 's user configurable PLM accurately determines exhaust gas mixture strength for various fuels.

SENSORS & ACCESSORIES:
A full range is available to suit individual applications. Contact your dealer for details.

M400 SYSTEM SPECIFICATIONS

ENGINE MANAGEMENT SYSTEM	M400
GENERAL	
Microprocessor - 3.3V 32 Bit with next generation time co-processor and 32MHz internal operation	✔
Quality Standard	ISO 9002
Manufacturing Standard - IPC-S-815-A Class 3 High Reliability	✔
Warranty Parts and Labour	2 year
Burn in –10 to 70 Deg C, 10 cycles in 32 hours	✔
ECU Control Software stored in updatable Flash memory	✔
High RFI Immunity	✔
Low heat generation when using low ohm injectors	✔
Battery transient protection	✔
Environmentally sealed electronics	✔
Waterproof connector with gold plated contacts	✔
Case Size (mm)	147 x 105 x 40
Weight (kg)	0.500
PC Communications	CAN
Logger and Display Communications	CAN and RS232
Cylinders	1, 2, 3, 4 Sequential
Engines 2 stroke, 4 stroke, Rotary (2 Rotor)	✔
Maximum RPM	> 20,000
OPERATING CONDITIONS	
Internal Temperature Range (Deg C)	-10 ~ 85 Deg
Ambient Temperature (Deg C) (Depending on load and ventilation)	-10 ~ 70 Deg
Operating Voltage	6 ~ 22V DC
Operating Current (ECU only)	0.5 A max.
Reverse Battery Protection	External Fuse
COMPUTER SOFTWARE	
Tuning, setup, diagnostic and utility software (Windows)	✔
Computer Requirements	IBM PC with printer port, Win 95 to XP
Built-in help system	✔
Data Logging Analysis	Opt. 1
User definable screen layouts	✔
INJECTION OUTPUTS	
Switchmode, high efficiency, low heat generation	✔
Type	Peak and hold
Number	4
Injector Resistance	> 0.1 Ohm
User Programmable Current	0.5 ~ 6 Amp peak
User Definable Battery Voltage Compensation	✔
FUEL CALIBRATION	
Accuracy	0.000002 sec
RPM and Load Sites are user programmable	✔
Main Table (3D) - RPM sites x Load sites	40 x 21
End of Injection Primary and Secondary (3D) - RPM sites x Load sites	20 x 11
Individual Cylinder Trim	✔
Individual Cylinder Tables (3D) – RPM sites x Load sites	20 x 11
Secondary Injector Balance Table (3D) - RPM sites x Load sites	20 x 11
Auxiliary Compensations (any channel)	2
Adjustable MAP, Engine and Air Temperature, Fuel Pressure, Fuel Temperature and Gear Compensations	✔
Accel./Deccel. Clamp, Decay and Sensitivity	✔
Cold Start (user definable 3D table)	✔
End of injection compensation (any channel)	1
Adjustable injector dead-time compensation	✔
Number	4
Ignition Interface allows connection to most OEM Ignition systems	✔
Accuracy	0.1 degree
RPM and Load Sites are user programmable	✔
Main Table (3D) - RPM sites x Load sites	40 x 21
Individual Cylinder Trim	✔
Individual Cylinder Tables (3D) – RPM sites x Load sites	20 x 11
Adjustable MAP, Engine and Air Temperature, Gear Compensations	✔
Auxiliary Compensations (any channel)	2
Gear Compensation	✔
Accel. Adv. Clamp, Decay and Sensitivity	✔
Dwell Time – RPM x Battery Voltage	10 x 11
Odd Fire engine capability (any angle)	✔
Rotary Ignition Split	✔
Main Table (3D) - RPM Sites x User Defined Sites	20 x11
Engine, Air and Exhaust Temperature Compensation	✔
Auxiliary Compensation (any channel)	1

ENGINE MANAGEMENT SYSTEM	M400
STANDARD FEATURES	
Narrow Band Lambda Control	✔
Wideband Lambda Control using external meter	✔
Switched Cam Control	✔
Driver Warning Alarm and Shift Light Control	✔
Tacho Output	✔
Gear Detection	✔
Dual RPM Limit	✔
Ground Speed Limiting	✔
Nitrous Oxide Enrich / Retard	✔
Air Conditioner Fan and Clutch Control	✔
Over Run Fuel Cut	✔
Programmable Sensor Calibrations	✔
RPM Limit, Hard or Soft cut, fuel and/or ignition	✔
Turbo Wastegate Control	✔
Intercooler Spray Bars	✔
Idle Speed Control (Pulse Width Modulated, Stepper, Drive by Wire)	✔
RPM / Load Dependent Valves	✔
Fuel Used Output	✔
Fuel Pressure Control	✔
Fuel Pump Relay Control	✔
Alternator Control	✔
Thermatic Fan Control	✔
Slip Warning Light	✔
User Definable 3D Output Tables with selectable axis parameters	✔
OPTIONAL FEATURES *(Necessary for some applications)*	
Data Logging	Opt. 1
Onboard Wideband Lambda Sensor Controller for NTK UEGO & Bosch LSU sensors	Opt. 2 (Single)
Traction Control and Launch Control (2, 3 or 4 wheel)	Opt. 3
Gear Change Ignition Cut (Flat shifts)	Opt. 3
High/Low Injection (Staged Injection)	Opt. 3
Overrun Boost Enhancement (Anti-lag)	Opt. 3*
Continuously Variable Cam Control	Opt. 4
Drive by Wire Throttle	Opt. 5
AUXILIARY OUTPUTS	
Number of Auxiliary Outputs	8
All outputs are Pulse Width Modulated or Switched capable	✔
4 Wire Stepper Motor capable	✔
Number of Outputs with High and Low Side drive	6
Auxiliary Outputs can be used for standard and optional functions as required	✔
TRIGGER SENSORS	
Directly Compatible with most OEM trigger systems including: Hall, Magnetic and Optical types Multi-tooth (e.g. Mazda and Toyota) 1 or 2 Missing Teeth (e.g. Porsche) Many other special types incl. Ford narrow tooth, Nissan optical, RX8 and more	✔
Digital Signal Processing with Advanced Diagnostics	✔
Throttle Position, Manifold Pressure, Engine and Air Temperature	✔
Auxiliary Sensor Inputs	10
Digital/Speed Inputs	4
Narrow Band	✔
Wideband using external meter	✔
Single onboard Wideband, fully temperature compensated using high speed, professional type NTK UEGO or Bosch LSU sensors	Opt. 2
Range – Lambda	0.70 to 32.0
Resolution – Lambda	0.001
Lambda inputs also usable as 0-5V analogue input	1
Logging of all ECU parameters	Opt. 1
Memory, Non-Volatile Flash	512k
Individual Parameter and Rate Selection	✔
Logging Rate – samples per second	1 to 200
Logging Time – 28 Parameters + Diagnostics at 5/sec	38 minutes
Interpreter Software – Graphical Analysis	✔
Maximum parameters logged	64
Maximum logging throughput	10 kbytes/sec
Injectors Open Circuit, Short Circuit, Peak Current not reached	✔
Sensors Open and Short Circuit	✔
Ref/Sync noise warning and error diagnostics (noise, runt pulses and amplitude)	✔
Operating Errors: RPM Limit Exceeding, Injector Overduty, Over Boost, Low Battery, REF Error etc.	✔

✔: Standard Opt.1: Logging Opt.2: Onboard Wideband Lambda - Single Opt.3: Advanced Functions Opt.4: Continuously Variable Cam Control Opt.5: Drive by Wire *Available as part of Advanced Functions or as a separate option.

www.motec.com.au

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For more information, contact your local MoTeC dealer

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