M4 & M48

engine management systems

MoTeC in control

M4 AND M48 ENGINE MANAGEMENT SYSTEMS

MoTeC have developed a range of advanced Engine Management Systems designed to cater for all types of users. Whether you are running a street car, touring car, rally car, formula car, motorbike or a boat, ***MoTeC*** have a system to suit both you and your budget.

Tuning an engine correctly can be time consuming with some systems. ***MoTeC*** provides management systems that offer ease of tuning, flexibility and maximum power to give you that winning edge. Your goal is to maximise horsepower and reliability! At ***MoTeC*** we provide the tools to do just that. The key variables of ignition advance, air-fuel ratio, injection timing (and boost level on forced induction engines) are easily tuned to ensure the best performance and reliability.

All ***MoTeC*** Engine Management Systems are fully configurable, allowing them to be programmed to suit all types of engines including 2 stroke, 4 stroke and rotary.

Not just in competition use either, many performance application engines controlled by ***MoTeC*** Engine Management Systems have achieved emissions certification.

INPUTS

Ref and Sync Trigger

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

3 Temperature Inputs

User Programmable as

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

3 Voltage Inputs

User Programmable as

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

Lambda Sensor Input

- Narrow Band
- High Speed Wide Band*

2 Digital Inputs

User Programmable as

- Wheel Speeds
- Nitrous Control
- Speed Limiting
- Switching
- Mass Air Flow

POWER

COMMUNICATIONS

- RS232 for Tuning, Logging retrieval, Telemetry

OUTPUTS

8 Fuel Injector Drivers M48
4 Fuel Injector Drivers M4

- Programmable Current Outputs
- Unused outputs have alternate function (M48 only)

2 Ignition Drivers M48
4 Ignition Drivers M4

- One output may drive up to 8 coils using Ignition Expander

4 Auxiliary Outputs (3 Shared)

User Programmable as

- Turbo Waste Gate Control
- Idle Speed Control
- Fuel Used Display
- Tacho Output
- Shift Lights
- Driver Warning Alarm
- RPM/ Load Dependent Device
- User Defined Table
- Slip Warning
- Fuel Pump Relay
- Thermatic Fan
- Air Conditioning Fan and Clutch
- Intercooler Spray Bars
- Status Output

LATEST TECHNOLOGY

The ***MoTeC*** M4 and M48 Engine Management Systems (ECU's) share similar architecture and componentry. At the heart of the ***MoTeC*** M4 and M48 ECU's is a 32 bit 33MHz microprocessor with time co-processor. The electronics are produced on an automated robotic assembly line to ISO 9002 standards.

ECU MODELS

The ***MoTeC*** M4 and M48 Engine Management Systems (ECU's) will suit most applications ranging from 1 to 12 cylinders and rotary engines. Within each model there are various upgrade options.

M4 Clubman

The M4 Clubman is our 4 cylinder sequential and rotary engine ECU designed to provide you with the most common features at the lowest possible cost. The M4 is the most compact and lightweight model in the ***MoTeC*** ECU range.

The M4 represents excellent value with four injector drivers controlling engines up to four cylinders in sequential injection mode or twelve cylinders in group fire mode.

It features full 3D Mapping and, although predominantly designed for performance street cars and bikes, by choosing the optional upgrade features (advanced tuning, logging and lambda) it is also ideally suited for competition use.

The M4 Clubman can be upgraded to the features of the M4 Pro at any time later.

M4 Pro

The M4 Pro has the Advanced Tuning and Data Logging option as standard. The Advanced Tuning offers traction control, boost enhancement (anti-lag), gear change ignition cut, wide band lambda control* and greater configurability.

M48 Clubman

The M48 represents excellent performance and value with eight injector drivers controlling engines up to eight cylinders in sequential injection mode, or twelve cylinders in group fire mode.

The M48's capability provides the ideal solution for competition use, performance street cars and bikes with full 3D mapping, optional upgrades for advanced tuning, logging and lambda.

The M48 Clubman can be upgraded to the features of the M48 Pro at any time later.

M48 Pro

Like the M4 Pro, the M48 Pro has the Advance Tuning and Data Logging option as standard. This offers traction control, boost enhancement (anti-lag), gear change ignition cut and greater configurability. The Pro is for leading edge engines up to eight cylinders where peak performance is required.

FEATURES

- Fully Programmable
- Field Upgradeable
- Advanced Tuning Features
- Data Logging
- Powerful Software
- 32 bit Microprocessor
- Wideband Lambda Measurement
- Rugged Aluminium Case
- Quality Standard ISO 9002
- Worldwide Support

Advanced Features

MoTeC Engine Management Systems offer highly advanced features including: traction control, launch control, overrun boost enhancement, data logging, gear change ignition cut, gear or throttle position dependent boost control, individual cylinder tuning, wideband lambda control and many more, either as standard or as options.

COMPATIBILITY

The vast majority of Original Equipment Manufacturers' (OEM's) and after market trigger systems, injectors and ignition systems can be used with ***MoTeC*** Engine Management Systems (ECU's). This avoids the cost and time needed to remanufacture these systems to suit the ECU.

SOFTWARE

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

EMP Tuning Software

The EMP software is designed for set-up, tuning and diagnostics of the ECU. Tuning may be done on line with the ECU connected, or offline and then sent to the ECU at a later time. The EMP software allows for viewing of all sensor readings, output settings, status reading, compensations and diagnostic errors. It has many powerful features including quick Lambda, which allows the fuel to be automatically adjusted to the correct value at the press of a button*.

Other features include: 3D graphing of calibration tables, site target, testing of fuel, ignition and auxiliary outputs, file comparison, table interpolation, table copy, table export, table mathematics for more rapid tuning and online help.

Interpret - Analysis Software

The Interpret software provides advanced tools to assist users in analysing the logged data quickly and efficiently. Data can be collected from any of the ***MoTeC*** ECU's internal log memory, by telemetry†, or by direct connection to a PC. The information contained within the log files can be viewed numerically or graphically in a number of formats. The ability to take numerical data and render it graphically is a powerful tool for understanding the interrelationships contained in the data.

All ***MoTeC*** software updates are available free of charge from our website at ***www.motec.com.au***.
This policy allows you to maintain the very latest in technology and features for many years to come.

UPGRADES

All ECU's have various options which are field upgradeable using a password and enabling system. Upgrade options include:

- ***Advanced Tuning*** – Upgrades an M4/M48 Clubman to all of the advanced features of a Pro, including Data Logging.
- ***Data Logging*** – Enables the 512Kbyte data logging memory. With 512k of memory, the user can quickly verify the operation of the vehicle engine during "on track" conditions. All ***MoTeC*** ECU's are capable of recording the engines operating parameters at 1, 2, 5, 10 or 20 times per second.

  The data may then be downloaded to a computer and analysed using the ***MoTeC*** Interpreter software. Data logging is standard on the 'Pro' ECU's.
- ***Wideband Lambda*** (Air Fuel Ratio) – Enables the use of our high accuracy fully temperature compensated Wideband Lambda (mixture strength) sensor. This feature is free on the M4/M48 for the first six hours running to assist with the initial set-up and tuning.
- ***Telemetry***
- ***Remote Logging*** (requires Telemetry option)

See specifications and Model Comparison table for further details.

Choose from a wide range of sensors for use with the ECU's including: temperature, position, accelerometers, speed, pressure and many others.

MoTeC SUPPORT

With a ***MoTeC*** system you can be assured of the highest level of customer support; our dealers are fully trained to the ***MoTeC*** standard and comprehensive information is provided at the ***MoTeC*** website (including downloadable diagrams, software and application notes).

MoTeC also conducts seminars with worldwide experts on engine management and data acquisition. All backed up by a full two year worldwide warranty.

** Requires Wide Band Lambda option*
† Requires Telemetry and Remote Logging options

MoTeC

SPECIFICATIONS & MODEL COMPARISON

ENGINE MANAGEMENT SYSTEMS	M4	M48
GENERAL		
Microprocessor - 32 Bit 33MHz with Time Co-Processor	✔	✔
Quality Standard	ISO 9002	ISO 9002
Manufacturing Standard - IPC-S-815-A Class 3 High Reliability	✔	✔
Warranty Parts & Labour	2 year	2 year
Burn in - 50 to 70 Deg C for 32 hours	✔	✔
ECU Control Software stored in updateable memory	✔	✔
High RFI Immunity	✔	✔
Low heat generation	✔	✔
Battery transient protection	✔	✔
Environmentally sealed electronics	✔	✔
Water-proof connector with gold plated contacts	✔	✔
Military Spec. connector	Optional	Optional
Case Size (mm)	120 x 100 x 36	150 x 100 x 36
Weight (kg)	0.400	0.480
Communication: - RS232 (to PC or Dash Logger) via optional interface cable	✔	✔
Cylinders	1,2,3,4,5,6,8,12	1,2,3,4,5,6,8,10,12
Engines 2 stroke, 4 stroke, Rotary (1 to 4)	✔	✔
Maximum RPM > 15,000	✔	✔
OPERATING CONDITION		
Internal Temperature Range (Deg C)	-10 ~ 85 Deg	-10 ~ 85 Deg
Ambient Temperature (Deg C) (Depending on load & ventilation)	-10 ~ 70 Deg	-10 ~ 70 Deg
Operating Voltage	6 ~ 22V DC	6 ~ 22V DC
Operating Current	0.4 A max.	0.4 A max.
Reverse Battery Protection	External Fuse	External Fuse
COMPUTER SOFTWARE		
Software included with every ECU: EMP Program - tuning, set up and diagnostic Interpret - data analysis	✔	✔
Computer Requirements	IBM PC, DOS or Windows 95 98 Me NT4 2000	IBM PC, DOS or Windows 95 98 Me NT4 2000
Built-in help system	✔	✔

	M4		M48	
INJECTION	Clubman	Pro	Clubman	Pro
Injector Drivers - Number and Type	4 sequential or group		8 sequential or group	
User Programmable Current	0.5 ~ 12 Amp peak		0.5 ~ 6 Amp peak	
User Definable Battery Compensation	✔	✔	✔	✔
FUEL CALIBRATION	Clubman	Pro	Clubman	Pro
Accuracy	0.00001 sec		0.00001 sec	
RPM & Load Sites are user programmable	✔	✔	✔	✔
Main Table (3D) - RPM sites x Load sites	40 x 21	40 x 21	40 x 21	40 x 21
Secondary Load Table	✘	✔	✘	✔
End of Injection Primary & Secondary - RPM Sites	20		20	
End of Injection Primary & Secondary (3D) - RPM Sites x load sites	20 x 6	20 x 6	20 x 6	20 x 6
Overall Trim	✔	✔	✔	✔
Individual Cylinder Trim	✔	✔	✔	✔
Individual Cylinder Tables (3D)	✘	20 x 11	✘	✘
Secondary Injector Balance Table (3D) - RPM sites x Load sites	20 x 6	20 x 6	20 x 6	20 x 6
Adjustable MAP, Engine & Air Temperature Compensations	✔	✔	✔	✔
Auxiliary Compensations	2		2	
Gear Compensation	✔	✔	✔	✔
Accel./Deccel. Clamp, Decay & Sensitivity	✔	✔	✔	✔
Cold Start (5 parameters)	✔	✔	✔	✔
	Clubman	Pro	Clubman	Pro
Number	4		2	
1 output may drive up to 8 coils using the MoTeC Ignition Expander	✔	✔	✔	✔
Ignition Interface allows connection to most OEM Ignition systems	✔	✔	✔	✔
	Clubman	Pro	Clubman	Pro
Accuracy	0.25 degree		0.25 degree	
RPM & Load Sites are user programmable	✔	✔	✔	✔
Main Table (3D) - RPM sites x Load sites	40 x 21	40 x 21	40 x 21	40 x 21
Overall Trim – % or Degrees	✔	✔	✔	✔
Individual Cylinder Trim	✔	✔	✔	✔
Individual Cylinder Tables (3D)	✘	20 x 11	✘	✘
Adjustable MAP, Engine & Air Temperature Compensations	✔	✔	✔	✔
Auxiliary Compensations	2	2	2	2
Gear Compensation	✔	✔	✔	✔
Accel. Adv. Clamp, Decay & Sensitivity	✘	✔	✘	✔
Dwell Time – RPM x Battery Voltage	✘	20 x 11	✘	20 x 11
Odd Fire engine capability	✔	✔	✔	✔
Rotary Ignition Split	✔	✔	✘	✘

ENGINE MANAGEMENT SYSTEMS	M4		M48	
BOOST CONTROL	Clubman	Pro	Clubman	Pro
Main Table - 20 RPM Sites	✔	✔	✔	✔
Table (3D) - RPM v Throttle/ Gear/ MAP/ Speed/ Volt	20 x 11	20 x 11	20 x 11	20 x 11
Overall Trim	✔	✔	✔	✔
Engine & Air Temperature Compensation	✔	✔	✔	✔
Auxiliary Compensations	2	2	2	2
TRIGGER SENSORS	Clubman	Pro	Clubman	Pro
Directly Compatible with most OEM trigger systems including: Hall, Magnetic and Optical types Multi-tooth (eg: Mazda and Toyota) 1 or 2 Missing Teeth (eg: Porsche) Many other special types including: Ford Narrow Tooth, Nissan optical, Harley Davidson	✔	✔	✔	✔
SENSOR INPUTS	Clubman	Pro	Clubman	Pro
Throttle Position, Manifold Pressure, Engine and Air Temperature	✔	✔	✔	✔
Auxiliary Sensor Inputs	2		2	
Digital/Speed Inputs	2		2	
AIR FUEL RATIO INPUTS	Clubman	Pro	Clubman	Pro
Narrow Band Air Fuel Ratio	✔	✔	✔	✔
Wideband Air Fuel Ratio Measurement	Opt.	Opt.	Opt.	Opt.
Number	1		1	
Range – Lambda	0.75 to 1.20		0.75 to 1.20	
Resolution – Lambda	0.01		0.01	
DATA LOGGING	Clubman	Pro	Clubman	Pro
Allows Logging of all ECU parameters	Opt.	✔	Opt.	✔
Memory Size	512KBytes		512KBytes	
Logging Rate – Sets / second	1 ~ 20		1 ~ 20	
Logging Time – 28 Par. + Diag. at 5/sec	38 minutes		38 minutes	
Interpret Software – Graphical Analysis	✔	✔	✔	✔
SPECIAL FUNCTIONS	Clubman	Pro	Clubman	Pro
Traction Control & Launch Control	✘	✔	✘	✔
Narrow Band Lambda Control	✔	✔	✔	✔
Wideband Lambda Control	✘	Opt.	✘	Opt.
Gear Change Ignition Cut	✘	✔	✘	✔
Over Run Boost Enhancement	✘	✔	✘	✔
Warning Alarms (Sensor HI / LO)	✔	✔	✔	✔
Gear Detection	✔	✔	✔	✔
Ground Speed Limiting	✘	✔	✘	✔
Dual RPM Limit	✔	✔	✔	✔
Nitrous Oxide Enrich / Retard	✔	✔	✔	✔
Air Conditioner Request	✔	✔	✔	✔
Over Run Fuel Cut	✔	✔	✔	✔
Standard Sensor Calibrations	✔	✔	✔	✔
Programmable Sensor Calibrations	✔	✔	✔	✔
RPM Limit, Hard or Soft cut, fuel and/ or ignition	✔	✔	✔	✔
	Clubman	Pro	Clubman	Pro
Number of Auxiliary	4 (3 shared)		4 (1 shared)	
Auxiliary Type - Switched / PWM	Any mix		2/2	
Auxiliary Outputs can be used for:				
Turbo Wastegate Control	✔	✔	✔	✔
Idle Speed Control	✔	✔	✔	✔
Fuel Used Control	✔	✔	✔	✔
Tacho Output	✔	✔	✔	✔
Shift Lights	✔	✔	✔	✔
Driver Warning Alarm	✔	✔	✔	✔
RPM / Load dependent device	✔	✔	✔	✔
User Definable Table (20x11) with selectable axis parameters	✔	✔	✔	✔
Slip Warning	✔	✔	✔	✔
Fuel Pump Relay	✔	✔	✔	✔
Thermatic Fan	✔	✔	✔	✔
Air Conditioner Fan and Clutch	✔	✔	✔	✔
Intercooler Spray Bars	✔	✔	✔	✔
Status Output	✔	✔	✔	✔
Alternate Injector Functions	✘	✘	✔	✔
	Clubman	Pro	Clubman	Pro
Injectors Open Circuit, Short Circuit, Peak Current not reached	✔	✔	✔	✔
Sensors Open & Short Circuit	✔	✔	✔	✔
Operating Errors: RPM Limit Exceeding, Injector overduty, Over Boost, Low Battery, REF Error etc.	✔	✔	✔	✔
	Clubman	Pro	Clubman	Pro
Allows real time monitoring & data acquisition via a telemetry link	Opt.		Opt.	

*An M4 or M48 Clubman with Advanced Tuning Upgrade enabled has the same features as the M4 or M48 Pro.

Notes: ✔ - Standard ✘ - Not available Opt - Upgrade Option must be installed to enable this feature PWM - Pulse Width Modulated output. Can also be used as switched output.

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For more information, contact your local MoTeC dealer

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