M190 ECU



MoTeC's unique M1 technology redefines the meaning of customisation, delivering total control without compromise, while highly advanced security strategies make these ECUs ideal for both category managed and unrestricted applications.

The M190 is a Port Injection ECU that offers full control for most modern engines.

LICENCING

At the time of purchase, an M1 ECU needs to be Licensed for use with a particular Package or a Development Licence.

Packages

An M1 Package is the file that is loaded into an M1 ECU. An M1 Package contains the entire ECU state including the tuning data, worksheets, security and the M1 firmware. M1 Packages themselves are opened and modified in M1 Tune.

- **GP Packages**

  MoTeC offers a suite of General Purpose Packages that allow an M1 ECU to be tuned to any number of applications. The flexibility of these GP Packages enables a tuner to configure the same ECU to very different engine setups, including those with road vehicle systems to maintain, such as air conditioning.

  GP Packages are available in variants such as Advanced, Race, Paddle shift and Direct Injection.

- **Targeted Packages**
  - **Public Packages**

    These are Packages specifically developed in-house by MoTeC engineers for a particular engine or vehicle. In some cases this includes integration with vehicle control systems beyond the engine, for example, stability control and cruise control.

    For some targeted applications, the M1 ECU is available in a complete Plug-In Kit which includes any additional hardware that may be required.

  - **Partner Packages**

    These are Packages developed by a MoTeC Partner Developer. It may be based on a Public Package with unique features added by the developer to offer a specific solution.

    MoTeC support staff will not provide assistance for these Packages, it will be provided by the Partner.

  - **Category Packages**

    These are Packages developed in-house by MoTeC engineers written specifically for the category, limiting the functionality to the class requirements.

Development Licence

When an M1 ECU is teamed with a Development Licence, it allows users to develop unique control strategies, or make modifications to existing M1 Packages. Using M1 Build software, experienced code writers can tailor the functionality of a single ECU or create a Partner Package for ongoing sales.

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BASIC SPECIFICATIONS

Injector

- Peak and Hold or Saturated Injector Outputs: 12
- Max Peak / Hold Current: 12 A / 4 A
- Low Side Injector Outputs*: 12

Ignition

- Low Side Ignition Outputs*: 12

** Unused ignition outputs can be used for other functions like cam or boost control solenoid operation*

Auxiliary Outputs

- Half Bridge Output: 10
- Low Side Auxiliary Output: 6

Inputs

- Universal Digital Input: 12
- Digital Input: 4
- Analogue Voltage Input: 17
- Analogue Temperature Input: 6
- Narrowband Lambda: 2
- Knock: 4

Data

- CAN Bus / RS232 / LIN: 3 / 1 / 1
- Logging Memory: 250 MB

Physical

- Dimensions: 162 x 127.5 x 40.5 mm
- Weight: 510 g
- Connector: 2 x 55 pin + 1 x 26 pin Autosport

Electrical

- Supply Voltage - Normal Operation: 8 V to 32 V
- Typical no-load supply current: 0.34 A at 13.8 V supply

SECURITY

The M1's advanced security system is based on public-key cryptography - the cornerstone of secure internet transactions - so it is virtually impossible to change the ECU function without authorised permission. Security is enforced by the ECU and protected by a microprocessor with integrated measures to prevent tampering.

A password feature grants different levels of access for different users, e.g. an engine tuner, a drive train tuner and a data analysis engineer. This is also suitable for Control ECU applications. Scrutineering teams can be given access to extra information and are able to lock down selected parts of the ECU, while other team members can be granted access to selected tuning parameters.

FEATURES

- Small and light in robust magnesium enclosure
- High-specification Autosport connectors
- Latest generation high performance processor
- Suitable for modern engines with DBW, Cam Control and multiple CAN buses
- Robust and comprehensive security features
- Flexible tuning software
- Programmable injector drive characteristics
- Programmable digital inputs for Ref/Sync, wheel speeds etc.
- Programmable trigger levels and diagnostics
- All Low Side and Half Bridge outputs have PWM capability
- With Logging Level 3 enabled:
  - Advanced logging features, high speed, multiple logs (with access logins)
  - Logging sets can be partitioned with access logins granting different information for different users from the same device. For example judicial (scrutineering) and team member access

UPGRADES

Logging Upgrades

There are three Logging Licence levels. The level determines the number of channels and sample rates available. Logging Level 1 Licence is diagnostic logging, which comes standard with the product, and includes a fixed log set and sample rates.

- **Logging Level 2 Licence:** This optional upgrade includes 2 log sets, up to 200 channels (including Level 1 diagnostics logging) and a maximum 200 Hz sample rate.
- **Logging Level 3 Licence:** This optional upgrade includes 8 log sets, up to 2000 channels (including Level 1 diagnostics logging) and a maximum 1000 Hz sample rate.

Pro Analysis

This optional upgrade to the professional version of **i2** data analysis software provides advanced mathematics, multiple overlay laps, and unlimited components, workbooks and worksheets.

SOFTWARE

Microsoft Windows™ based software:

- **M1 Tune**: PC Tuning software used to tune fuel and ignition, and set up sensors, outputs and available functions.
- **M1 Build**: PC software used to create a custom software Package with user specific functions.

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WIRING AND CONNECTING

Communication (UI)

User communication with the ECU requires an Ethernet connection. A cable providing an Ethernet plug and suitable pin termination for the M1 mating connector can be purchased from MoTeC Dealers.

Inputs

Maximum voltage in inputs not resulting in damage: -30 V to 35 V

Outputs

Maximum current on outputs:

- Low Side Injector outputs: max 3.5 A, RMS 2 A
- Half Bridge outputs: Low Side 12 A, High Side 9 A, RMS 4 A

Wire Gauges

- **Battery**
  - Bat_Pos: all pins should be connected with AWG20, AWG18, or AWG16 wire to a switched battery supply
  - Bat_Neg: all pins should be connected with AWG20, AWG18, or AWG16 wire to a chassis ground or battery negative terminal. 'Star' distribution should be employed to ensure that no ECU ground currents are mixed with actuator ground currents
  - Recommended minimum supply wiring: 3x Bat_Pos, 4x Bat_Neg
  - Max supply voltage 35 V
- **Outputs**

  Depending on the current draw for some outputs, a minimum wire gauge is recommended for safe operation:
  - Low Side Ignition, Peak Hold Injector, Low Side Injector outputs: AWG20 (ideally) and AWG22 (optional)
  - Half Bridge and Full Bridge outputs: these outputs may be used to drive low side actuators, throttle servos, and direct injection pumps. Wire size should be chosen to suit the current requirements of the actuator device. For example, throttle servos and direct injection pumps should use AWG18 or AWG20 wiring
  - Half Bridge or Peak Hold Injector outputs provide internal recirculation circuitry, whereas all Low Side outputs do not. In applications where camshaft solenoids and other inductive devices cannot be driven from outputs with internal recirculation circuitry, external recirculation by means of a diode can be installed to prevent slow turn-off of some devices

For further wiring recommendations, contact your local MoTeC representative or MoTeC support (*support@motec.com.au*).

M190 PINOUT

M190 Connector A — 55 way

Mating Connector: Autosport 55 way Yellow - (Deutsch) AS6-16-35SA – MoTeC #65031

Pin Number	Designation	Full Name	OE Pin	Function	Description
A01	INJ_LS3	Low Side Injector 3			
A02	INJ_LS2	Low Side Injector 2			
A03	INJ_LS1	Low Side Injector 1			
A04	INJ_LS12	Low Side Injector 12			
A05	INJ_LS4	Low Side Injector 4			
A06	LA_NB2	Lambda Narrow Input 2			
A07	LA_NB1	Lambda Narrow Input 1			
A08	SEN_5V0_C1	Sensor 5.0V C			
A09	SEN_5V0_C2	Sensor 5.0V C			
A10	INJ_LS8	Low Side Injector 8			
A11	INJ_PH1	Peak Hold Injector 1			
A12	INJ_PH2	Peak Hold Injector 2			
A13	AV11	Analogue Voltage Input 11			
A14	DIG2	Digital Input 2			
A15	RS232_RX	RS232 Receive			
A16	SEN_5V0_C3	Sensor 5.0V C			
A17	INJ_LS11	Low Side Injector 11			
A18	SEN_0V_C1	Sensor 0V C			
A19	SEN_0V_C2	Sensor 0V C			
A20	SEN_0V_C3	Sensor 0V C			
A21	DIG1	Digital Input 1			
A22	LIN	LIN Bus			
A23	RS232_TX	RS232 Transmit			
A24	CAN2_HI	CAN Bus 2 High			
A25	INJ_LS7	Low Side Injector 7			
A26	INJ_PH3	Peak Hold Injector 3			
A27	AV15	Analogue Voltage Input 15			
A28	AV16	Analogue Voltage Input 16			
A29	AV17	Analogue Voltage Input 17			
A30	DIG3	Digital Input 3			
A31	CAN2_LO	CAN Bus 2 Low			
A32	INJ_LS10	Low Side Injector 10			
A33	INJ_PH4	Peak Hold Injector 4			
A34	AV13	Analogue Voltage Input 13			

Pin Number	Designation	Full Name	OE Pin	Function	Description
A35	AV12	Analogue Voltage Input 12			
A36	INJ_PH7	Peak Hold Injector 7			
A37	DIG4	Digital Input 4			
A38	BAT_BAK	Battery Backup			
A39	CAN3_HI	CAN Bus 3 High			
A40	INJ_LS6	Low Side Injector 6			
A41	AV14	Analogue Voltage Input 14			
A42	INJ_PH9	Peak Hold Injector 9			
A43	INJ_PH10	Peak Hold Injector 10			
A44	INJ_PH6	Peak Hold Injector 6			
A45	INJ_PH5	Peak Hold Injector 5			
A46	CAN3_LO	CAN Bus 3 Low			
A47	INJ_LS9	Low Side Injector 9			
A48	INJ_LS5	Low Side Injector 5			
A49	INJ_PH11	Peak Hold Injector 11			
A50	INJ_PH12	Peak Hold Injector 12			
A51	INJ_PH8	Peak Hold Injector 8			
A52	IGN_LS12	Low Side Ignition 12			
A53	IGN_LS9	Low Side Ignition 9			
A54	IGN_LS10	Low Side Ignition 10			
A55	IGN_LS11	Low Side Ignition 11			

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M190 Connector B — 26 way

Mating Connector: Autosport 26 way Red - (Deutsch) AS6-16-26SN – MoTeC #65034

Pin Number	Designation	Full Name	OE Pin	Function	Description
B_A	OUT_HB1	Half Bridge Output 1			
B_B	OUT_HB2	Half Bridge Output 2			
B_C	OUT_HB3	Half Bridge Output 3			
B_D	OUT_HB4	Half Bridge Output 4			
B_E	OUT_HB5	Half Bridge Output 5			
B_F	OUT_HB6	Half Bridge Output 6			
B_G	BAT_NEG1	Battery Negative			
B_H	BAT_POS1	Battery Positive			
B_J	BAT_POS2	Battery Positive			
B_K	BAT_POS3	Battery Positive			
B_L	BAT_POS4	Battery Positive			
B_M	OUT_HB10	Half Bridge Output 10			
B_N	OUT_HB9	Half Bridge Output 9			
B_P	OUT_HB8	Half Bridge Output 8			
B_R	OUT_HB7	Half Bridge Output 7			
B_S	OUT_LS4	Low Side Output 4			
B_T	OUT_LS6	Low Side Output 6			
B_U	OUT_LS1	Low Side Output 1			
B_V	OUT_LS2	Low Side Output 2			
B_W	BAT_NEG2	Battery Negative			
B_X	BAT_NEG3	Battery Negative			
B_Y	BAT_NEG4	Battery Negative			
B_Z	BAT_NEG5	Battery Negative			
B_a	OUT_LS5	Low Side Output 5			
B_b	OUT_LS3	Low Side Output 3			
B_c	BAT_NEG6	Battery Negative			

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M190 Connector C — 55 way

Mating Connector: Autosport 55 way Red - (Deutsch) AS6-16-35SN – MoTeC #68090

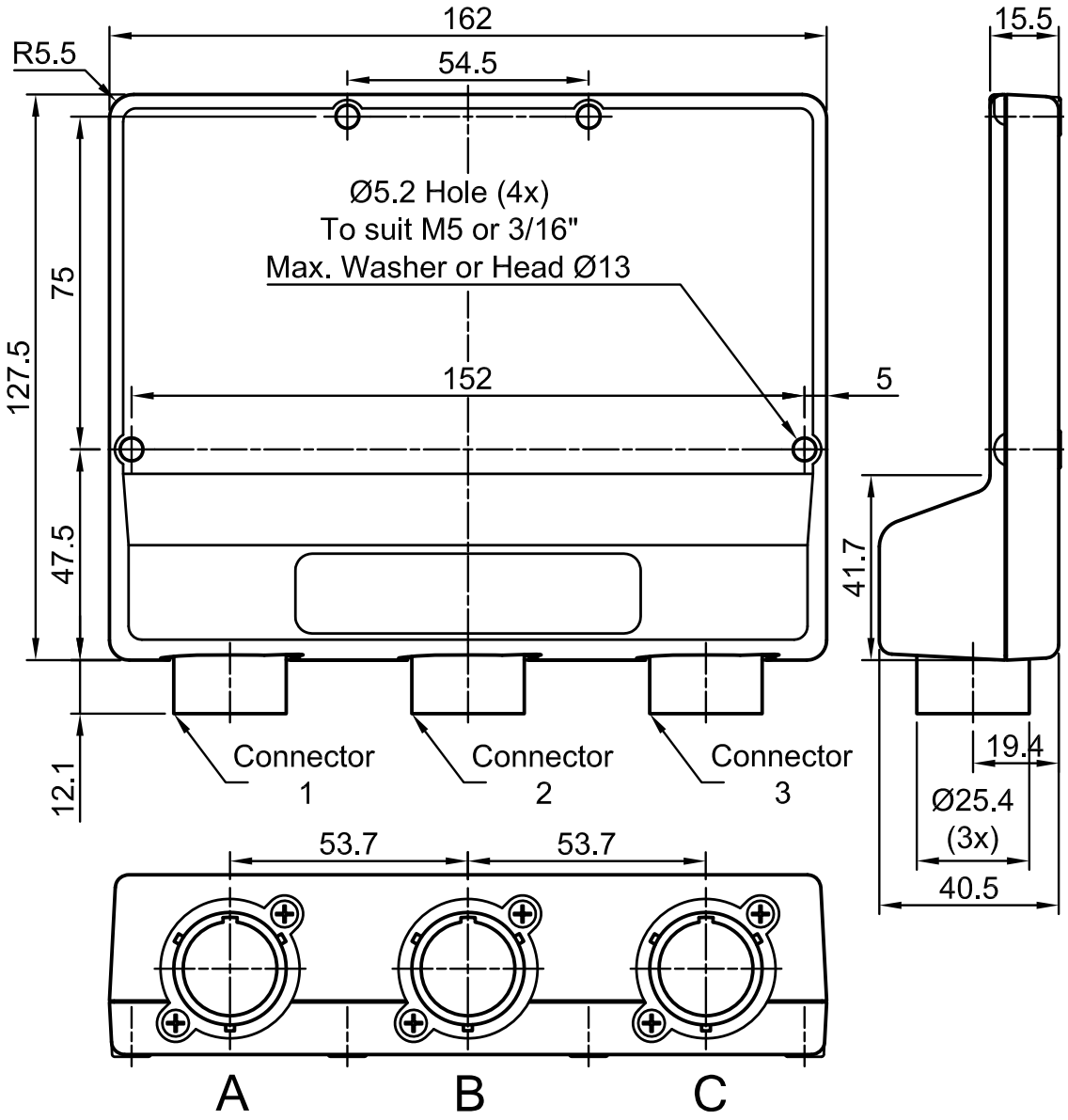
Pin Number	Designation	Full Name	OE Pin	Function	Description
C01	IGN_LS4	Low Side Ignition 4			
C02	IGN_LS3	Low Side Ignition 3			
C03	IGN_LS8	Low Side Ignition 8			
C04	IGN_LS6	Low Side Ignition 6			
C05	IGN_LS5	Low Side Ignition 5			
C06	AV8	Analogue Voltage Input 8			
C07	AV10	Analogue Voltage Input 10			
C08	IGN_LS2	Low Side Ignition 2			
C09	IGN_LS7	Low Side Ignition 7			
C10	UDIG8	Universal Digital Input 8			
C11	AV6	Analogue Voltage Input 6			
C12	AV7	Analogue Voltage Input 7			
C13	AV9	Analogue Voltage Input 9			
C14	SEN_0V_A1	Sensor 0V A			
C15	SEN_0V_A2	Sensor 0V A			
C16	IGN_LS1	Low Side Ignition 1			
C17	UDIG7	Universal Digital Input 7			
C18	UDIG1	Universal Digital Input 1			
C19	UDIG12	Universal Digital Input 12			
C20	UDIG11	Universal Digital Input 11			
C21	UDIG10	Universal Digital Input 10			
C22	UDIG9	Universal Digital Input 9			
C23	SEN_0V_B1	Sensor 0V B			
C24	CAN1_HI	CAN Bus 1 High			
C25	UDIG3	Universal Digital Input 3			
C26	ETH_RX-	Ethernet Receive-	Ethernet Orange		
C27	UDIG4	Universal Digital Input 4			
C28	AV4	Analogue Voltage Input 4			
C29	AV5	Analogue Voltage Input 5			
C30	SEN_0V_B2	Sensor 0V B			
C31	CAN1_LO	CAN Bus 1 Low			
C32	UDIG2	Universal Digital Input 2			
C33	ETH_RX+	Ethernet Receive+	Ethernet Orange/White		
C34	ETH_TX-	Ethernet Transmit-	Ethernet Green		
C35	AV3	Analogue Voltage Input 3			

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Pin Number	Designation	Full Name	OE Pin	Function	Description
C36	AV2	Analogue Voltage Input 2			
C37	AT1	Analogue Temperature Input 1		1k Pull up to SEN_5V_A	
C38	AT3	Analogue Temperature Input 3		1k Pull up to SEN_5V_B	
C39	AT2	Analogue Temperature Input 2		1k Pull up to SEN_5V_A	
C40	UDIG5	Universal Digital Input 5			
C41	ETH_TX+	Ethernet Transmit+	Ethernet Green/White		
C42	AV1	Analogue Voltage Input 1			
C43	KNOCK3	Knock Input 3			
C44	KNOCK2	Knock Input 2			
C45	AT5	Analogue Temperature Input 5		1k Pull up to SEN_5V_C	
C46	AT4	Analogue Temperature Input 4		1k Pull up to SEN_5V_B	
C47	UDIG6	Universal Digital Input 6			
C48	SEN_5V0_A1	Sensor 5.0V A			
C49	KNOCK4	Knock Input 4			
C50	SEN_5V0_B1	Sensor 5.0V B			
C51	KNOCK1	Knock Input 1			
C52	AT6	Analogue Temperature Input 6		1k Pull up to SEN_5V_C	
C53	SEN_5V0_A2	Sensor 5.0V A			
C54	SEN_6V3	Sensor 6.3V			
C55	SEN_5V0_B2	Sensor 5.0V B			

DIMENSIONS AND MOUNTING

Measurements in mm.



Mounting

The product provides through holes for mounting. See drawing for details. The recommended mounting torque value is 5 Nm. The torque value must not exceed 5.5 Nm.

PRODUCT INFORMATION

Compliances

M1 ECUs are designed for use in a vehicle. As such, this product complies with the following standards:

- CISPR 22 Edition 6 (2008): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
- Directive 2011/65/EU: RoHS (Restriction of the Use of Certain Hazardous Substances in Electronic & Electrical Equipment)

Installation

IP Rating (dust or water ingress)

This product should be installed in a protected location where only occasional water splashing occurs and where the exposure to dust does not exceed conditions typical for vehicle installations.

Operating Temperature Range

This product is designed for an internal operating temperature range of -40 °C to 85 °C.

It should be installed in a location with sufficient air circulation and be shielded against thermal emissions from surrounding components.

Vibration Statement

This product is designed to withstand vibrations typical for normal vehicle installations.

It should not be exposed to severe and lasting vibrations. For example, the product should not be installed in solid connection to vibrating components like engines or undamped vehicle structures.

Safety

- For safe operation, use only undamaged.
- Minimal force should be exerted to plug in connectors.
- These devices may output voltages which may constitute a risk to human safety. Appropriate precautions must be taken:
  - At no time operate the device with faulty, bare or exposed wiring.
  - Adhere to the normal supply voltage limits as listed in the **Basic Specifications** section
  - Adhere to wire gauges as listed in **Wiring and Connecting**.

Repair

Do not attempt to open and/or repair the device.

For repairs, contact your local MoTeC representative and return the product via an Authorised MoTeC Dealer.

Disposal



This product should be disposed of in accordance with relevant national regulations for disposal of electronic waste.
It does not contain hazardous materials which might be subject to specific materials regulations.

Manufacturer Information

MoTeC Pty. Ltd.
121 Merrindale Drive,
Croydon South,
VIC 3136, Australia.
Phone: +61 3 9761 5050
Fax: +61 3 9761 5051
Website: *www.motec.com.au*
Email: *admin@motec.com.au*