M130EV VEHICLE CONTROL UNIT

MoTeC's M1 VCU range begins a new era in EV/HEV control. The M1's unique technology redefines the meaning of customisation, delivering a total control solution for both EV and HEV applications.

Highly advanced security strategies make these VCUs ideal for category managed and unrestricted applications.

FEATURES

- Small and light in robust magnesium enclosure
- Latest generation high performance processor
- Multiple I/Os suitable for EV/HEV applications
- Large logging memory (up to 120 MB)
- Advanced logging features, high speed, multiple logs (with access logins)
- Suitable for EV/HEV supervisory control applications
- I/O expansion using E816/E888 expanders
- Flexible calibrating/tuning software
- Robust and comprehensive security features
- Programmable engine fuel injectors and ignition coil drives suitable for HEV application
- Programmable digital inputs for Ref/Sync (HEV), wheel speeds etc.
- Programmable voltage trigger levels and diagnostics
- All High Side and Low Side outputs have PWM capability.

M1 VCU EV SOLUTIONS

MoTeC offers numerous M1 solutions with varying levels of adaptability and customisation.

Targeted Solutions

The VCU firmware is configured to a specific vehicle or engine. In some cases this includes integration with vehicle control systems beyond the engine, e.g. stability control and cruise control.

Development Solutions

Users familiar with the coding environment can develop fully customised control strategies at the firmware level, creating unique VCU functionality for their EV/HEV or for other customers. In either instance, the resulting firmware can be loaded into a single Development VCU or rolled out for customers around the world to purchase.

Ruggedised

Sometimes an extra level of protection for electronic components is required, such as marine applications or environments subject to dirt or dust. Our Ruggedised M1 hardware ensures maximum longevity under these extreme conditions.

SOFTWARE

- Microsoft Windows™ based software
- **M1 Tune**: PC Tuning software used to tune and calibrate sensors, outputs and available functions.
- **M1 Build**: PC Software used to create a custom software Package with user specific functions.

SECURITY

The M1's advanced security system is based on public-key cryptography - the cornerstone of secure internet transactions - making it virtually impossible to change the VCU function without authorised permission.

Security is enforced by the VCU and protected by a microprocessor with integrated measures to prevent tampering.

A password feature grants different levels of access for different users, e.g. battery management engineer, drive train tuner and data analysist.

This feature is also suitable for motorsport category applications, where scrutineering teams can be authorised to access extensive information and lock down selected parts of the VCU, while other team members' access can be limited to specific parameters.

MOTORSPORT CATEGORY MANAGEMENT

The combination of advanced security strategies, configurable firmware and a high performance processor make the M1 VCU an ideal choice for motorsport categories with restrictions in place for either performance parity or cost containment.

Firmware can be written specifically for the category, limiting the functionality to the class requirements.

Multiple data logging sets are available, which can be partitioned with restricted access to allow generation of both judicial (scrutineering) and team data from the same device. The M1 VCU's security system prevents unauthorised access to data and implementation of unspecified functionality.

UPGRADES

Various logging options are available.

The Logging Licence determines the number of channels and sample rates available. There are three Licence levels:

- **Logging Level 1 Licence**

  This diagnostic logging, which comes standard with the product, includes a fixed log set and sample rates.

- **Logging Level 2 Licence**

  This optional upgrade includes one fixed log set, 200 channels (including diagnostics) and a maximum 200 Hz sample rate.

- **Logging Level 3 Licence**

  This optional upgrade includes 8 fixed log sets, 2000 channels and a maximum 1000 Hz sample rate.

BASIC SPECIFICATIONS

Outputs

- High Side Outputs: 6
  - 6 x 9 A - PWM 1 kHz
- Low Side Outputs: 24 - PWM 20 kHz
  - 6 x 12 A
  - 2 x 2 A
  - 8 x 2 A - Programmable current source
  - 8 x 2 A - Programmable set peak and hold current drive plus diagnostics
- Sensor Supply: 3
  - 2 x 5 V Sensor supply
  - 1 x 6.3 V Sensor supply

Inputs

- Universal Digital: 7 - PWM Input
- Analogue Voltage: 10
- Analogue Temperature: 4

Data

- CAN Bus: 1 (125, 250, 500, 1000 kbits/s)
- Logging Memory: 120 Mb

Physical

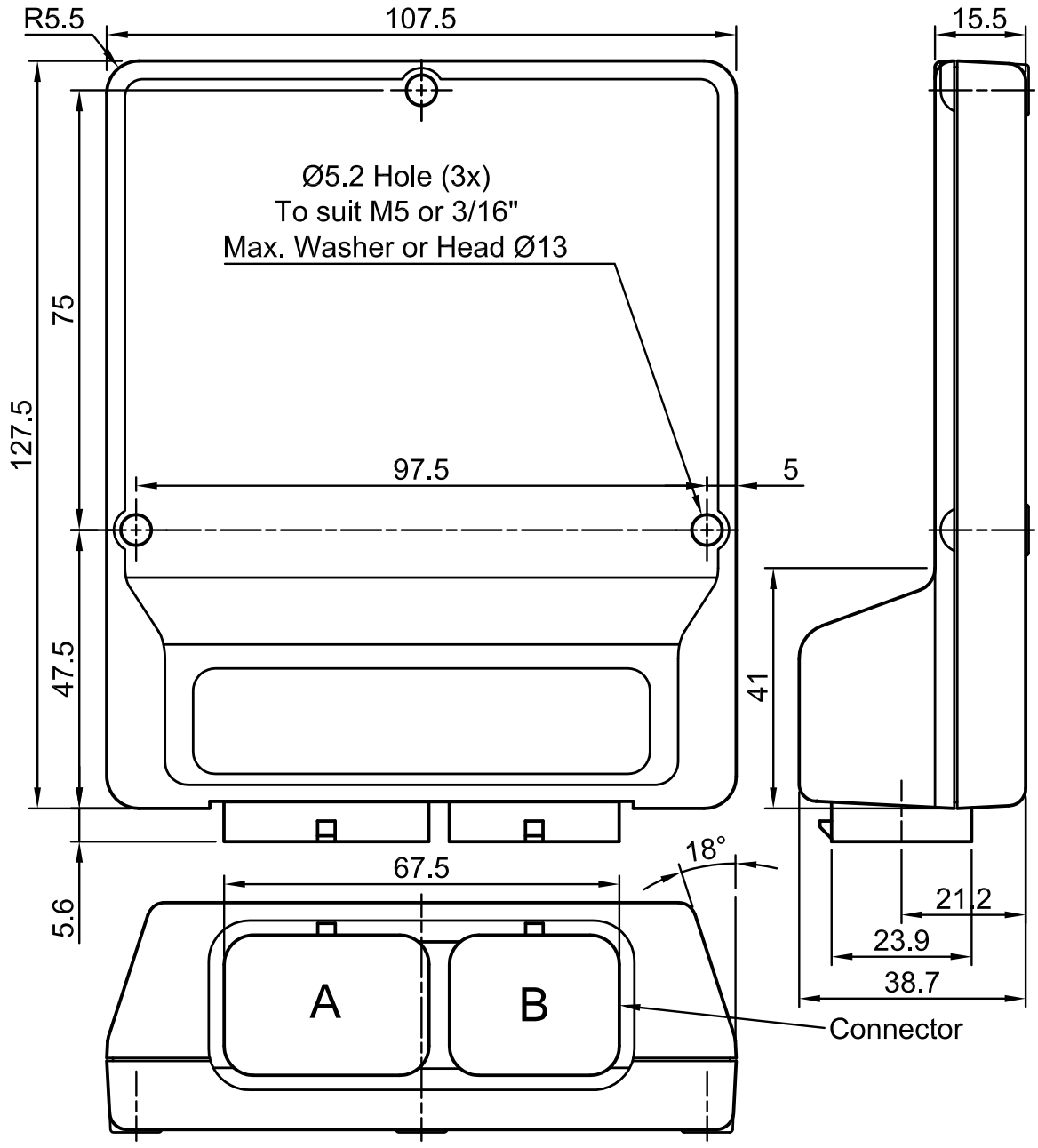
- Dimensions: 107.5 x 127.5 x 38.7 mm
- Weight: 300 g
- Connectors:
  - 1 x 34 pin plastic connector
  - 1 x 26 pin plastic connector

Electrical

- Supply Voltage - Normal Operation: 8 V to 32 V
- Supply Voltage - Maximum: 35 V
- Recommended minimum supply wiring: 1x BAT_POS, 2x BAT_NEG, AWG20

DIMENSIONS AND MOUNTING

Measurements in mm.



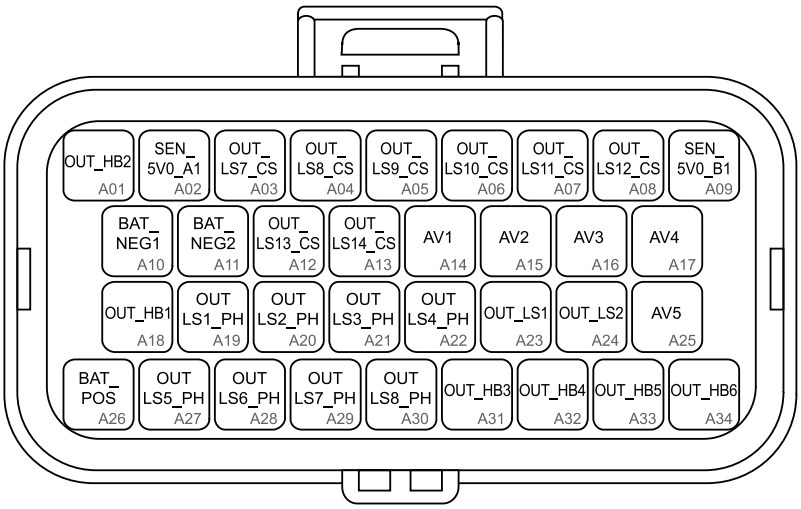
M130E PINOUT

Pin	Designation	Full Name	Function	Description
B03	AT1	Analogue Temperature Input 1	Fixed 1k Pull Up to SEN_5V	Supports resistive type temperature sensors
B04	AT2	Analogue Temperature Input 2		
B05	AT3	Analogue Temperature Input 3		
B06	AT4	Analogue Temperature Input 4		
A14	AV1	Analogue Voltage Input 1	0 V – 6.0975 V in (12 bit ADC)	Supports absolute and ratiometric measurement
A15	AV2	Analogue Voltage Input 2	Fixed 100K Pull Down	
A16	AV3	Analogue Voltage Input 3		
A17	AV4	Analogue Voltage Input 4		
A25	AV5	Analogue Voltage Input 5		
B20	AV6	Analogue Voltage Input 6		
B21	AV7	Analogue Voltage Input 7		
B22	AV8	Analogue Voltage Input 8		
B07	AV9	Analogue Voltage Input 9	-0.562 V – 5.562 Vmax (12 bit ADC)	Suitable to be used for knock detection in HEV applications
B13	AV10	Analogue Voltage Input 10	Fixed Pull Up/Down	
B01	UDIG1	Universal Digital Input 1	-10.6 V – 11.4 V (10 bits ADC)	Suitable for hall/optical and magnetic sensors
B02	UDIG2	Universal Digital Input 2	Vmax: 200 V, 70 Vrms	
B08	UDIG3	Universal Digital Input 3	PWM: 1 Microsec pulse width measurement resolution	
B09	UDIG4	Universal Digital Input 4		
B10	UDIG5	Universal Digital Input 5	Programmable 3k3 Pull Up to 5 V	
B11	UDIG6	Universal Digital Input 6	Programmable trigger and hysteresis voltages	
B14	UDIG7	Universal Digital Input 7	Programmable digital filtering	
A18	OUT_HB1	Half Bridge Output 1	Programmable High Side or Low Side Outputs	Two Half Bridge outputs could operate as Full Bridge Output
A01	OUT_HB2	Half Bridge Output 2	9 A High Side Output	Voltage measurement
A31	OUT_HB3	Half Bridge Output 3	PWM High Side: 0 – 1 kHz	
A32	OUT_HB4	Half Bridge Output 4	12 A Low Side Output	
A33	OUT_HB5	Half Bridge Output 5	PWM Low Side: 0 – 20 kHz	
A34	OUT_HB6	Half Bridge Output 6		
A23	OUT_LS1	Low Side Output 1	2 A Low Side Output	Suitable for permanently powered loads
A24	OUT_LS2	Low Side Output 2	Pulse current 3.5 A	Voltage measurement (12 bits ADC)
			Vmax: 40 V	
			PWM: 0 – 20 kHz	

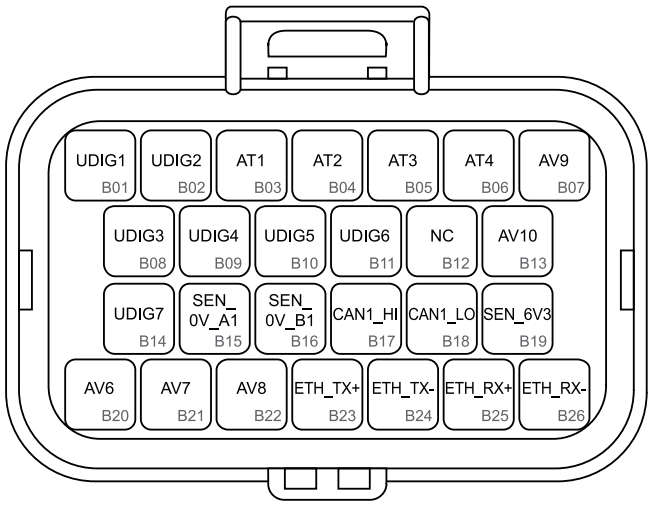
Pin	Designation	Full Name	Function	Description
A03	OUT_LS7_CS	Low Side Output 7	2 A Low Side Output	Suitable to drive an ignition coil igniter in HEV applications
A04	OUT_LS8_CS	Low Side Output 8	Pulse current 3.5 A	Suitable to directly drive transistors
A05	OUT_LS9_CS	Low Side Output 9	Vmax: 40 V	Voltage measurement (12 bits ADC)
A06	OUT_LS10_CS	Low Side Output 10	PWM: 0 – 20 kHz	
A07	OUT_LS11_CS	Low Side Output 11	0 – 40 mA programmable current source	
A08	OUT_LS12_CS	Low Side Output 12		
A12	OUT_LS13_CS	Low Side Output 13		
A13	OUT_LS14_CS	Low Side Output 14		
A19	OUT_LS1_PH	Low Side Output 19	2 A Low Side Output	Suitable to drive fuel injectors in HEVs
A20	OUT_LS2_PH	Low Side Output 20	PWM: 0 – 20 kHz	Suitable to drive inductive coils such as relays, contactors
A21	OUT_LS3_PH	Low Side Output 21	Vmax: 40 V	Voltage measurement (12 bits ADC)
A22	OUT_LS4_PH	Low Side Output 22	Imax: 12 A	Diagnostics for Short, Open and High Impedance
A27	OUT_LS5_PH	Low Side Output 23	Programmable set peak and hold current drive	
A28	OUT_LS6_PH	Low Side Output 24		
A29	OUT_LS7_PH	Low Side Output 25		
A30	OUT_LS8_PH	Low Side Output 26		
A02	SEN_5V0_A1	Sensor 5.0V A	5 V Sensor Supply Positive	Voltage measurement
B15	SEN_0V_A1	Sensor 0V A	Sensor Supply Ground	Internally connected
A09	SEN_5V0_B1	Sensor 5.0V B	5 V Sensor Supply Positive	Voltage measurement
B16	SEN_0V_B1	Sensor 0V B	Sensor Supply Ground	Internally connected
B19	SEN_6V3	Sensor 6.3V	6.3 V Sensor Supply Positive	Voltage measurement
B17	CAN1_HI	CAN Bus 1 High		
B18	CAN1_LO	CAN Bus 1 Low		
B26	ETH_RX-	Ethernet Receive -	Programming the VCU	
B25	ETH_RX+	Ethernet Receive +		
B24	ETH_TX-	Ethernet Transmit -		
B23	ETH_TX+	Ethernet Transmit +		
A26	BAT_POS	Battery Positive	8 – 32 Vin	Voltage measurement
A10	BAT_NEG	Battery Negative		
A11	BAT_NEG	Battery Negative		

M130EV CONNECTORS

Pin designation when looking into the VCU.



CONNECTOR A
Tyco Superseal 34 Position Keying 2 - MoTeC #65044



CONNECTOR B
Tyco Superseal 26 Position Keying 3 - MoTeC #65045