

KPERFORMANCE SM3+ ECU Module User Manual

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SM3+ ECU r1.5b User Manual Kperformance

SM3+ ECU User manual

Software, drivers and latest info can be downloaded at

www.Kperformance.be



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Introduction

Congratulations buying the SM3 ECU. The circuit is based on Megasquirt 3. It was refined build 100% AEC-Q100 compliant and IP65 grade! A KPerformance Wideband Lambda Controller is also part of the SM3 ECU. A Bosch LSU 4.9 sensor can be connected directly without the need to buy a extra controller.

Included in Delivery

- SM3 ECU
- USB cable pre-crimped
- User manual
- ECU Connector pins and cover

Software

Recommended free tuning software TUNERSTUDIO and/or Megalog viewer.

USB Driver

The onboard FTDI chip simulates a serial RS232 connection:

Tunerstudio – Communications – Settings:

USB and Wireless (registered Version), Auto , 115200 Baud

Data Connections

Our SM3 is smart, it will automatic revert to master USB connection as soon as the USB cable is plugged in! Without USB connection it will switch to Bluetooth(if installed).

OnBoard Bluetooth (optional)

Its Pre-configured and ready to use simulating a serial RS232 connection.

Name: SM3+ with pin: 1234 or 0000

USB Port

The USB port of the SM3 is equipped with 8kV ESD protection of VBUS and Data lines. The data chip and ESD protection is "USB powered". This fact simplifies the optimization of the start-up behaviour significantly when you restart the ignition, the PC wont download the USB driver each time. The USB chip is of course downwards compatible, which means it can be used both with USB 3.0, 2.0 and 1. To achieve maximum water tightness IP65 grade, we pre-crimp the USB on to the ECU connector.

Fuses

Recommended input fuse for protecting the SM3 :

-3A slow blow single lambda

-5A slow blow dual lambda

A automated 5A PTC SMD fuse is integrated on the board. It will reset itself after cooling down/solving issue or short circuit.

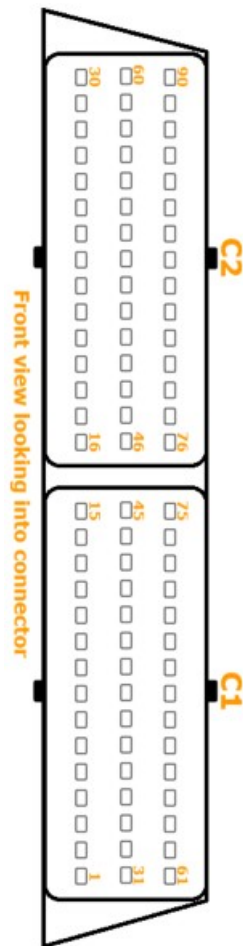
Electrical connections

Like all other voltage supplied parts – must be preceded by a fuse in function of cable section.
Recommended cable types:

- Ignition: min 1.5 mm²
- Injection: min 1.5 mm²
- VR sensor: min 0.5 mm²
- Shielded Sensors: min 0.35 mm²
- Others: min 0.35 mm²

Internal LED's functions

LED Label	Color	Function
LD2	GREEN	5V power supply
LD3	GREEN	O2 controller standby/power
LD4	RED	O2 controller heating/measuring
LD5	GREEN	USB Data packets
LD6	RED	USB Data packets
LDA	RED	Ignition pulse A
LDB	RED	Ignition pulse B
LDC	RED	Ignition pulse C
LDD	RED	Ignition pulse D
LDE	RED	Ignition pulse E
LDF	RED	Ignition pulse F

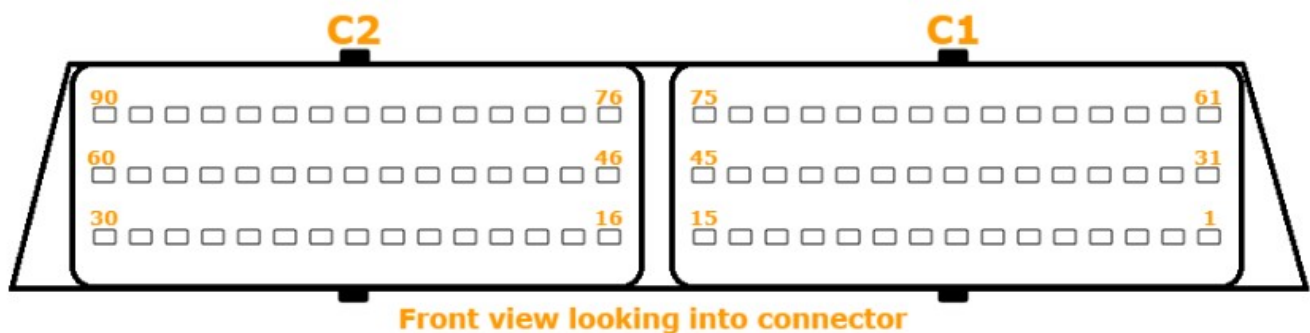


Pin	Pin Label	Function
1	High Power IGN A	Ignition output Passive A
2	High Power IGN D	Ignition output Passive D
3	INJ output F	Injection valve F
4	TTL level IGN A1	Ignition output Smart A
5	TTL level IGN D1	Ignition output Smart D
6	IGN GND	Ignition Ground separately
7	INJ output E	Injection valve E
8	Engine GND	Engine/Main Ground
9	Power input	Input Voltage 8-16V
10	Power input	Input Voltage 8-16V
11	Power input	Input Voltage 8-16V
12	VR-2P	VR2 positive/CAM Input
13	VR-2N	VR2 negative input
14	VR-1P	VR1 positive/CRANK Input
15	VR-1N	VR1 negative input
16	CAN H	CANBUS HIGH input

17	CAN L	CANBUS LOW input
18	CLT	Coolant sensor input
19	MAT	Air Temp sensor input
20	MAP	MAP sensor input
21	TPS	Throttle sensor input
22	Additional LSU4.9	Additional LSU4.9 GREEN
23	Additional LSU4.9	Additional LSU4.9 BLACK
24	Additional LSU4.9	Additional LSU4.9 RED
25	Additional LSU4.9	Additional LSU4.9 YELLOW
26	Additional LSU4.9	Additional LSU4.9 WHITE
27	EGO2	Analog OXY bank 2 input
28	+5V	+5V Power Supply Sensors
29	+5V	+5V Power Supply Sensors
30	+12V Power Supply LSU4.9	LSU4.9's GREY
31	High Power IGN B	Ignition output Passive B
32	High Power IGN E	Ignition output Passive E
33	INJ output D	Injection valve D
34	TTL level IGN B1	Ignition output Smart B
35	TTL level IGN E1	Ignition output Smart E
36	IGN GND	Ignition Ground separately
37	INJ output C	Injection valve C
38	GND	Spare Ground
39	AIN0/Ext MAP	Programmable Analog Input
40	AIN1/Flex	Programmable Analog input
41	GPO1/PT4	Programmable Output 1A
42	DIN6/PT6/DataLog in	Digital Input
43	AIN3/AD7	Programmable Analog Input
44	AIN2/JS12	Programmable Analog Input
45	DIN1/NitroIN	Programmable Digital Input
46	Knock1	Knock Sensor1 input
47	Knock GND	Common Knock Ground
48	Knock2	Knock Sensor2 input
49	GPO2/PP1	Programmable Output 1A

50	GPO3/PP0	Programmable Output 1A
51	GPO8/Idle	Programmable Output 1A
52	Onboard LSU4.9	LSU4.9 GREEN
53	Onboard LSU4.9	LSU4.9 BLACK
54	Onboard LSU4.9	LSU4.9 RED
55	Onboard LSU4.9	LSU4.9 YELLOW
56	Onboard LSU4.9	LSU4.9 WHITE
57	EGO1	Analog OXY bank 1 input
58	GND	Spare Ground
59	EGT1+	K-type Thermocouple
60	EGT1-	K-type Thermocouple
61	High Power IGN C	Ignition output Passive C
62	High Power IGN F	Ignition output Passive F
63	INJ output B	Injection valve B
64	TTL level IGN C1	Ignition output Smart C
65	TTL level IGN F1	Ignition output Smart F
66	IGN GND	Ignition Ground separately
67	INJ output A	Injection valve A
68	GND	Spare Ground
69	DIN2/JS7	Programmable Digital Input
70	GPO7/VTT	Programmable Output 2A
71	DIN3/TBL	Programmable Digital Input
72	1k Sensor Pull-Up 5V	Pull Up Output
73	1k Sensor Pull-Up 5V	Pull Up Output
74	DIN4/Launch	Programmable Digital Input
75	PT5	!!Direct CPU pin!!
76	VBUS	External USB Connection Red
77	DPUSB	External USB Connection Green
78	GNDUSB	External USB Connection Black
79	DMUSB	External USB Connection White
80	GPO12/PT1	Programmable Output 1A
81	GPO4/Boost	Programmable Output 1A
82	GPO5/Tacho	Programmable Output 1A

83	GPO2/Nitro2	Programmable Output 2A
84	GPO3/Nitro1	Programmable Output 2A
85	GPO11/PK7	Programmable Output 1A
86	IDLO	Idle Valve Open
87	IDLC	Idle Valve Close
88	GPO9/IAC2	Programmable Output 2A
89	GPO10/IAC1	Programmable Output 2A
90	FP	Fuel Pump relay Output



Pin numbering is also marked on both plastic connectors

-Spare "Power Input" pins can also be used to power low current devices as HALL, Boost, Idle -valves, LSU4,9's etc

-Direct CPU pins have no safety nor short circuit protection!

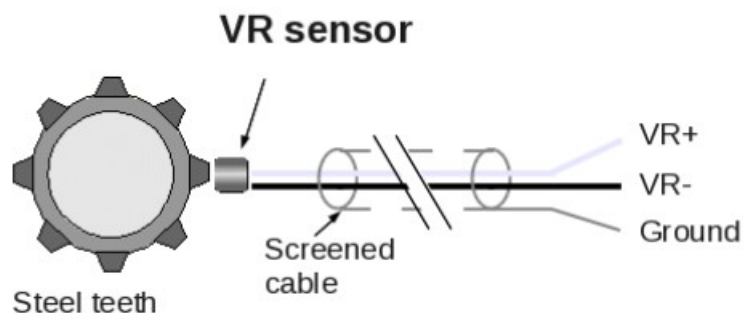
Be careful using these pins.

Pulling down to ground is safest way to use any digital input

Engine Speed Measurement

VR sensors inputs:

- CRANK: VR-1N&VR-1P
- CAM: VR-2N&VR-2P

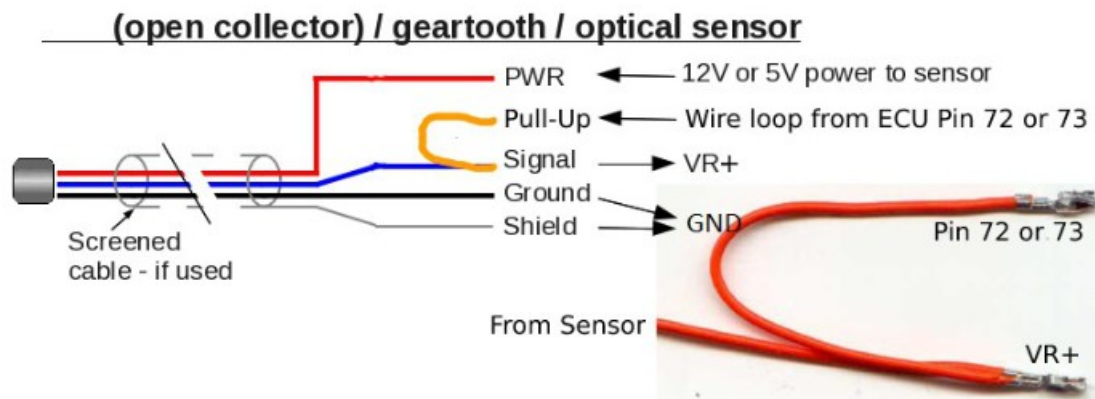


Rising Edge is most accurate for VR-type sensor !

Very hot VR signals: only connect VR positive inputs.

Hall & Optical inputs:

- CRANK: VR-1P
- CAM: VR-2P



!Leave VR-1N & VR-2N floating (do not connect)

Signal Pull-Up: wire loop (see image above)

Throttle Position Sensor

The throttle potentiometer is connected up by a 3-wire cable. +5V and GND are connected to the outer static pins of the potentiometer. The corresponding calibration is done under TunerStudio via

“Tools” – “Calibrate TPS”

Temp Sensor Inputs (CLT+IAT)

This sensor measures the temperature of the engine coolant (or cylinder head for air-cooled engines.) It is primarily used to provide additional fuel during engine warm-up.

One wire connects to ground, the other to the CLT/IAT input on the ECU. One-wire sensors are not recommended.

Common sensor presets available under TunerStudio!

Digital Input

There are digital inputs(DIN) that can be used for example as “Launch Control”. The corresponding function has to be defined in Tunerstudio. Preferable use Ground activated.

Never connect more than 5V on any input!

Analog Input

There are analog inputs(AIN) that can be user programmed The corresponding function has to be defined in Tunerstudio. Additional pressure, Flex, temp sensors can all be connected.

Never connect more than 5V on any input

Programmable Output

There are General Purpose Outputs(GPO) that can be user programmed and have to be defined in Tunerstudio.

Idle Speed Controller (Fidle)

The SM3 supports both the 2-pin and the 3-pin idle speed valves.

Pin connections of the idle speed control:

2-pin: +12V & FDLO

3-pin: +12V & FDLO (open) & FDLC (closed)

The FDLO & FDLC are automatic inverted on the PCB, use Fidle control under TunerStudio,

Ignition

The ignition coils can be activated directly by the integrated power drivers. We recommend using a shielded multiconductor cable . The SM3 is equipped with 6 power drivers enabling sequential activation of 6 passive ignition coils or 12 in wasted spark. We designed the outputs so it's possible to trigger 6 Passive coils OR 6 smart coils by using the correct ECU connector output pins!

- 6x Passive Coils Power Ignition outputs (Ground Activated Coils)

- 6x Smart Coils Ignition Outputs (5V TTL Activated Coils)

Do not connect/use both Ignition methods at the same time!

Spare un-used Ignition outputs, can be used as additional programmable outputs.

TTL level outputs = smart coils

High Power IGN outputs = passive coils

Passive coils NEED atleast 2x IGN GND pins(6-36-66) to be connected directly to a good high current capable ground.

Ex Chassis,Engine,battery etc

SM3 firing sequence ABCDEF,please wire accordingly We prefer active coils to keep high feedback voltages out of the SM3 ECU! 12V powering of coils and injectors is done by relays, PMU, switches etc ,never via the ECU pins!

Injection

There are 6 injector outputs (INJ1-6) ; The injection valves are supplied with +12 V via the ignition switch and the ground side of the injectors are activated via the SM3 ECU.

Attention: The setting whether the injection valves are of high or of low resistance has to be entered in Basic Settings” – “Injector Characteristics” strictly before the first test run because wrong settings can cause destruction of the injection valves and/or the SM3.

Starting values (no guarantee):

High impedance:

PWM Current Limit (%): 100

PWM Time Threshold (ms): 25.5

Low impedance:

PWM Current Limit (%): 30

PWM Time Threshold (ms): 1.5

SM3 firing sequence ABCDEF,please wire accordingly 12V powering of coils and injectors is done by relays, PMU, switches etc ,never via the ECU pins!

Onboard Wideband Lambda Controller (Optional Dual)

A Bosch LSU 4.9 sensor can be connected directly without the need to buy a further controller. (connect according onboard LSU4.9 pin numbers)

Calibration data TUNERSTUDIO custom linear wideband:

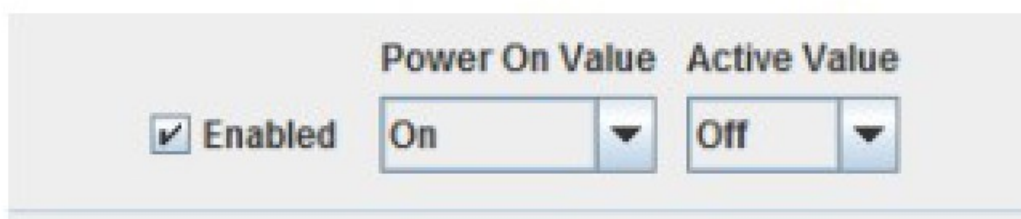
0V = Lambda 10.20 = AFR 22.35

4V = Lambda 0.650 = AFR 9.50

Starting of the Lambda controller is done by

software grounding selecting :

Output “Ignition G/O2controller” if necessary with optional customer requirements settings.



Not grounding the output will result in standby lambda controller(s).

Onboard Knock

The knock IC uses a purpose designed dual knock sensing amplifier chip to filter knock signals. Inputs Knock1 & Knock GND & Knock2

Onboard Baro


The SM3 is equipped with an onboard barometric MPX6115 sensor.

Input Spare ADC13/Baro Onboard EGT The EGT IC uses a purpose designed amplifier chip to filter Ktype sensor signals and uses “EGT/AD6 input” selectable via tunerStudio.

Optional pre-crimped K-thermocouple connection kit available CAN Bus Like for MegaSquirt the CAN Bus hardware is populated on the board, but has to be setup accordingly by the user/hardware if desired.

Couple of CAN pre-sets are available under TunerStudio

Documents / Resources

	<p>KPERFORMANCE SM3+ ECU Module [pdf] User Manual SM3 ECU Module, SM3 ECU, Module</p>
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References

-  [KPerformance](#)