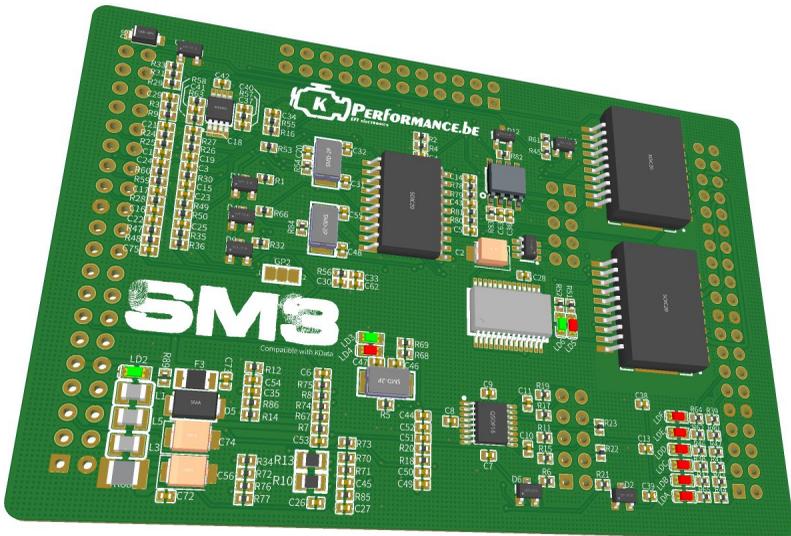




# SM3 ECU User manual

Software,drivers and latest info can be downloaded at

[www.Kperformance.be](http://www.Kperformance.be)



## Introduction

Congratulation buying the SM3. 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. 1 Bosch LSU 4.9 sensor can be connected directly without the need to buy a extra controller. Even a optional Oled-display can be connected to visual see Lambda and temp values of the sensor. (4.2 can also be connected with small resistor changes)

## Included in Delivery

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

## Software

Recommended 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*

### **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 simplifies and optimizes 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.**

### **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 mm<sup>2</sup>
- Injection: min 1.5 mm<sup>2</sup>
- VR sensor: min 0.5 mm<sup>2</sup>
- shielded Sensors: min 0.5 mm<sup>2</sup>
- Others: min 0.75 mm<sup>2</sup>

## 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.

## Onboard LED's functions

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

**Pinouts:**

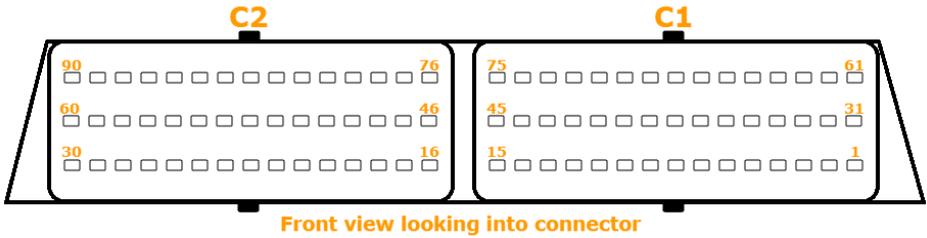
Pin Number	Pin Label	Function
1	<b>High Power IGN outputA</b>	Ignition output Passive 1
2	<b>High Power IGN outputD</b>	Ignition output Passive 4
3	<b>INJ output6</b>	Injection valve 6
4	<b>TTL level IGNA</b>	Ignition output Smart 1
5	<b>TTL level IGND</b>	Ignition output Smart 4
6	<b>GND</b>	Ground
7	<b>INJ output 5</b>	Injection valve 5
8	<b>GND</b>	Ground
9	<b>Power input</b>	Input Voltage 8-16V
10	<b>Power input</b>	Input Voltage 8-16V
11	<b>Power input</b>	Input Voltage 8-16V
12	<b>VR-2P</b>	VR2 positive/CAM Input
13	<b>VR-2N</b>	VR2 negative input
14	<b>VR-1P</b>	VR1 positive/CRANK input
15	<b>VR-1N</b>	VR1 negative input
16	<b>CAN H</b>	CANBUS HIGH input
17	<b>CAN L</b>	CANBUS LOW input
18	<b>CLT</b>	Coolant sensor input
19	<b>MAT</b>	Air Temp sensor input
20	<b>MAP</b>	MAP sensor input
21	<b>TPS</b>	Throttle sensor input
22	<b>Additional LSU4.9</b>	Additional LSU4.9 GREEN
23	<b>Additional LSU4.9</b>	Additional LSU4.9 BLACK
24	<b>Additional LSU4.9</b>	Additional LSU4.9 RED
25	<b>Additional LSU4.9</b>	Additional LSU4.9 YELLOW
26	<b>Additional LSU4.9</b>	Additional LSU4.9 WHITE
27	<b>EGO2</b>	OXY bank 2 external input
28	<b>+5V</b>	+5V Power Supply Sensors

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29	+5V	+5V Power Supply Sensors
30	<b>Power Supply LSU sensors</b>	LSU4.9's GREY 12V supply
31	<b>High Power IGN outputB</b>	Ignition output cylinder 2
32	<b>High Power IGN outputE</b>	Ignition output cylinder 5
33	<b>INJ output 4</b>	Injection valve 4
34	<b>TTL level IGNB</b>	Ignition output Smart 2
35	<b>TTL level IGNE</b>	Ignition output Smart 5
36	<b>GND</b>	Ground
37	<b>INJ output3</b>	Injection valve 3
38	<b>GND</b>	Ground
39	<b>AIN2/Ext MAP</b>	ProgrammableAnalog Input
40	<b>Flex</b>	Flex sensor input
41	<b>GPO1/PT4</b>	Programmable Output 1A
42	<b>Nitro2</b>	Programmable Output 1A
43	<b>Nitro1</b>	Programmable Output 1A
44	<b>Boost</b>	Programmable Output 2A
45	<b>Tacho</b>	Programmable Output 1A
46	<b>Knock1</b>	Knock Sensor1
47	<b>Knock GND</b>	Knock Ground
48	<b>Knock2</b>	Knock Sensor2
49	<b>NitroIN</b>	Programmable Input
50	<b>AIN2/JS12</b>	ProgrammableAnalog Input
51	<b>Launch</b>	Programmable Input
52	<b>Onboard LSU4.9</b>	LSU4.9 GREEN
53	<b>Onboard LSU4.9</b>	LSU4.9 BLACK
54	<b>Onboard LSU4.9</b>	LSU4.9 RED
55	<b>Onboard LSU4.9</b>	LSU4.9 YELLOW
56	<b>Onboard LSU4.9</b>	LSU4.9 WHITE
57	<b>EGO1</b>	OXY bank 1 external input
58	<b>GND</b>	Ground
59	<b>EGT1+</b>	K-type Thermocouple

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60	EGT1-	K-type Thermocouple
61	High Power IGN outputC	Ignition output Passive 3
62	High Power IGN outputF	Ignition output Passive 6
63	INJ output2	Injection valve 2
64	TTL level IGNC	Ignition output Smart 3
65	TTL level IGNF	Ignition output Smart 6
66	GND	Ground
67	INJ output1	Injection valve 1
68	GND	Ground
69	DIN1/JS7	Programmable DigitalInput
70	VTT	Programmable Output 2A
71	TBL	Programmable pin
72	SDA	Onboard O2 oled
73	SCL	Onboard O2 oled
74	PK3	Programmable pin <b>directCPU</b>
75	PK1	Programmable pin <b>directCPU</b>
76	VBUS	External USB Connection
77	DPUSB	External USB Connection
78	GNDUSB	External USB Connection
79	DMUSB	External USB Connection
80	GPO2/IDLE	Programmable Output 1A
81	DIN2/PT6/DataLog in	Programmable DigitalInput
82	DIN3/PT5	Programmable DigitalInput
83	AIN1/AD7	ProgrammableAnalog Input
84	AIN3/SpareADC	ProgrammableAnalog Input
85	PK7	Programmable pin <b>directCPU</b>
86	IDLO	Idle Valve Open
87	IDLC	Idle Valve Close
88	IAC2	Programmable Output 1A
89	IAC1	Programmable Output 1A
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 etc

-**DirectCPU pins have no safety nor short circuit protection!**  
Be carefull using these pins.

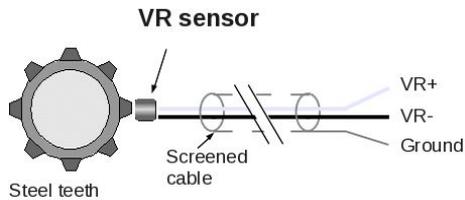
**Pulling down to ground is safest way to use any digital input**

## Engine Speed Measurement

The SM3 supports VR, Hall and Optical engine speed sensors.

### VR sensors inputs:

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

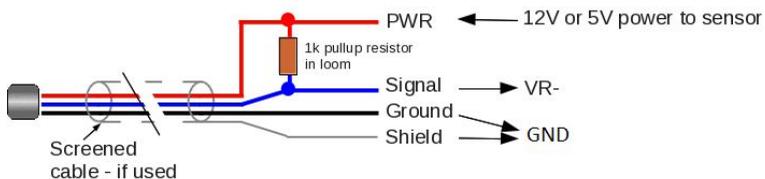


**!Rising Edge trigger is most accurate for VR-type sensor !**

### Hall & Optical inputs:

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

### (open collector) / geartooth / optical sensor



**Leave VR-1P & VR-2P floating (do not connect Positive side)**

## 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”

## Digital Input

There are digital inputs that can be used for example as “Launch Control”. The corresponding function has to be defined in Tunerstudio. Digital inputs preferably pull to ground.

**Never connect more than 5V on any input!**

## Programmable Pins

There are PINS that can be user programmed as INPUT or OUTPUT and has to be defined in Tunerstudio.

**Never connect more than 5V on any input!**

## Programmable Outputs

There are High Current GND-OUTPUTS these can be user programmed and has to be defined in Tunerstudio.

## Idle Speed Controller

The SM3 supports both the 2-pin and the 3-pin idle speed controller. Pin connections of the idle speed control:

2-pin: +12V & FDLO

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

## Ignition

The ignition coils can be activated directly by the integrated power drivers. We recommend using a shielded multi-conductor cable for connection. 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**

**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 wires 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 or of 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

**12V powering of coils and injectors is done by relays, PMU, switches etc ,never via the ECU pins!**

## Onboard Wideband Lambda Controller

A Bosch LSU 4.9 sensor can be connected directly without the need to buy a further controller. (4.2 can also be connected with 2 small resistor changes) Even an optional I2C Oled-display can be connected to visual see Lambda and temp values of the sensor. (SDA CLK 5V GND)

### Calibration data TUNERSTUDIO custom linear wideband:

**0V= AFR 22.39**

**5V= AFR 7.39**

Starting of the Lambda controller is done by software grounding selecting :

Output "Ignition G/O2controller" with is optional customer requirements settings.

	Power On Value	Active Value
<input checked="" type="checkbox"/> Enabled	On ▼	Off ▼

**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 & GND & Knock2

### **Onboard EGT**

The EGT IC uses a purpose designed amplifier chip to filter K-type sensor signals and uses AD6 input.

**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 programmed accordingly by the user if desired. For further information on this item please read the respective Megasquirt /MSextra websites.

**User Remarques and info**