



SM3+ V2 ELitE ECU

User Manual

Software,drivers and latest info can be downloaded at

www.Kperformance.be



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. Two Bosch LSU 4.9 sensors can be connected directly without the need to buy a extra controller.

Included in Delivery

- SM3+ ECU
- USB cable pre-crimped
- External GPS and Wfi Antenna
- User manual(digital)
- 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 Wifi

Its Pre-configured and ready to use TCP/IP wifi connection. Full version Tunerstudio REQUIRED

SSID: SM3+ ELite with pin: 012345678

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

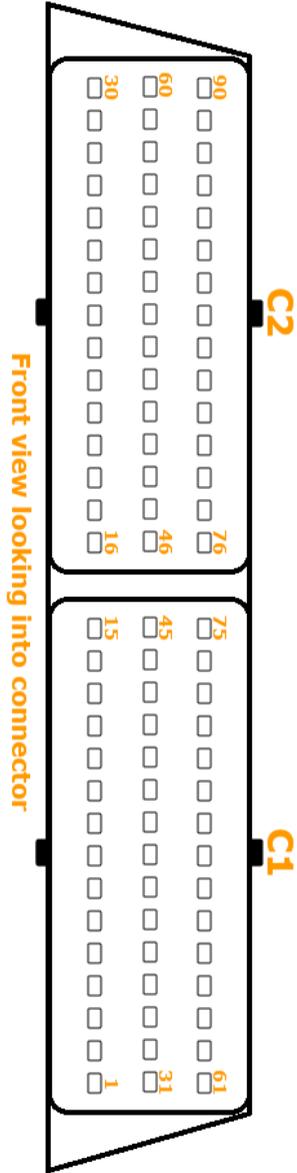
Like all other voltage supplied parts - must be preceded by a fuse in function of cable section.

Recommended cable types:

- Ignition: min 0,5 mm²
- Injection: min 1 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
LDG	RED	Ignition pulse G
LDH	RED	Ignition pulse H

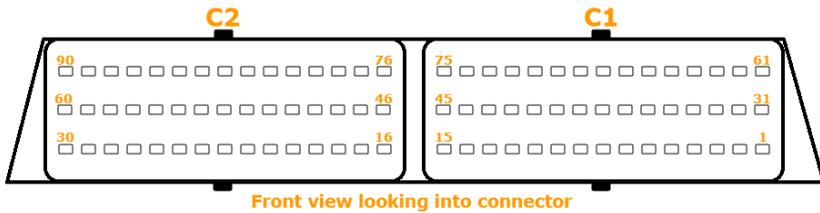


Pin	Pin Label	Function
1	VR-3N	VR2 negative Input
2	VR-3P	VR2 positive Input
3	INJ output F	Injection valve F
4	TTL level IGN A1	Ignition output Smart A
5	TTL level IGN D1	Ignition output Smart D
6	TTL level IGN G1	Ignition output Smart G
7	INJ output E	Injection valve E
8	Engine GND	Engine/Main Ground
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

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28	+5V	+5V Power Supply Sensors
29	+5V	+5V Power Supply Sensors
30	+12V Power Supply LSU4.9	LSU4.9's GREY
31	DME Relay Output	DME Relay Output
32	INJ output H	Injection valve H
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	TTL level IGN H1	Ignition output Smart H
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	DIN0/JS12-PE1	Programmable Digital Input/VR3
45	DIN1/NitroIN	Programmable Digital Input
46	Knock1	Knock Sensor1 input
47	Knock GND	Common Knock Ground 1+2
48	Knock2	Knock Sensor2 input
49	NA	NA
50	NA	NA
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	Ignition Switch Input	DME Relay Input Activation
62	INJ output G	Injection valve G
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	GND	Ground
67	INJ output A	Injection valve A
68	GND	Spare Ground
69	DIN2/JS7-PE0	Programmable Digital Input
70	GPO7/VTT	Programmable Output 2A
71	DIN3/TBL	Programmable Digital Input
72	1k Sensor Pull-Up 5V	Pull Up Output (Pg10)
73	1k Sensor Pull-Up 5V	Pull Up Output(Pg10)
74	DIN4/Launch	Programmable Digital Input
75	NA	NA
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	NA	NA
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

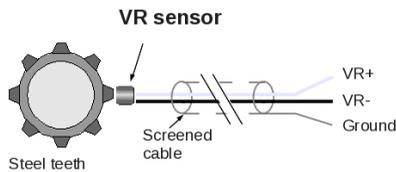
-**DirectCPU pins have no safety nor short circuit protection!**
Be careful using these pins.

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
- Additional Cam/ABS sensor: VR-3N&VR-3P

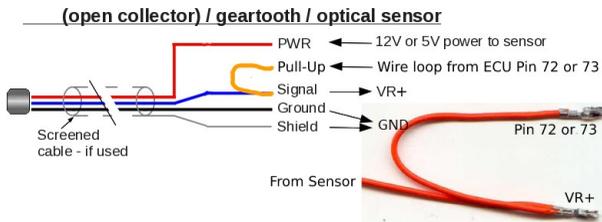


Rising Edge is most accurate for VR-type sensor !

Very hot VR signals: only connect VR positive inputs.

Hall & Optical inputs:

- CRANK: VR-1P
- CAM: VR-2P
- Additional Cam/ABS sensor: VR-3P



!Leave VR-xN floating (do not connect)!

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

Throttle Position Sensor

The throttle potentiometer is connected 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 (ON/OFF)

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 (0-5V)

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 (GND operated)

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,

Speed & Gear Sensors

The SM3 is equipped with a 3 VR conditioner,

Making it possible to read ABS,gearbox,final drive sensor etc

JS12-PE1 to be used

Ignition

The SM3 V2 **ONLY** supports **ACTIVE/SMART coils**, sequential activation of 8 ignition coils or 16 in wasted spark.

- 8x Smart Coils Ignition Outputs (5V TTL Activated Coils)

SM3 firing sequence ABCDEFGH, please wire accordingly

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 ABCDEFGH, 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

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

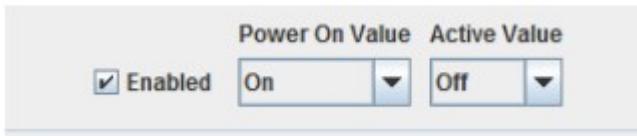
Calibration data TUNERSTUDIO custom linear wideband:

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 “PT5-JS10” 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 EGT

The EGT IC uses a purpose designed amplifier chip to filter K-type sensor signals and uses “EGT/AD6 input” selectable via tunerStudio.

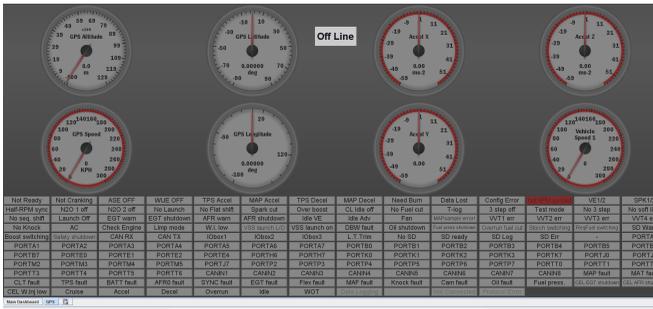
Optional pre-crimped K-thermocouple connection kit available

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.

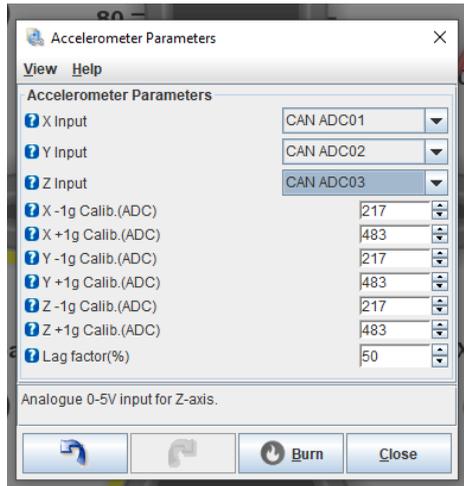
Couple of CAN pre-sets are available under TunerStudio

GPS Onboard (Settings preloaded in MSQ)



Read out of Speed,Altitude,latitude,longitude via GPS

Digital Onboard Accelerometer (Settings preloaded in MSQ)



Calibration values:

XYZ: -1G ~1000
 +1G ~3125

These calibration values should read ~9,8m/S in tunerstudio.

As 1G(gravity force) = 9.8 m/s^2

If to far off,please alter calibration:

- Position the accelerometer with the X-arrow pointing down for the first calibration point.
- Define this as -9.8 m/s^2 or -1 g . Rotate the accelerometer so the X-arrow points up and use the reading for the second calibration point.
- Define this as $+9.8 \text{ m/s}^2$ or $+1 \text{ g}$.

Do the same for all other axes.

Respect the mounting axis or adjust according your specific ECU mounting.

Problemes,question support

<https://www.kperformance.be/support>

> Knowledges

User Remarques and info