SM3+ 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. 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
- K-type thermocouple connection 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

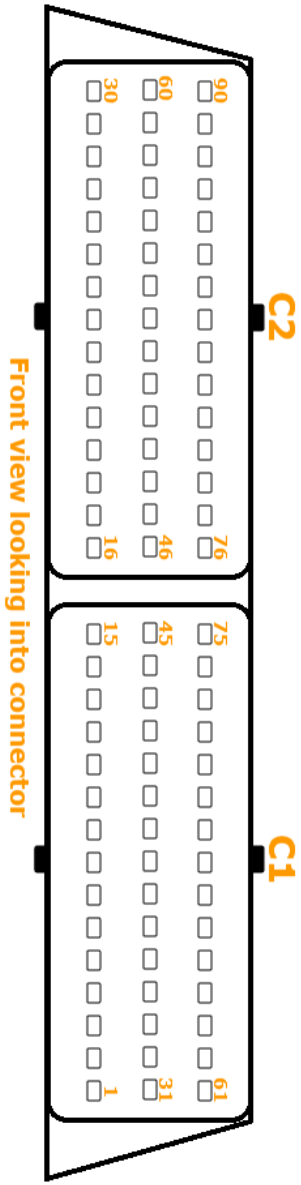
Like all other voltage supplied parts - must be preceded by a fuse in function of cable section.

Recommended cable types:

- Ignition: min 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

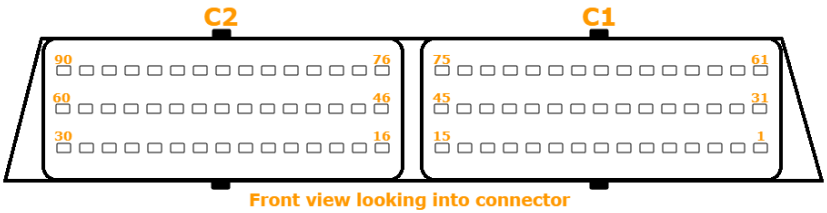
LED Label	Color	Function
LD2	GREEN	5V power supply
LD3	GREEN	O2 controller standby/power
LD4	RED	O2 controller heating/measering
LD5	GREEN	USB Data packets
LD6	RED	USB Data packets
LDA	RED	Ignition pulse A
LDB	RED	Ignition pulse B
LDC	RED	Ignition pulse C
LDD	RED	Ignition pulse D
LDE	RED	Ignition pulse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


C2
90
60
30
76
46
16
C1
75
45
15
61
31
1
Front view looking into connector

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	**DIN0/PE1**	Programmable Digital Input
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	**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-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	**DIN5/PT5**	Programmable Digital Input
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

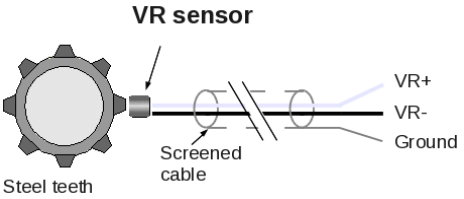
-DirectCPU pins have no safety nor short circuit protection! Be careful using these pins.

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

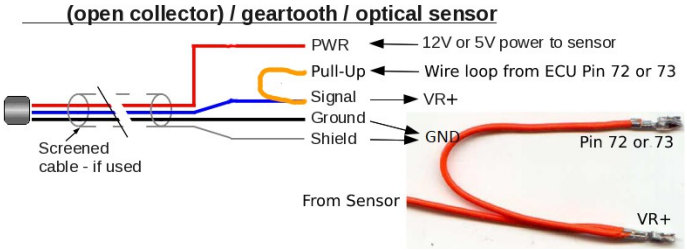


Rising Edge is most accurate for VR-type sensor !

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 (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,

Ignition

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

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

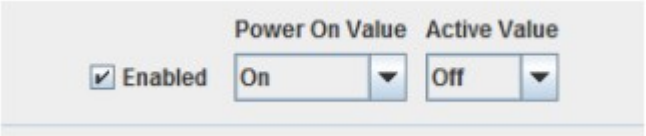
Calibration data TUNERSTUDIO custom linear wideband:

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 EGT

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

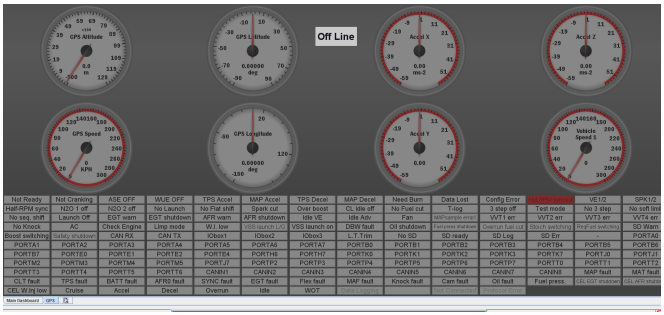
Optional pre-crimped K-thermocouple connection kit available

CAN Bus

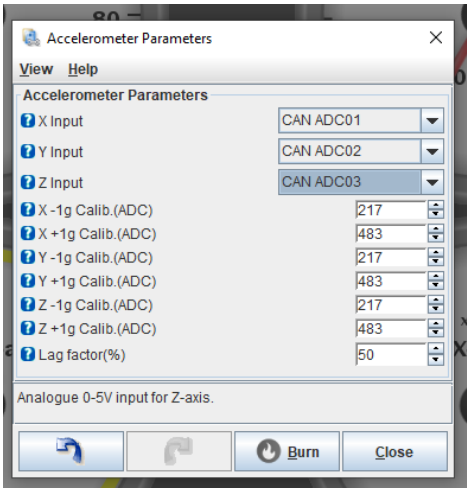
Like for MegaSquirt the CAN Bus hardware is populated on the board, but has to be setup accordingly by the user/hardware if desired.

Couple of CAN pre-sets are available under TunerStudio

GPS Onboard (Settings preloaded in MSQ)



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 m/s^2 or +1 g.

Do the same for all other axisses.

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

Problemes,question support

https://www.kperformance.be/support

> Knowledges

User Remarques and info