



E-LEAN RACE PRO DATASHEET

Rugged 6 DOF Smart Inertial
Measurement Unit for race
and custom applications

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Issue 1.1



1 GENERAL DESCRIPTION

E-LEAN RACE PRO is a full inertial measuring unit with 6 degrees of freedom and equipped with a 16bit Microcontroller with digital signal processing unit.

E-LEAN RACE PRO also makes internal estimation of the lean angle and pitch angle of the vehicle, if properly fed with vehicle speed.

E-LEAN RACE PRO is connected to the vehicle CAN BUS where it receives the vehicle speed and it transmits the accelerations signals A_x - A_y - A_z , the angular rate signals W_x - W_y - W_z , the estimation of the vehicle attitude and the diagnosis status of the hardware.

The attitude estimation is based on the most accurate state of the art algorithms of signal filtering and processing.

E-LEAN RACE PRO features a milled aluminum housing suitable for heavy duty applications.

2 E-LEAN APPLICATIONS

E-LEAN RACE PRO may be used both in two-wheeled and four wheeled vehicle applications which benefit from attitude and inertial measurements knowledge.

The main application for E-LEAN RACE PRO is telemetry.

On request, E-LEAN RACE PRO can be used for custom applications, including:

- ✓ Slide Out/Lowside identification (motorcycles)
- ✓ Rollover identification (cars)
- ✓ Traction Control and Braking Control
- ✓ Suspension Control and Stability Control
- ✓ Adaptive lighting
- ✓ Airbag-triggering
- ✓ Energy management and range prediction in electric vehicles

3 KEY FEATURES

Key Features of E-LEAN
The 6DOF and the algorithm allow orientation installation flexibility¹
Robust to vehicle vibrations up to 10g RMS, over the standard engine frequencies
The 16g accelerometer scale makes it suitable to suspension (active or semi-active) control
Automotive Compliant (regulation UN/ECE R10)
Compact dimension and weight
Fault Diagnosis and Recovery (signal coherence, over-temperature)
Temperature compensation
Rugged housing in aluminum 6082

4 TECHNICAL DATA

Technical Data	
Supply Voltage	Nominal: 12V Range: 8V..18V
Supply Current	34mA @ 12V
Protection Class	IP 67
Operating Temperature Range	-10°C ... +70°C
Storage Temperature Range	-40°C ... +85°C
Acceleration Range	Up to ±16g
Angular rate Range	Up to ±250 deg/sec
Native resolution	Accelerations: 16 bit Angular rates: 16 bit
Bandwidth (-3dB cut-off)	Roll rate: 7Hz Accelerations: 7Hz Angular Rates: 7Hz Customization available upon request
Weight	35g

¹ See Section STANDARD MOUNTING ORIENTATION for more details on positioning.

5 CAN INTERFACE

CAN INTERFACE	
Refresh rate	10ms
Baudrate	1 Mbaud (customizable)
Identifier Length	11 bit
OUPUT Identifier	Customizable
OUPUT information	Attitude angles (motorcycle applications) 3 axis accelerations 3 axis ang. Rates Fault status
INPUT Identifier	Customizable
INPUT Information	Vehicle Speed ²
Terminating Resistance	120 Ohm
Impedance to VDD and GND	4.7 kOhm

6 PINOUT

Pinout – Connector JAE MX44	
PIN No	Name
1	CAN-High
2	GND
3	Vbatt
4	CAN-Low

² Vehicle speed is mandatory for providing attitude angles in motorcycle applications.

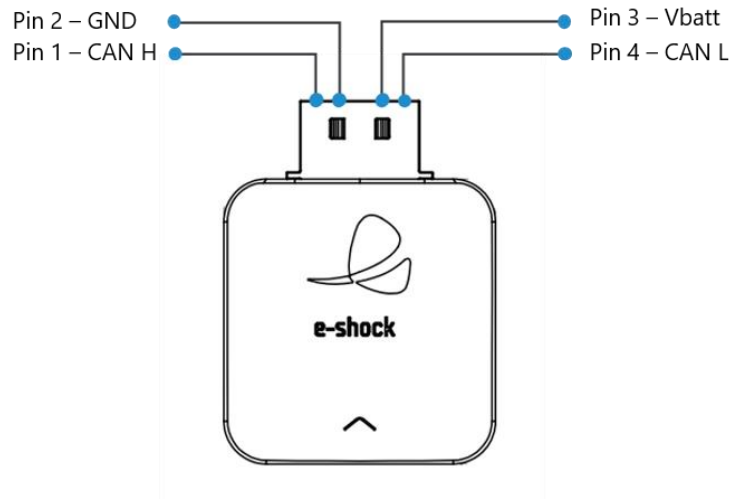


Fig. 1 Pinout illustration

7 DIMENSIONS

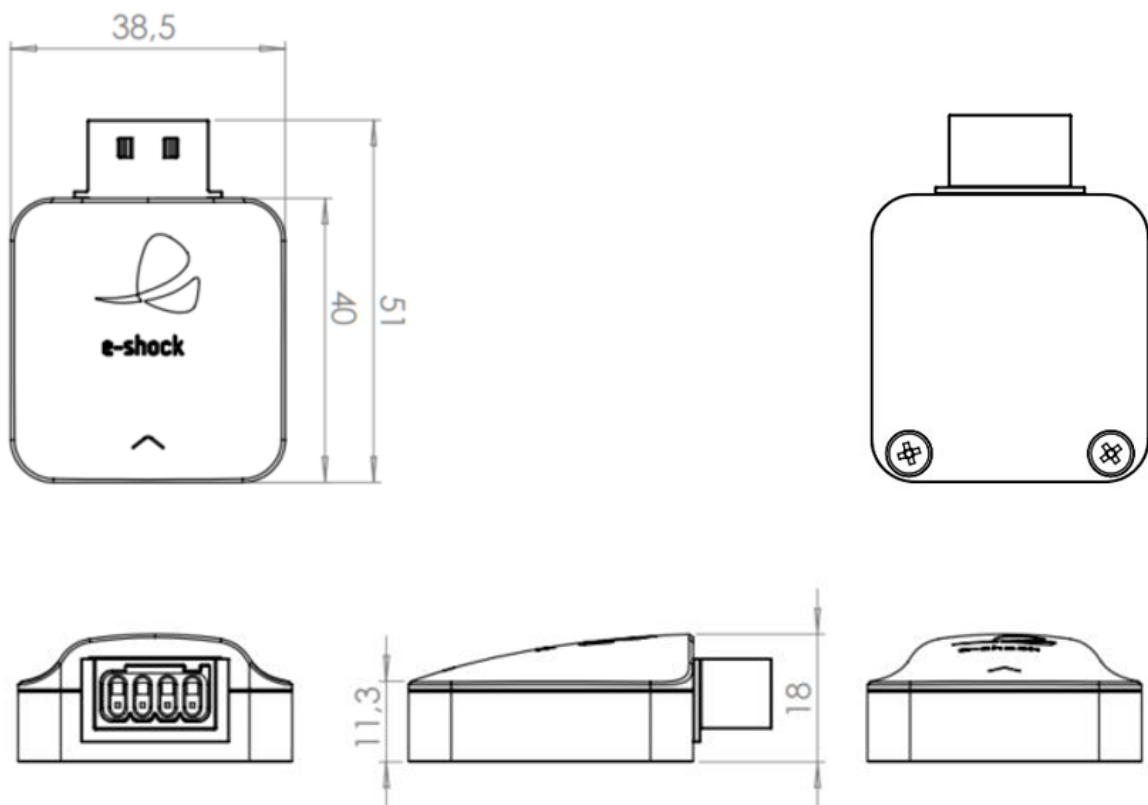


Fig. 2 Dimensions in millimeters

8 STANDARD MOUNTING ORIENTATION

E-LEAN RACE PRO standard mounting orientation is illustrated in Fig. 3.

X, Y and Z represent longitudinal, lateral and vertical axis of the vehicle respectively, according to right-handed orientation tern.

Direction symbol \wedge indicates the forward longitudinal direction of movement of the vehicle.

For standard installation, the face of the device with direction symbol \wedge must look upward.

To compensate installation tolerances up to ± 45 degrees with respect to nominal orientation, a zeroing procedure is recommended in order to get best performance from the device.

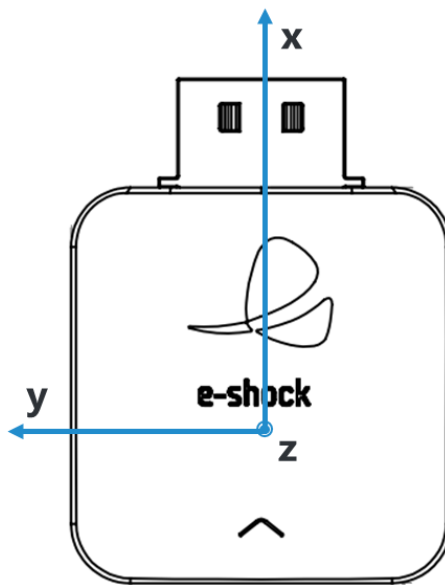


Fig. 3 Standard mounting position

Installation orientation can be customized upon request. Please refer to instruction manual provided with the prototype for correct installation.

Wrong installation or missing zeroing of the device may impact on correct functioning of roll and pitch angle estimations, when available.

9 DISCLAIMER

The prototype delivered is an experimental version of the attitude sensor for lean angle estimation "E-LEAN".

E-LEAN RACE PRO has been tested and validated in heavy duty conditions, on several motorbikes and tracks using proper technical instrumentations.

This electronic device is an object whose concept design is preliminary, it has custom and limited functionalities that could shape the final prototype.

The methodology and the production process employed to do this kind of sensor prototype are potentially different from those that could be used for the final and definitive production.

The prototype must be used only for racing applications and for the customer to verify its functional requirements.

The prototype does not have all the characteristics of completeness, robustness and scalability of a finished "automotive" product and it is not possible to force it to an intensive use.

The possible use of this prototype for experimental and / or demonstration purpose cannot and must not be confused with the marketing of a finished product.

E-Shock S.r.l. is not liable in any way and it will not provide any warranty against defects, it will not correct any malfunctions, even partial, resulting from a massive use and / or misuse of this prototype in any way.

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