



FSE2014 Energy Meter Specification

Description:

FSAE2014 Rule EV4.10 states that a calibrated energy meter has to be inserted in the tractive system supply lines to measure the energy used for calculation of the energy efficiency score, and to observe whether the power limitation of 85kW is met. The FSE2014 Energy Meter consists of a single box with 4 connectors.

The first 2 connectors are M10 copper bolts, sticking out of the top of the box. The HV- line has to be connected to these copper bolts such that the current to the motor controllers is routed through the power shunt inside the energy meter.

The third connector has to be connected to the HV+ line. It is mounted on top of the Energy Meter. The exact type and RS part number can be found in the connectors table below.

The fourth connector, shown on the left side of the Energy Meter including its mating part, has to be directly connected to the potential switched by the GLVMS. This supplies the energy meter, whenever the control system is switched on. The exact type and RS part number can be found in the connectors Table 6.



Figure 1: FSE2014 Energy Meter CAD Rendering

The energy meter box should be properly fastened and be mounted at a place, where it is protected from water.

Detailed data and information can be found in the following tables, drawings and diagrams. CAD-data is provided in the "Rules&Important Documents"-section for the FSE2014 event.

If there are any questions, please do not hesitate to write an e-mail to fse-rules@formulastudent.de



Table 1: Supply by Control System

Supply Voltage	7 - 30VDC
Power Consumption	2.0W max
Internal Fusing	None

Table 2: Data Logging

Sample Rate	250Hz
Internal Logger Capacity	16GByte
Logging Duration	200h
Data Download	WLAN IEEE802.11b/g

Table 3: Voltage Sensing

Typical Voltage Range	$\pm 600V$
Maximum Voltage (2s)	$\pm 1000V$
Sensing Principle	High-Precision Voltage Divider
Error	$\pm 0.1\%$
Offset	$\pm 50mV$
Resolution	20mV

Table 4: Current Sensing

Continuous Current	$\pm 600A$
Peak Current (1s)	$\pm 1500A$
Sensing Principle	High-Precision Power Shunt
Shunt Resistance	50 μ Ohm
Error (up to 300A)	$\pm 0.1\%$
Error (above 300A)	$\pm 1\%$
Offset (up to 300A)	$\pm 20mA$
Offset (above 300A)	$\pm 200mA$
Resolution (up to 300A)	10mA
Resolution (above 300A)	100mA

Table 5: Mechanical Parameters

Housing Dimensions	110x75x78.3mm
Weight	480gr
Vibration Resistance	Tested against automotive standards



Table 6: Connectors

HV-, Energy Meter side	Copper Bolts, M10, see HV- #1 and HV- #2 in the drawings below. MAXIMUM TIGHTENING TORQUE: 10Nm
HV-, Vehicle side	M10 ring-lugs or similar
HV+, Energy Meter side	Molex Mini-Fit Jr. 50-36-1734 RS Part Number: 670-4622 Pin 1: HV+ Pin 2: NC
HV+, Vehicle side	Molex Mini-Fit Jr. 39-01-3022 RS Part Number: 670-4569 Pin 1: HV+ Pin 2: NC
LV, Energy Meter side	Harting 21033111402 RS Part Number: 707-3737 Pin 1: V+ Pin 2: GND Pin 3: NC Pin 4: NC
LV, Vehicle side	Harting 21032122305 RS Part Number: 623-5915 Pin 1: V+ Pin 2: GND Pin 3: NC Pin 4: NC

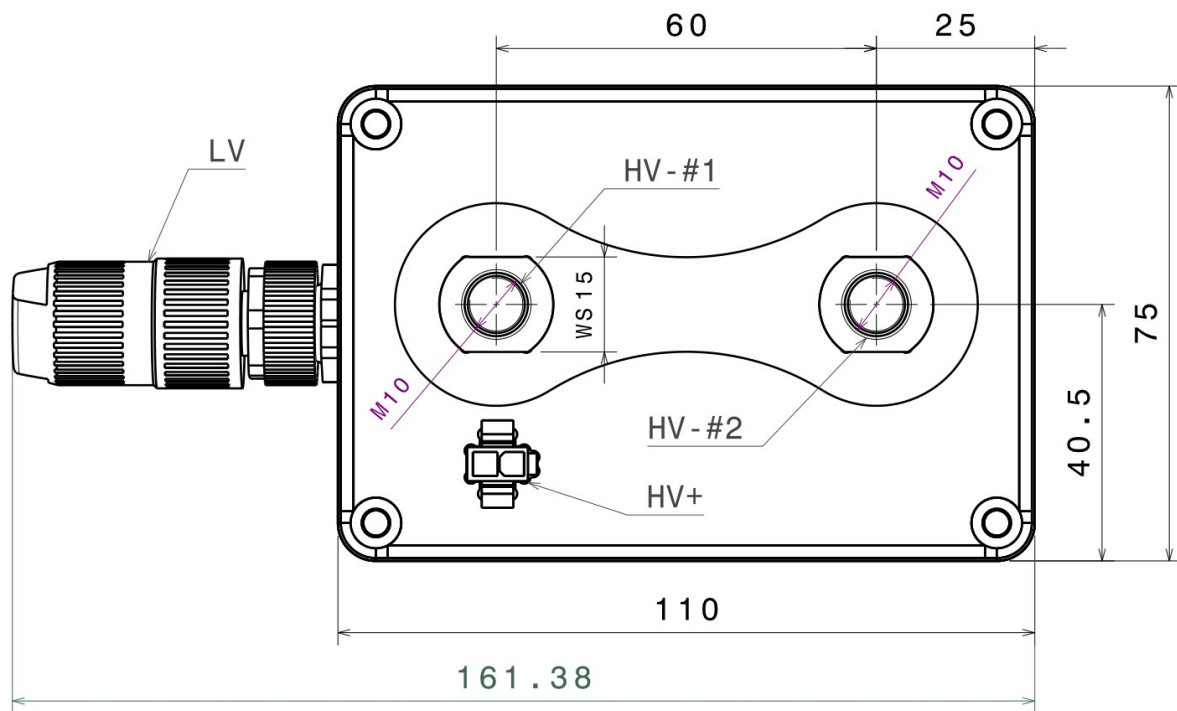


Figure 2: Energy Meter Top View (all dimensions in mm)

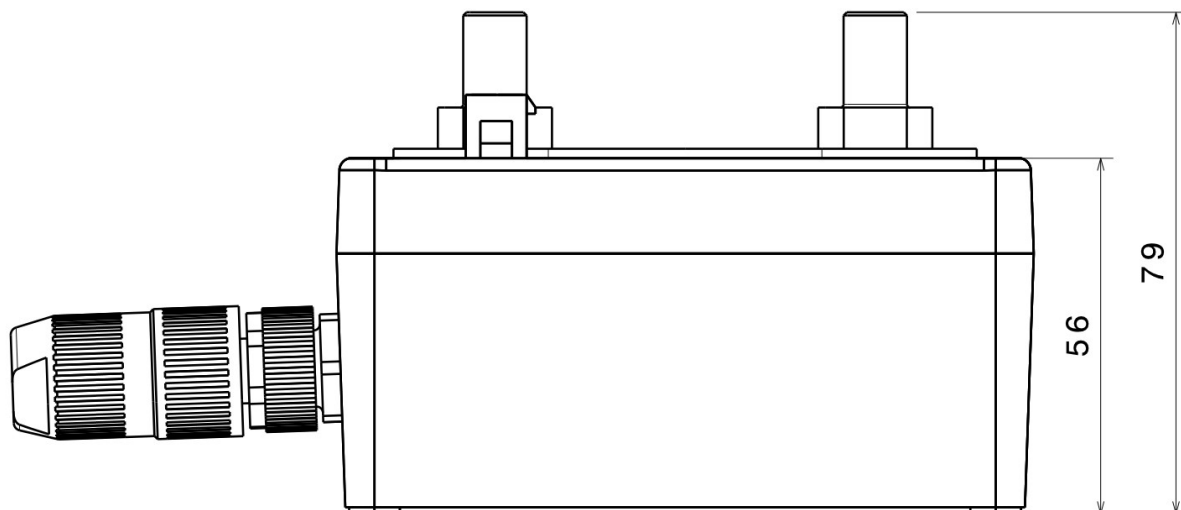


Figure 3: Energy Meter Side View (all dimensions in mm)

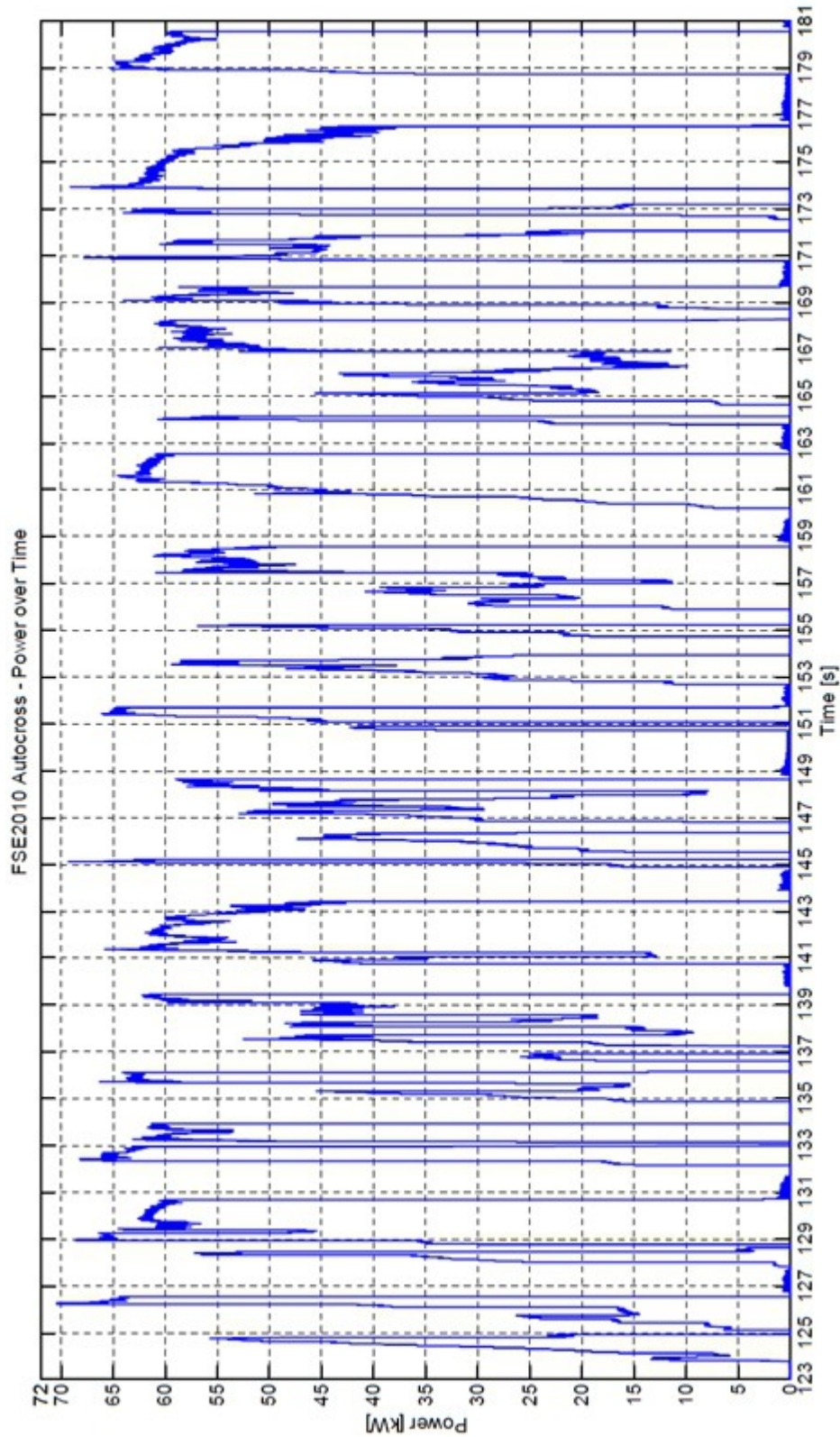


Figure 4: Example Data recorded during FSE2010



Changelog:

v1.1:

HV+ Vehicle Side and Energy Meter Side connectors were mixed up, now correct

v1.0:

Initial release