



FSE2011 Energy Meter Specification

Description:

FSE2011 Rule 7.27 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 100kW is met.

The FSE2011 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 is an Anderson Power connector which has to be connected to the HV+ line. The connector is shown with its mating part and is marked in red. It is mounted on top of the Energy Meter. A mating connector will be provided at the event for each participating team. However the exact type and RS part number can be found in the connectors table below, if a team wishes to attach the connector prior the event.

The fourth connector, shown on the left side of the Energy Meter including its mating part, has to be connected to a switched control system supply line. This supplies the energy meter, whenever the control system is switched on. A mating connector will be provided by Harting at the event for each team. However the exact type and RS part number can be found in the connectors Table 6, if a team wishes to attach the connector prior the event. You may also find the used pin configuration there.

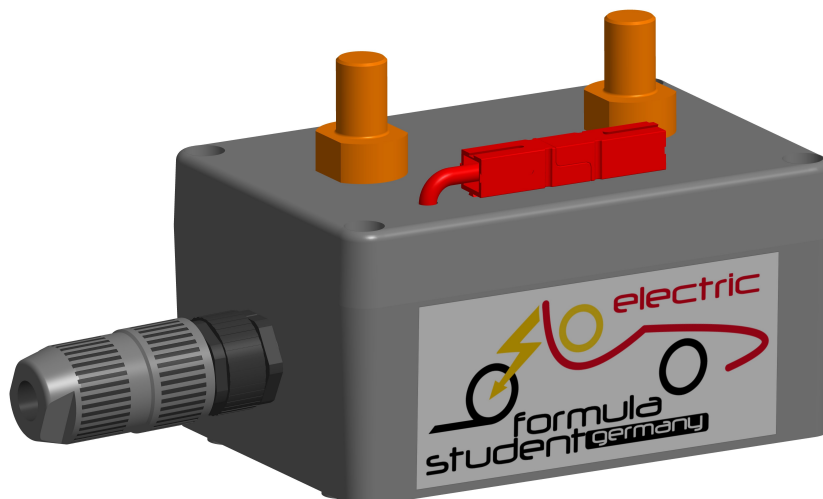


Figure 1: FSE2011 Energy Meter CAD Rendering

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 FSE2011 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

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	±600V
Maximum Voltage (2s)	±1000V
Sensing Principle	High-Precision Voltage Divider
Error	±0.1%
Offset	±50mV
Resolution	20mV

Table 4: Current Sensing

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

Table 5: Mechanical Parameters

Dimensions	110x75x78.3mm
Weight	480gr
Vibrations	Tested against automotive standards



Table 6: Connectors

HV+, Energy Meter side	Anderson Power Powerpole Connector
HV+, Vehicle side	Anderson Power Powerpole Connector, RS Part Number: 534-985 Contact RS Part Number: 534-963
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
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

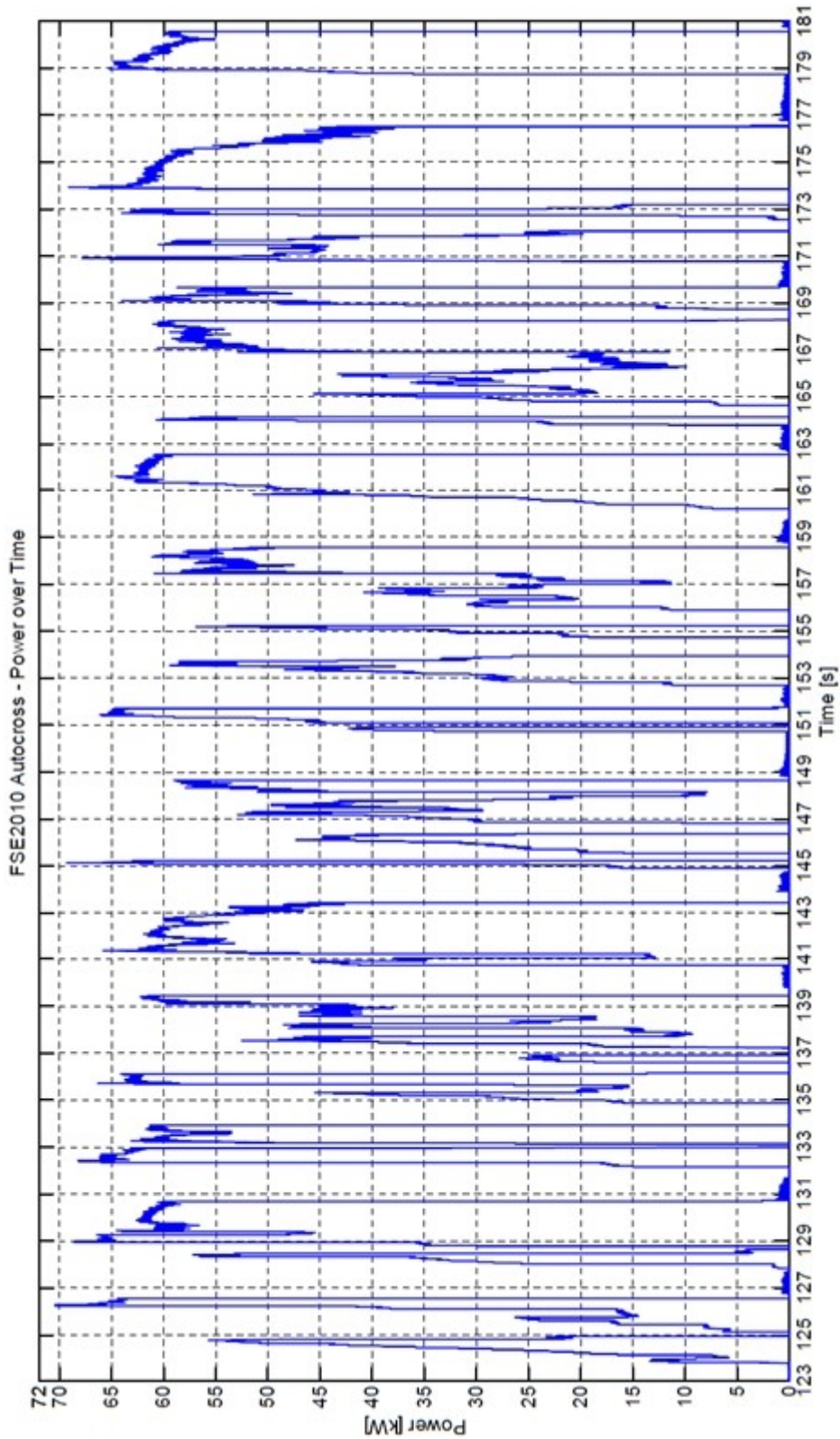


Figure 4: Example Data recorded during FSE2010



Changelog with respect to the preliminary specification:

HV+ Connector:

Changed from M8 ring lug to Anderson Power Powerpole Connector, see Table 6.

HV- Connectors:

Copper bolt dimensions changed from M8 to M10, maximum tightening torque of 10Nm specified, see Table 6.

LV Connector:

Was not specified in preliminary specification, is now Harting 21033111402 on the Energy Meter side and Harting 21032122305 on the vehicle side. Pin Configuration added, see Table 6.