



# 中国大学生方程式系列赛事能量计说明书

## Energy Meter Specification

### 介绍

为满足《中国大学生方程式系列赛事规则》第五章 2.2 条，所有参加大学生方程式-电动赛的赛车必须安装官方统一供应的能量计。本能量计将会用来测量用电电量（双向），功率（电能），电压及电流(双向)、同时将会测量车身相关动态及高 G 值加速度参数等。所有数据将会在能量计本地储存，同时上传云端实现实时监控。本能量计将会在赛前由赛事主办方提供，在赛事结束后必须返还。

### Introduction

In order to comply with the "Formula Student China Series Regulation" Chapter 5 Article 2.2 , all entry of the competition must have an official energy meter installed. The energy meter will measure the energy usage by monitoring the current(bi-directional), voltage and power of the power bus for rule violations; at the meantime, the measurements of dynamics and high-G acceleration will be recorded. All data will be stored locally on the energy meter and uploaded to the cloud for live data display. The energy meter will be provided by the competition organizers and must be returned by the end of the competition.

### 技术参数

#### Technical Specification

##### 能量计基本参数:

供电电压: 5-40Vdc

运行功率: <2W

防护等级: IP65

##### Energy Meter basic specs:

Supply Voltage: 5-40Vdc

Power Consumption: <2W

Splash, Water, and Dust Resistant: IP65

##### 高压电压测量:

测量高压电压范围: 0-900Vdc

最高测量电压:  $\pm 0-1200$ Vdc

分辨率: 48mV

HV Voltage Sensing:  
Measuring Voltage Range: 0-900Vdc  
Voltage Limit:  $\pm 0-1200\text{Vdc}$   
Resolution: 48mV

**高压电流测量：**

持续电流： $\pm 500\text{A}$   
分流器内阻： $100\mu\Omega$   
分辨率：10mA

HV Current Sensing:  
Continuous Current:  $\pm 500\text{A}$   
Shunt Resistance:  $100\mu\Omega$   
Resolution: 10mA

**其他传感器：**

内置 IMU, High-G, PT100-1000 接入, AN\*4

Other sensors:  
IMU, High-G, Input for PT100-1000, Analog input \*4

**通信：**

CAN 总线 1Mbit/s  
4G LTE. Cat 1  
WiFi, BLE 4.1

Communication:  
CAN Bus 1Mbit/s  
4G LTE. Cat 1  
WiFi, BLE 4.1

**接线线路**

能量计测量接入

能量计测量通过 3 个侦测点接入。外露的 2 个螺柱接口接入高压总线负极。能量计采用分流器测量电流。分流器接入负极测量，参赛车队必须保证所有高压电能必须通过此分流器。第 3 个能量计侦测点将接入高压总线正极，通过能量计侧面所自带的橘色连接器接入。能量计同时可进行一些测量，为主办方提供比赛状态参考。能量计高压模块将自带保险，但建议参赛车队加装二次保险。

**Wiring**

Energy Meter Measuring Wiring

The Energy Meter measures the energy via 3 wiring connections. The 2 wiring connections are the bus bars on the meter, which is the shunt input for current measuring. These 2 wiring connections must be wired in series on the negative side of the Tractive System (TS) such

that all current flow to the TS passes the energy meter. The third wiring connection need to connect to the positive of the TS for voltage measuring. This connection will be connected to the energy meter via the orange connector on the side. The energy meter will take some other measurement via the internal sensors as reference of the race status for the organizer. The energy meter has fuse internally. It's suggested for the team to fuse the positive connection.

### 低压连接

在能量计侧边为能量计的低压连接器，对接连接器为 Fischer SS102A059-130 或 HN F102T03J059-130 (国产型号)。

链接引脚如下表

### Low Voltage Connection

The mating connector for the low voltage side PN: Fischer SS102A059-130 or HN F102T03J059-130

1	GND
2	5-24v
3	CAN+
4	CAN-

