2025 中国大学生方程式系列赛事
FORMULA STUDENT CHINA

2025 中国大学生方程式系列赛事能量计说明书

Formula Student China Energy Meter Instruction

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一、综述 Overview

2025 中国大学生方程式系列赛事（电、无人组别）将采用新型号能量计，本能量计产品具备超功率检测、电能消耗记录、车载视频记录及关键通讯信号记录能力。

2025 Formula Student China (EV, AV class) will adopt a new model of energy meter. This energy meter product features extra-power detection, energy consumption recording, video recording, and signal logger.

能量计总成硬件为传感器、车载终端，并配套天线、麦克风、摄像头和部分传输线束。传感器以伊莎贝棱特功率传感器为核心硬件，并进行外围改造；车载终端使用机车小子 G3 主机，尺寸如下：

The energy meter assembly hardware consists of sensors, controller, along with antennas, microphones, cameras, and partial wire. The sensors use the Isabellenhütte power sensor as the core hardware; the controller is basis on Gspot G3, the dimensions is below:

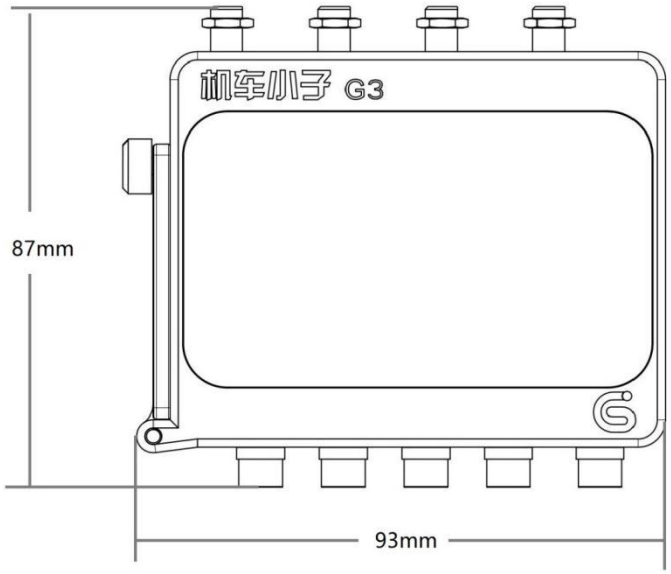


图 1 车载终端主机主视图（厚度 40mm）

Figure 1 Main view of the controller (thickness 40mm)

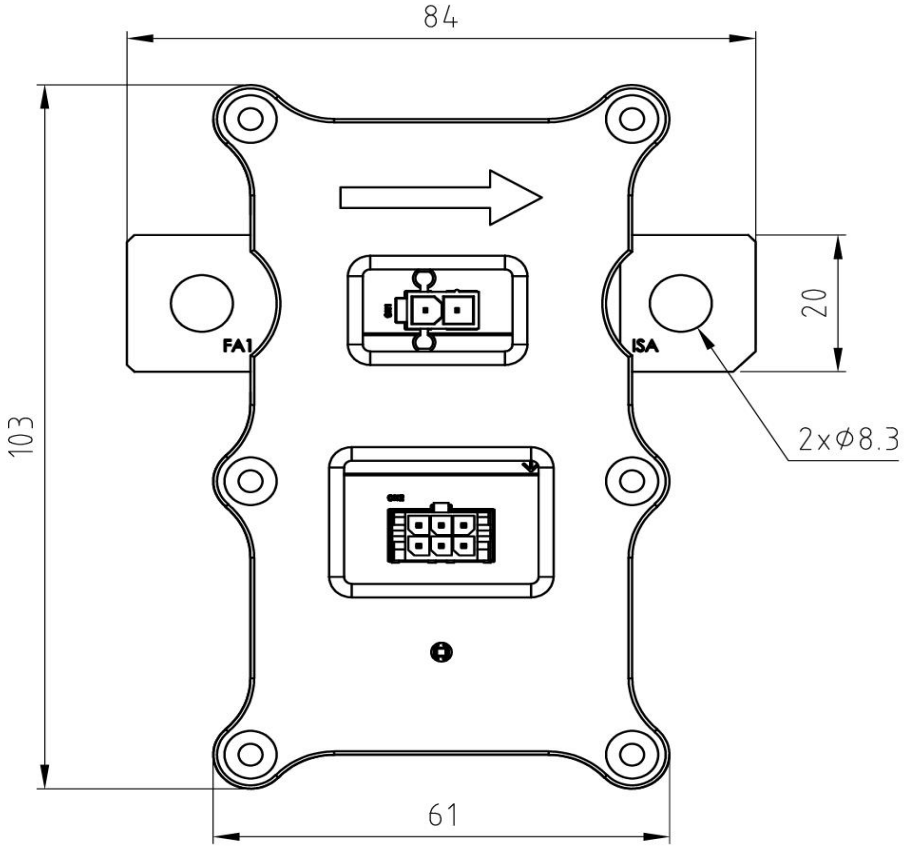


图 2 功率传感器主视图（厚度 35mm）

Figure 2 Main view of the power sensor (thickness 35mm)

二、功率传感器 Power sensor

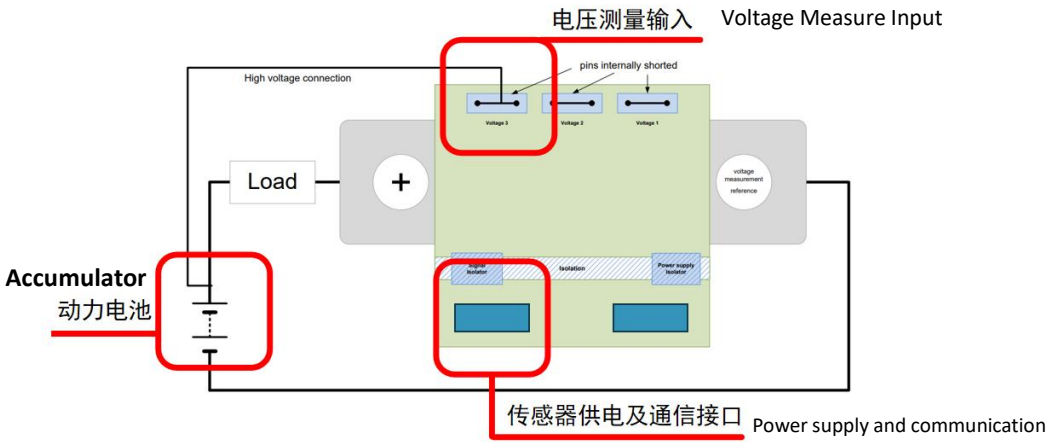
功率传感器采用伊莎贝棱特 IVT-S-500-U3-I-CAN1-12/24 型号功率传感器，产品规格如下：

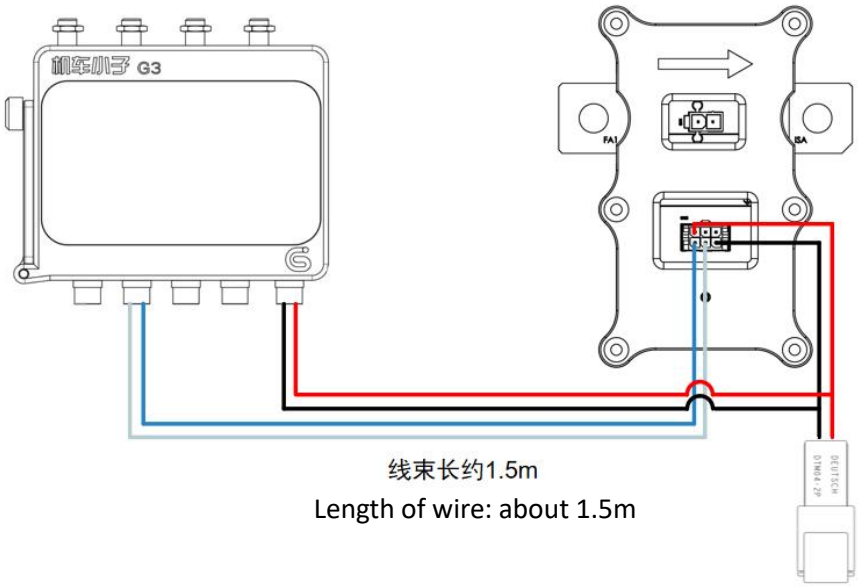
The power sensor adopts the Isabellenhütte IVT-S-500-U3-I-CAN1-12/24 power sensor, with product specifications as follows:

输入电流范围 Input Current Scope	±500A
输入电压范围 Input Voltage Scope	±1000V
工作温度 Working Temperature	-40~+125℃
隔离电压 Isolation Voltage	1000V
供电电压 Voltage of Power Supply	5.5~40V
通信接口 Communication Protocol	CAN
电压采集连接器 Voltage Measure Connector	Molex 39299023
电流采集连接器 Current Measure Connector	M8 螺栓+铜排 M8 Bolt with Busbar
供电及通信连接器 Communication & Power Supply Connector	Molex 430450624

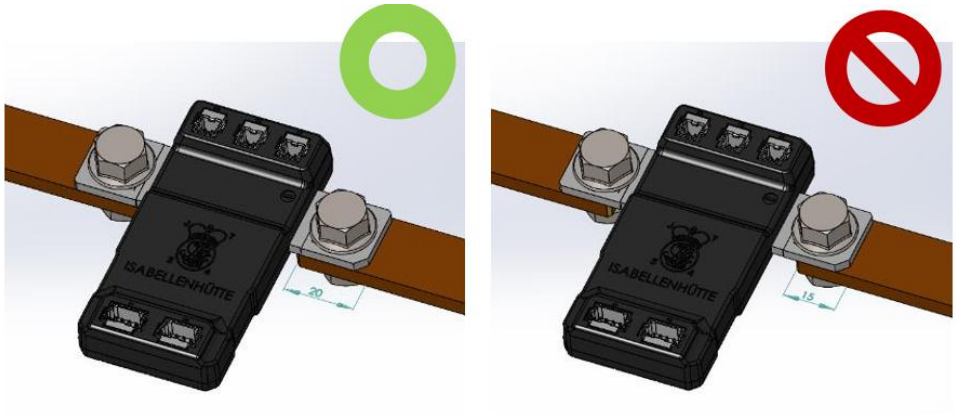
传感器接线框图如下，具体安装建议见下文安装指引教程。

The wiring diagram is below, For specific installation recommendations, refer to the installation guide tutorial in the following section.





线束长约1.5m
Length of wire: about 1.5m



铜排的叠加宽度需要达到约20mm
Superimposed width of busbar > 20mm

三、数据记录 Datalogger

能量计具备关键 CAN 数据信号记录能力，报文格式与德国赛数据记录仪相同（ https://www.formulastudent.de/fileadmin/user_upload/all/2023/important_docs/FS_Datalogger_Status_v0.2.dbc），本赛季不强制要求车队上传 CAN 报文。

The energy meter has the capability to record CAN data signals, the message format requirement is same as FSG (https://www.formulastudent.de/fileadmin/user_upload/all/2023/important_docs/FS_Datalogger_Status_v0.2.dbc). Teams are not mandated to upload CAN messages in 2025.

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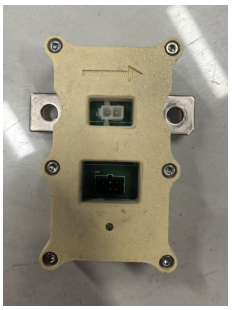
能量计安装指引教程

Energy Meter Installation Guidance

1. 开箱后检查全部硬件是否齐全：

Parts Catalogue：

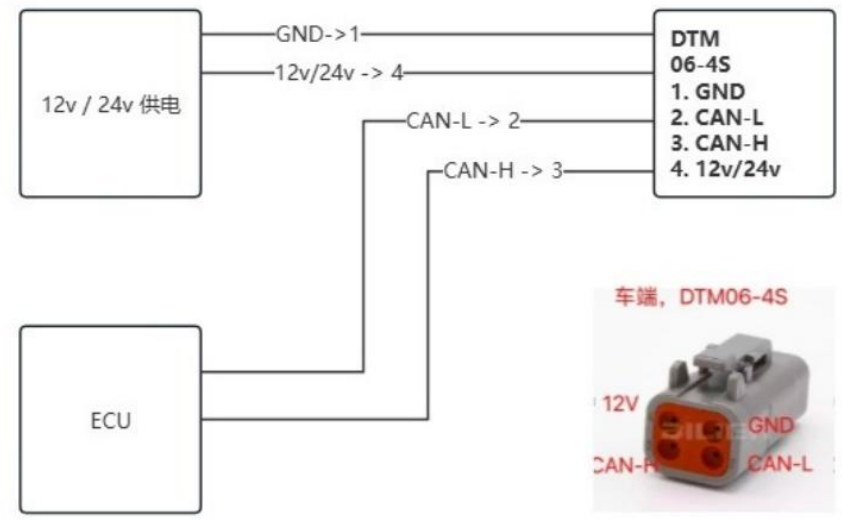
机车小子主机 （含固定夹具） Controller w/ Clamp	摄像头 Camera	GPS 天线 GPS Antenna	电压电流传感器 Current Sensor
			
麦克风 Microphone	高压电压测量线 Voltage-measure cable	低压供电线&通讯线 Power Supply & Communication Cable	4G 天线 x2 wifi/BT 天线 x1 4G Antenna x2 WIFI/BT Antenna x1
			

2. 根据如下定义准备好车端插头。供电受控于低压主开关。CAN_H 和 CAN_L 可自愿选择是否连接。

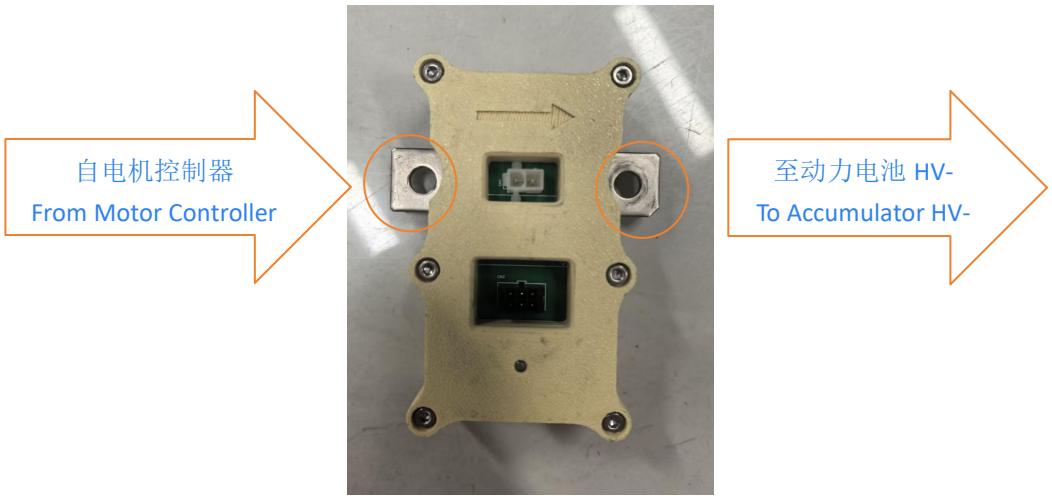
Preparing connector in vehicle loom according to following definition. Power supply should be controlled by LVMS. The connection of CAN_H and CAN_L is optional.

注意：请使用 0.5~1.0mm^2 线缆压接插头端子；低压正负极切勿接反。

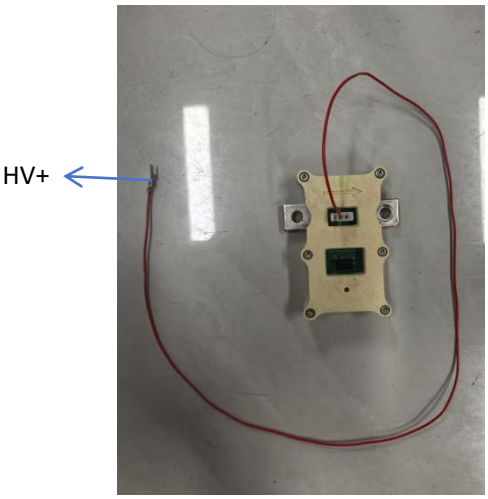
Caution：Please use 0.5~1.0mm^2 cable. DO NOT reverse the power supply.



3. 将电压电流传感器串联在直流母线 HV-上，能量计壳体上的箭头方向即电流方向。
Connect the current sensors in series on HV- line. Arrow direction indicates current flow.
注意：电压电流传感器无防水防尘能力，请各车队务必做好防护。
Caution: The current sensor lacks waterproof and dustproof capabilities.



4. 将高压电压测量线与电压电流传感器相连；高压电压测量线的叉型端子连接到 HV+。
Connect the Voltage-measure cable to current sensor. Connect Voltage-measure cable terminal to HV+.
注意：高压操作务必注意安全
Caution: Pay attention to safety when operating under HV.

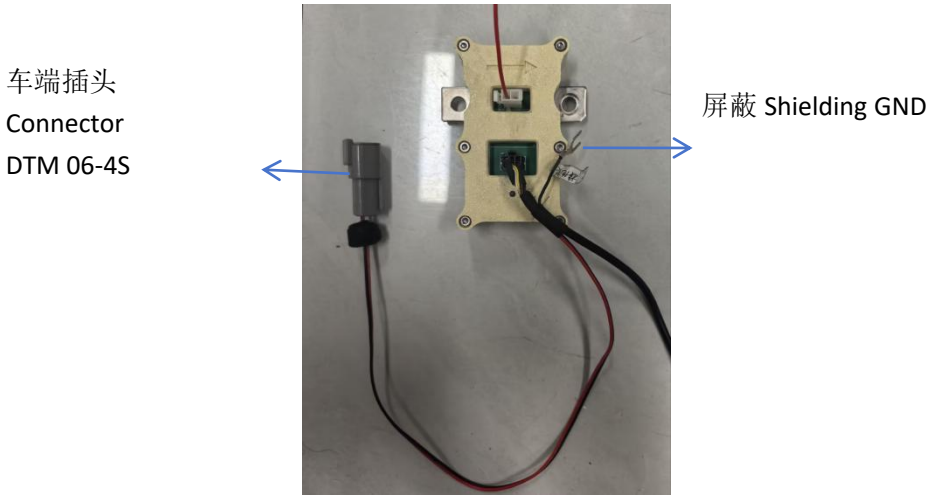


5. 将低压供电线&通讯线与电压电流传感器相连；DTM 04-2P 与车端插头 DTM 06-4S 相连；叉型端子为屏蔽层，需与车架/防滚架相连。

Connect power supply & communication cable to current sensor. Connect DTM04-2P connector the vehicle loom. Connect shielding terminal to ground.

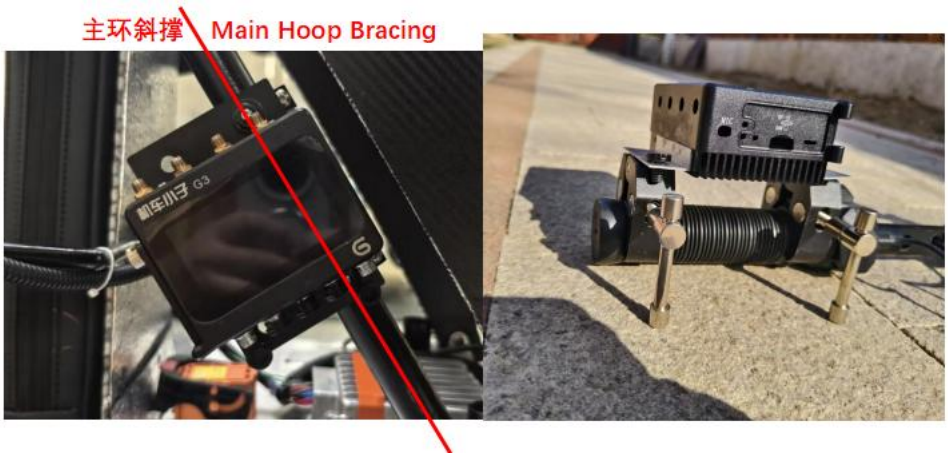
注意：严禁将屏蔽 GND 连接至驱动（高压）系统！

Caution: DO NOT connect shielding terminal to HV system!

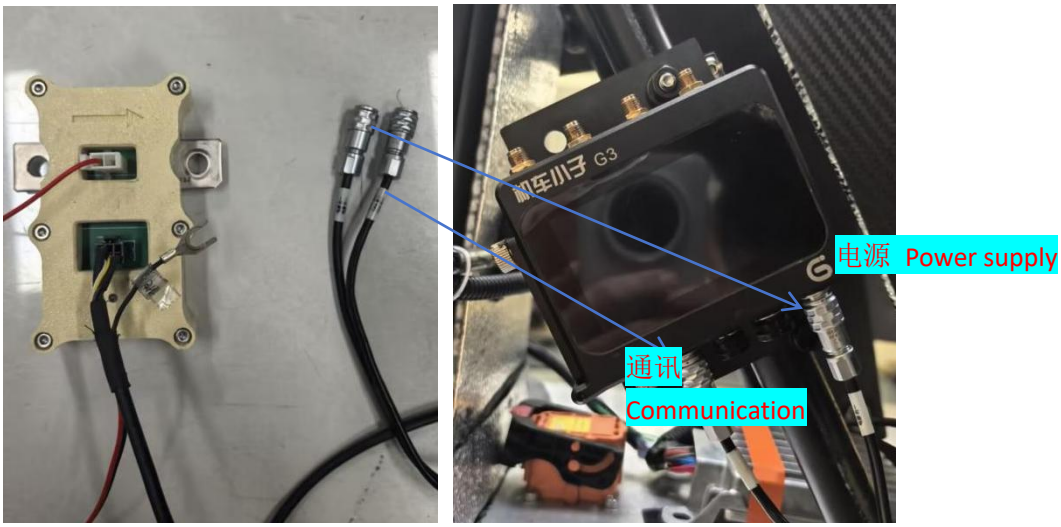


6. 使用配套的固定夹具，将机车小子主机安装在防滚架或防滚架斜撑上。

Install the controller on main-hoop or main-hoop braces with clamp.



7. 按照线上标注将通讯线和低压电源线连接至主机。
Connect power supply and communication cable to the controller.



8. 将摄像头插头连接至主机，并将摄像头固定在主环最高点，摄像头对准驾驶舱。
Connect camera to controller. Fixed the camera on the top of your main-hoop and pointing to cockpit.

注意：推车杆可能会损坏摄像头，请尽量避免推车时产生的磕碰并妥善保存组委会财产
Caution： Push bar may may damage the camera. Please avoid any bumps when pushing and properly store the property of the organizing committee

9. 将 GPS 天线连接至主机，并将 GPS 固定在整车高点。

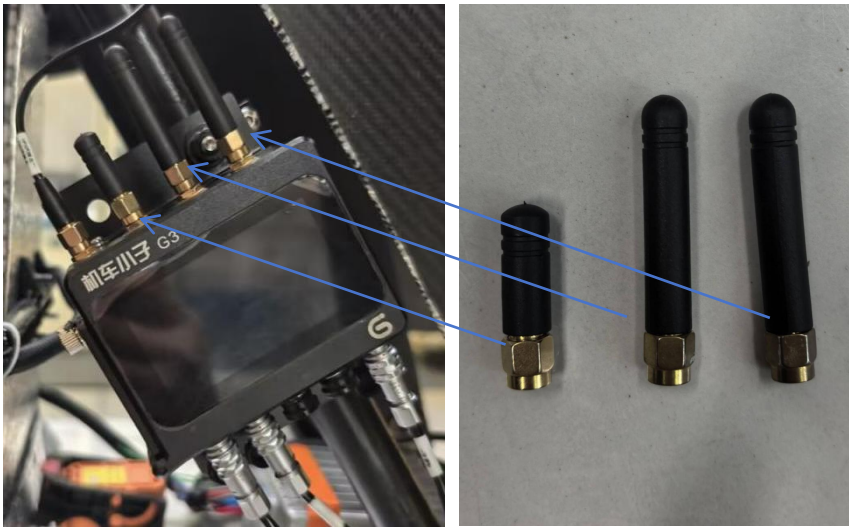
Connect GPS antenna to controller. Fixed the GPS antenna on the top of your mainhoop.

10. 安装 WIFI/BT 天线（短）、两根 4G 天线（长，不区分左右）。

Install WIFI/BT antenna (short) and two 4G antennas (Long).

注意：务必正确安装三根天线，否则可能导致通讯失败！

Caution: Installing the antenna incorrectly will lead to measurement failure.



11. 安装麦克风。
    Connect the microphone