



I&C Energy Manager Hardware Specification

Product Name: I&C Energy Manager

Product Model: EMS-1-P-HV1.0.0

Version: No.V1.1

Zhuhai Virtual Power Plant Technology Co., Ltd

Declaration

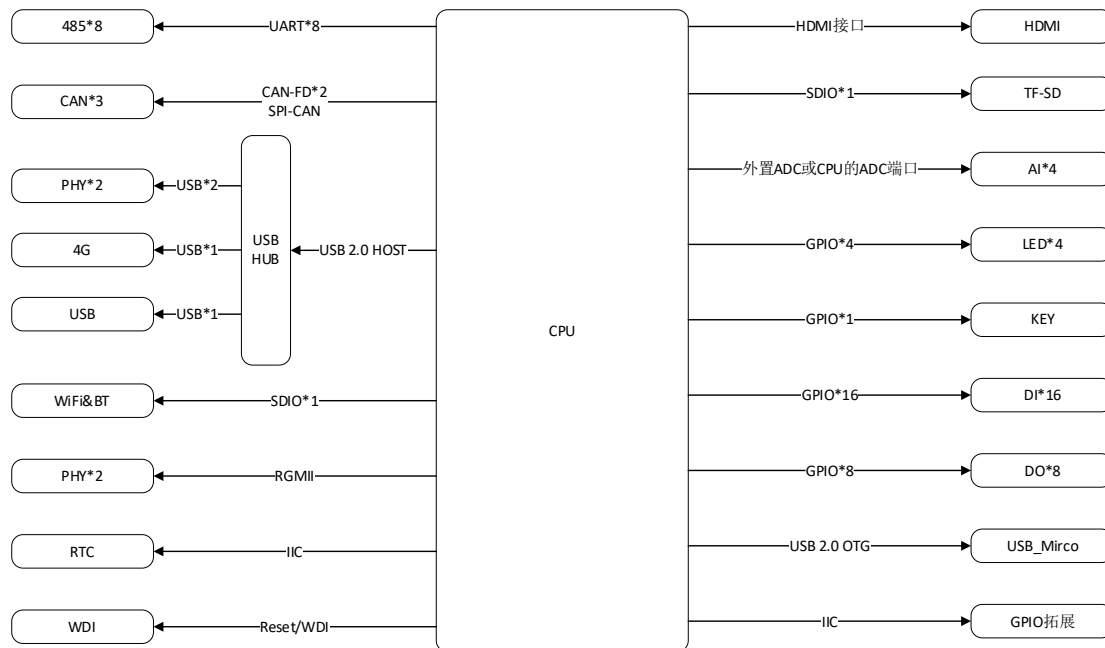
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1 System Overview

1.1 System Block Diagram



1.2 System Functions and Features

EMS-P-1 energy digital gateway E series is centered on industrial and commercial energy demand, light, storage, charging, use and other scenarios, support for energy storage characteristics, support for energy storage cabinet unit access, data convergence, protocol conversion, data storage, centralized monitoring and maintenance and other functions, support for peak shaving and valley filling, power reserve management, anti-reverse current and other basic energy storage strategies.

On the basis of centralized management of units in the cabinet, it supports unified scheduling of energy sources such as photovoltaic, energy storage, charging piles and loads in industrial and commercial scenarios, and also supports parallel cabinet management of multiple energy storage cabinets, so that users can realize greater utilization of photovoltaic power generation by configuring the strategy of the optical storage and charging system.

It supports a variety of basic strategies such as peak sales and valley filling, demand control, backflow prevention, new energy consumption, and advanced strategies such as load forecasting and energy forecasting. Supports a variety of industry standard

protocols, such as MODBUS, MQTT, etc., and supports the docking of third-party systems.

1.3 Technical Parameters

| Equipment Configuration | Configuration specification |
|-------------------------|---|
| CPU | RK3576J, octa-core 64-bit ARM V8 processor , 4 × A72@2.2GHz+4 × A53@1.8GHz+arm Cortex-M0 MCU supports NEON instruction set. |
| NPU | Supports INT4/INT8/INT16/FP16/BF16/TF32 hybrid computing with up to 6 TOPS of arithmetic power |
| GPU | G52 MC3 GPU@900MHz, supports Open GL ES 3.2 and 2D RGA acceleration module. |
| VPN | 8K@30fps H.264/H.2652 Decoder 4K@60fps H.264/H.265 Encoder |
| IPS | 16M ISP with HDR (up to 120dB) |
| Operating System | Linux 6.1 |
| Memory | 4GB LPDDR4X |
| EMMC | 32GB EMMC |
| HDMI | 1 channel HDMI 2.1, supports up to 7680x4320@60Hz output |
| ETHERNET | 2-way 10/100/1000M, 2-way 10/100M |
| USB 3.0 | 1 channel TYPE-C interface, compatible with USB 3.0 and the following protocols |
| USB 2.0 | 1 channel TYPE-A, compatible with USB 2.0 and the following protocols |
| SD | 1 channel Micro SD, support 258G |
| 485 | 8-way 485 |
| CAN | 3 CAN |
| DI | 16CH DI |
| PWM | 1 PWM input detection (10~25KHz), 1 PWM output (10~25KHz) |
| AI | 3-way current detection (0-20mA), 1-way voltage detection (0-12V) |
| DO | 8-way DO |
| 4G | FDD-LTE, TDD-LTE |
| GPS | GNSS |
| WiFi | IEEE 802.11b/g/n/ax(@2.4GHz), Wi-Fi compliant |
| BT | BLE5.2 |

2 Electrical Characteristics

2.1 Electrical Characteristics (Ta=25°C)

| Main Technical Parameters | | Minimum value | Typical value | Maximum value | Unit | Remarks |
|---------------------------|------------------------|---------------|----------------|---------------|-----------------------------|---|
| Power supply | Working Voltage | 18 | 24 | 36 | Voltage | |
| | Operating current | | | | mA | |
| | Power supply detection | 18 | -Power Sense | 36 | Self-detecting power supply | Self-detecting power supply |
| Voltage sampling | Voltage range | 0 | -Voltage range | 12 | Voltage range | |
| | Sampling accuracy | | ± 1 | | % of sampling accuracy | |
| Current Sampling | Current range | 0 | -0 | 20 | mA | |
| | Sampling accuracy | | ± 1 | | % of sampling accuracy | |
| DI Input | DI Input Voltage | 0 | -0 | 5 | V | |
| | DI Input Current | | 10 mA | | mA | |
| DO Output | DO output voltage | | 24 mA | | V | DO output voltage equal to supply voltage |
| | DO output current | 0 | -0 | 1 | A | J6 connector power supply |

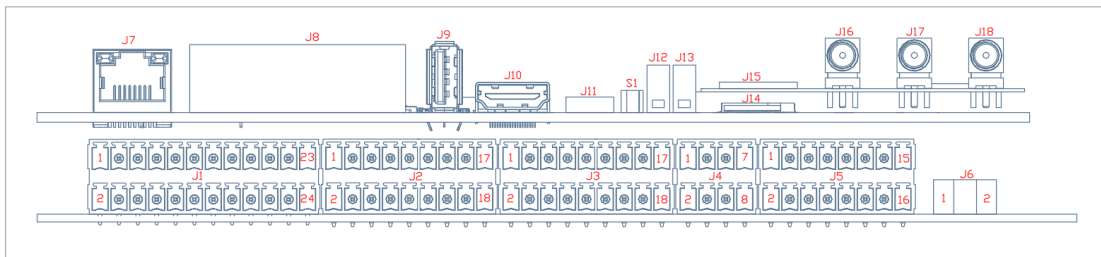
2.2 Maximum Limit Parameters

| Characteristics | Min. | Maximum | Unit | Remarks |
|-----------------|------|---------|------|---------|
|-----------------|------|---------|------|---------|

| | | | | | |
|-----------------------|-------------------|----------------|-------|-----------------------|-----------------|
| Input Voltage | | -0.3 | 100 | V | |
| Operating environment | Temp. | -30 | 85° C | °C | |
| | Humidity | 5 | 95 | % of the total amount | No condensation |
| | Altitude | | 3000 | m | |
| Storage temperature | | | 25° C | °C | |
| ESD Protection | Air Discharge | -Air Discharge | 15 | kV | |
| | Contact Discharge | | 8 | | |

3 Interface Definition

3.1 Interface definition



EMS-P-1 Wiring Front View

Note: J1-J4 connector center numbers represent pin numbers.

| Port Number | Brand | Pin Number | Board End Material Code | Board End Material Code |
|---|-------|------------|-------------------------|-------------------------|
| J1 | KF | J1 KF | kf2edgkrh-3.81-2×12p | KF2EDGKNH-3.81-2×12P |
| KF connector pins: adapted to single/multiple wires AWG 28-16 | | | | |
| J2 | KF | 18 | KF2EDGKRH-3.81-2×9P | KF2EDGKNH-3.81-2×9P |
| KF connector pins: adapted to single/multiple wire AWG 28-16 | | | | |
| J3 | KF | 18 | KF2EDGKRH-3.81-2×9P | KF2EDGKNH-3.81-2×9P |

| | | | | |
|---|----|----|---------------------|----------------------|
| KF connector pins: adapted to single/multiple wires AWG 28-16 | | | | |
| J4 | KF | 8 | KF2EDGKRH-3.81-2×4P | KF2EDGKNH-3.81-2×4P |
| KF connector pins: adapted to single/multiple wires AWG 28-16 | | | | |
| J5 | KF | 16 | KF2EDGKRH-3.81-2×8P | KF2EDGKNH-3.81-2×8P |
| KF connector pins: adapted to single/multiple wires AWG 28-16 | | | | |
| J6 | AN | 3 | f8a-3-3.81-03p-5-an | f7em-3.81-03pl-5-100 |
| AN connector pins: adapted to single/multiple wires AWG 24-16 | | | | |

| Connector | Standard interface | Function/Remarks |
|-----------|--------------------|----------------------------|
| J7 | RJ45×1 | WAN |
| J8 | RJ45×3 | LAN×3 |
| J9 | USB 2.0 A | Program upgrade, save data |
| J10 | HDMI 2.1 - A | External display |
| J11 | TYPE-C 3.0 | Burning Firmware |
| S1 | RESET | Reset |
| J12 | J12 | Controller Status |
| J13 | LED | Controller status |
| J14 | Micro SD | SD Card |
| J15 | Micro SIM | SIM Card |
| J16 | SMA Female Pin | WiFi&BT Antenna |
| J17 | SMA Female Pin | 4G Antenna |
| J18 | SMA Female Pin | GPS passive antenna |

Note: The Ethernet interfaces all support Auto-MDIX switching, so users can use any type of network cable to communicate with the unit.

| J1 (board end): KF2EDGKRH-3.81-2× 12P | | | | | | |
|--|--------------|----------|----------|----------|----------|----------|
| Pins | 1 | 2 | 3 | 4 | 5 | 6 |
| Definition | RS485_1 A | RS485_1B | RS485_2A | RS485_2B | RS485_3A | RS485_3B |
| Pins | 7 | 8 | 9 | 10 | 11 | 12 |

| | | | | | | |
|------------|--------------|----------|----------|----------|----------|----------|
| Definition | RS485_4 A | RS485_4B | RS485_5A | RS485_5B | RS485_6A | RS485_6B |
| Pins | 13 | 14 | 15 | 16 | 17 | 18 |
| Definition | RS485_7 A | RS485_7B | RS485_8A | RS485_8B | RS485_8B | NC |
| NC | 19 | 19 | 21 | 22 | 23 | 24 |
| Definition | CAN1_H | CAN1_L | CAN2_H | CAN2_H | CAN3_H | CAN3_L |

| J2 (board side): KF2EDGKRH-3.81-2×9P | | | | | | | | | |
|---|------|-----|-----|------|------|------|------|------|------|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Definition | DI+1 | I-1 | I+2 | I-2 | I+3 | I-3 | I+4 | I-4 | I+5 |
| Pins | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| inition | I-5 | I+6 | I-6 | DI+7 | DI-7 | DI+8 | DI-8 | DI+9 | DI-9 |

| J3 (board end): KF2EDGKRH-3.81-2×9P | | | | | | | | | |
|--|-------|-------|-------|-------|------|-----------|-----------|------------------|-----------|
| in | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| nition | +10 | -10 | +11 | -11 | +12 | -12 | +13 | -13 | +14 |
| ins | 10 | 1 | 12 | 13 | 14 | 5 | 16 | 17 | 18 |
| inition | DI-14 | DI+15 | DI-15 | DI+16 | I-16 | M_VI N | M_VI N | N PWM _GND | M_G ND |

| J4 (board side): KF2EDGKRH-3.81-2×4P | | | | |
|---|-------|-------|-------|-------|
| in | 1 | 2 | 3 | 4 |
| ition | AI_1+ | AI_1- | AI_2+ | AI_2- |
| ns | 5 | 6 | 7 | 8 |
| finition | AI_3+ | AI_3- | V_1+ | V_1- |

| J5 (board end): KF2EDGKRH-3.81-2×8P | | | | |
|--|---|---|---|---|
| Pin | 1 | 2 | 3 | 4 |

| | | | | |
|------------|----------|----------|----------|----------|
| Definition | HSD_OUT8 | HSD_GND8 | HSD_OUT7 | HSD_GND7 |
| SD_GND7 | 5 | 6 | 6 | 8 |
| Definition | HSD_OUT6 | HSD_GND6 | HSD_OUT5 | HSD_GND5 |
| _OUT5 | 9 | 10 | 11 | 12 |
| inition | HSD_OUT4 | HSD_GND4 | HSD_OUT3 | HSD_GND3 |
| _GND3 | 13 | 14 | 13 14 | 16 |
| ition | HSD_OUT2 | HSD_GND2 | HSD_OUT1 | HSD_GND1 |

| J6 (board side): F8A-3-3.81-03P-5-AN | | | |
|---|---------|---------|-------|
| Pin | 1 | 2 | 3 |
| efinition | 24V_VIN | 24V_GND | EARTH |

3.2 Interface Definition Description

| Connector | Connector Name | Definition |
|-----------|----------------|----------------|
| J1 | RS485_1A[1] | Channel 1 485A |
| | RS485_1B[1] | Channel 1 485B |
| | RS485_2A[1] | Channel 2 485A |
| | RS485_2B[1] | Channel 2 485B |
| | RS485_3A[1] | Channel 3 485A |
| | RS485_3B[1] | Channel 3 485B |
| | RS485_4A[1] | Channel 4 485A |
| | RS485_4B[1] | Circuit 485B |
| | RS485_5A[1] | Channel 5 485A |
| | RS485_5B[1] | Channel 5 485B |
| | RS485_6A[1] | Channel 6 485A |
| | RS485_6B[1] | Channel 6 485B |

| | | |
|--|-------------|-------------------------|
| | RS485_7A[1] | Channel 7 485A |
| | RS485_7B[1] | 485B of the 7th circuit |
| | RS485_8A[1] | Channel 8 485A |
| | RS485_8B[1] | Channel 8 485B |
| | NC | NC |
| | NC | NC |
| | CAN1_H[2] | 1st CAN_H |
| | CAN1_L[2] | 1st CAN_L |
| | CAN2_H[2] | 2nd CAN_H |
| | CAN2_L[2] | 2nd CAN_L |
| | CAN3_H[2] | 3rd CAN_H |
| | CAN3_L[2] | 3rd CAN_L |

| Pin | Definition | Description |
|-----|------------|---------------|
| J2 | DI+1 | 1st DI+ |
| | DI-1 | 1st DI- |
| | DI+2 | 2nd DI+ |
| | DI-2 | 2nd DI- |
| | DI+3 | 3rd DI+ |
| | DI-3 | 3rd DI- |
| | DI+4 | Channel 4 DI+ |
| | DI-4 | DI-4 |
| | DI+5 | DI+5 |
| | DI-5 | 5th DI- |
| | DI+6 | DI+6 |
| | DI-6 | DI+7 |
| | DI+7 | 7th DI+ |
| | DI-7 | 7th DI- |
| | DI+8 | DI+8 |

| | | |
|--|------|---------|
| | DI-8 | DI-8 |
| | DI+9 | DI+9 |
| | DI-9 | 9th DI- |

| Pin | Definition | Description |
|-----|------------|----------------|
| J3 | DI+10 | 10th DI+ |
| | DI-10 | 10th DI- |
| | DI+11 | DI+11 |
| | DI-11 | 11th DI- |
| | DI+12 | DI+12 |
| | DI-12 | DI+12 |
| | DI+13 | DI+13 |
| | DI-13 | 13th DI- |
| | DI+14 | 14th DI+ |
| | DI-14 | 14th DI- |
| | DI+15 | DI+15 |
| | DI-15 | Channel 15 DI- |
| | DI+16 | DI+16 |
| | DI-16 | 16th DI- |
| | PWM_VIN | PWM_VIN |
| | PWM_GND | PWM input- |
| | PWM_OUT | PWM_OUT |
| | PWM_GND | PWM Output- |

| Pin | Definition | Description |
|-----|------------|-----------------------|
| J4 | AI_1+ | 1st current sample + |
| | AI_1- | 1st current sampling- |
| | AI_2+ | 2nd current sampling+ |
| | AI_2- | 2nd current sampling- |

| | | |
|--|-------|----------------------------------|
| | AI_3+ | 3rd current sampling+ |
| | AI_3- | 3rd current sampling- |
| | V_1+ | Voltage sampling of 1st channel+ |
| | V_1- | V_1- Voltage Sampling |

| Pin | Definition | Description |
|-----|------------|---|
| J5 | HSD_OUT8 | High-side relay drive output for 8th channel+ |
| | HSD_GND8 | High-side relay drive output 8- |
| | HSD_OUT7 | High-side relay drive output 7 + HSD_GND7 |
| | HSD_GND7 | High-side relay drive output 7 - HSD_OUT6 |
| | HSD_OUT6 | High-side relay drive output 6 + HSD_GND6 |
| | HSD_GND6 | High-side relay drive output 6 - HSD_OUT5 |
| | HSD_OUT5 | High-side relay drive output 5 + HSD_GND5 |
| | HSD_GND5 | High-side relay drive output 5 - HSD_OUT4 |
| | HSD_OUT4 | High-side relay drive output 4 + HSD_GND4 |
| | HSD_GND4 | High-side relay drive output 4 - HSD_OUT3 |
| | HSD_OUT3 | 3rd high side relay drive output + HSD_GND3 |
| | HSD_GND3 | 3rd high side relay drive output - HSD_OUT2 |
| | HSD_OUT2 | 2nd high side relay drive output + HSD_GND2 |
| | HSD_GND2 | 2nd high side relay drive output - HSD_OUT1 |
| | HSD_OUT1 | 1st high side relay drive output + HSD_GND1 |
| | HSD_GND1 | High-side relay drive output 1 - HSD_OUT1 |

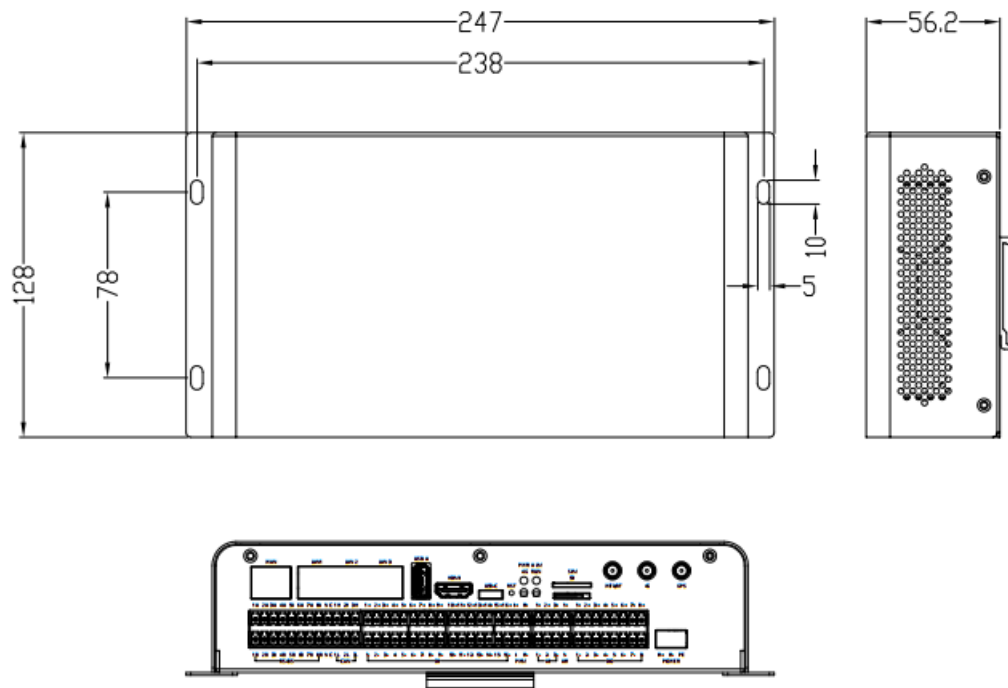
| Pin | Definition | Descripción |
|-----|------------|---------------------------|
| J6 | 24V_VIN | 24V supply input positive |
| | 24V_GND | 24V supply input negative |
| | EARTH | Case |

Note: [1] The 485 board is equipped with a load resistor of 120 Ω .

The CAN board is equipped with a load resistor of 120 Ω .

4 Mounting Dimensions

Mounting dimensions are shown in the diagram:



5 How to Use the Product and Precautions

How to use the product:

First fix the controller, then connect the harness connector to the connection port, then connect the communication port connector, and finally power on the system. Check whether the controller is working properly with the upper computer or LED status provided by our company.

Caution:

Before installing the controller, please check the wiring harness carefully for any appearance deformation, connector deformation and other problems. Please follow the instruction of the specification to connect the wiring harness and make sure the node screws are tightened;

Before installing the controller, please check the board carefully for any serious damage.

Note: Please ensure that the housing screws are connected stably with the chassis.

6 Technical Support and Service

Our company is equipped with specialized technical service personnel, from the pre-sale, sale and after-sale three stages have professional technicians to provide full technical support and service, product information, technology and use of the problem can be at any time to get in touch with us, but also by logging on to my company's Web site, mailboxes, faxes, WeChat public number, etc. to contact us, we will be the first time to give you a reply after receiving the information. ZVPP staff look forward to communicating with you!

Regarding the use of products and technology-related issues, you can log on to our company's website or through the mailbox, WeChat public number and other ways to contact us, we will be the first time after receiving the information to give you an answer, we look forward to communicating with you!

E-mail: info@zvpp.ai

Address: No.801-1, Building 2, No.178 Dingxing Road, Hi-Tech Zone, Zhuhai, China.