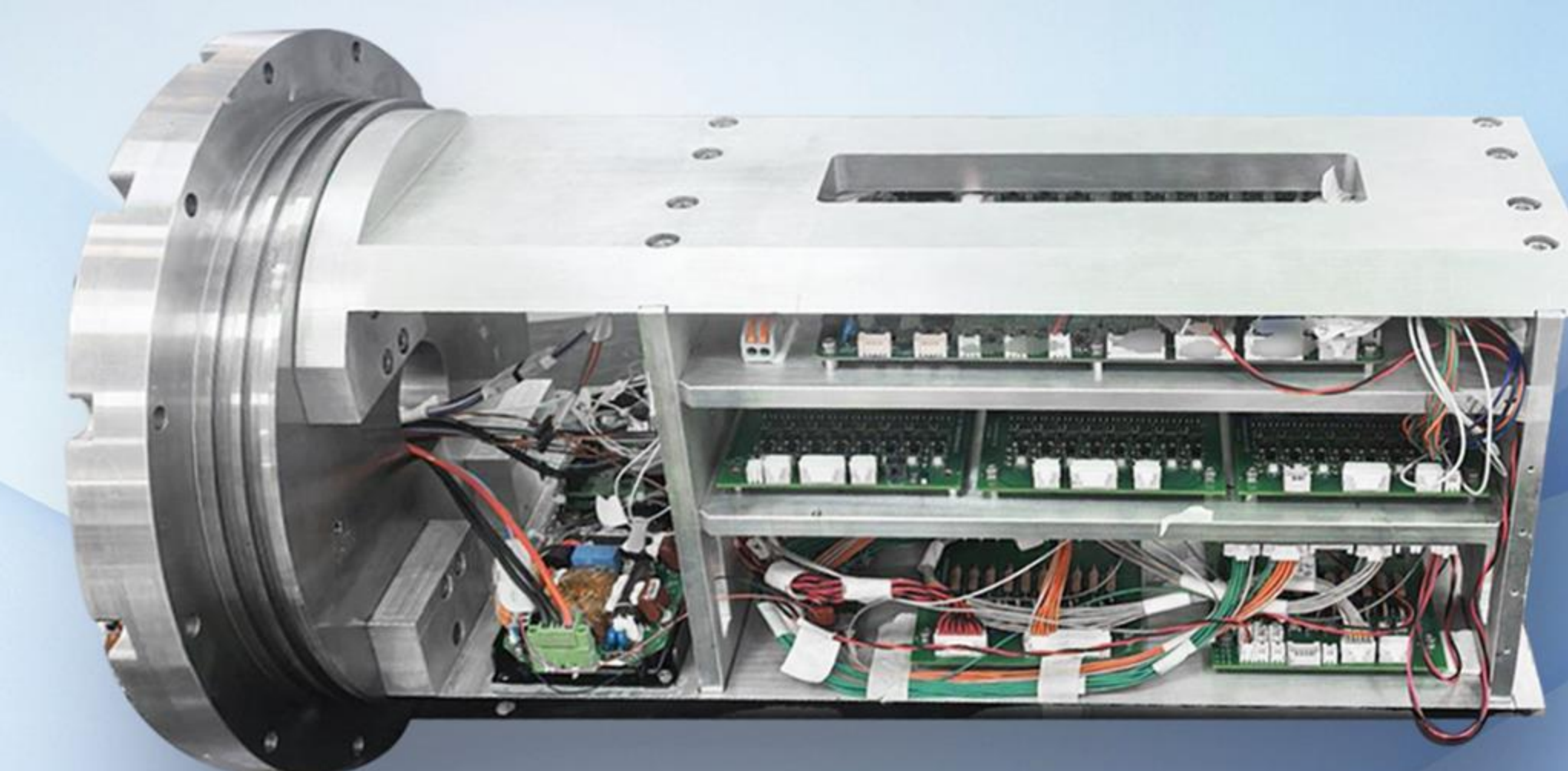


HSEM



About Us



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HSEM Board Control System

TECHNOLOGY CHANGES
EVERYTHING



Catalogue

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Specification

TECHNOLOGY CHANGES ENERGY

Heli Tech Energy Co., Ltd. is a technology enterprise dedicated to resolving clients' pain points. Our business encompasses: R&D and Experimental Services, Precision Core Component R&D and Manufacturing, Smart Downhole Tools R&D and Manufacturing, Smart Equipment R&D and Manufacturing, and Geo-Engineering Integrated Project Management (IPM).

Heli Tech Energy Co., Ltd. is a scientific and technological oil service enterprise focusing on technology research and development and application in the field of oil and gas development, undertaking national key R&D projects, and is a national “Specialized Precision and Characteristic” Small Giant Enterprise, national key Small Giant Enterprise, national science and technology enterprise, national hi-tech enterprise, and a leading enterprise of strategic emerging industries in Tianjin, Tianjin Gazelle Enterprise, Tianjin Specialized and Specialized New Enterprises, Vice Chairman of Tianjin Offshore Industry Union, China Scientist Forum Science and Technology Innovation Demonstration Unit, National High-end Downhole Tool Technology Center.

This is a R&D platform created by HELI in order to improve the comprehensive R&D level in conjunction with universities. The laboratory is equipped with 59 large and medium-sized instruments and equipment with a total value of about 100 million RMB.

The R&D team consists of senior experts, technical experts, with technical fields covering mechanical, electrical, intelligent control, communication, Internet of Things and other disciplines.

Heli Tech Energy Co., Ltd. has extensive experience in industry cooperation
The marketing system is spread all over the world

Heli Tech Energy Co., Ltd.



Product Overview

Subsea production system (SPS) is the core equipment of deep-sea oil and gas development. As oil and gas exploration expands to deep seas (> 1500 m) and ultra-deep seas, traditional Control methods rely on surface platforms face high costs and delayed response. To solve the above problems. The electronic Control module SEM has emerged as the "intelligent brain" of underwater production systems.

Currently, there are related products in China that have passed the API certification of DNY, such as CNOOC and Harbin Engineering. However, only foreign manufacturers, such as ABB and Aker-Solution, have SEM products that meet the SIL3 safety level standards.



- Heli Tech Energy Co., Ltd. takes it as its responsibility to break through foreign technological blockades and achieve the localization of key components and systems in the petroleum industry. Currently, the underwater electronic module designed and manufactured by Our company has obtained the SIL3 safety level calculation report issued by DNV (the first in China) and completed the self-test of API-17 standard.
- The SEM system developed by Our company consists of 11 boards including main control, power supply, communication, and drive. ARM+FPGA architecture, dual-redundant hot backup system, full coverage of fault diagnosis system. It supports up to 42 channels of 4-20mA current collection, 48 channels of solenoid valve drive output, and 16 channels of digital communication. The sub-module of 20kb/s carrier communication with the surface control station has obtained the SIL3 safety level calculation report issued by DNV (the first in China) and completed the self-test of API-17 standard.

HSEM board control system



System Introduction

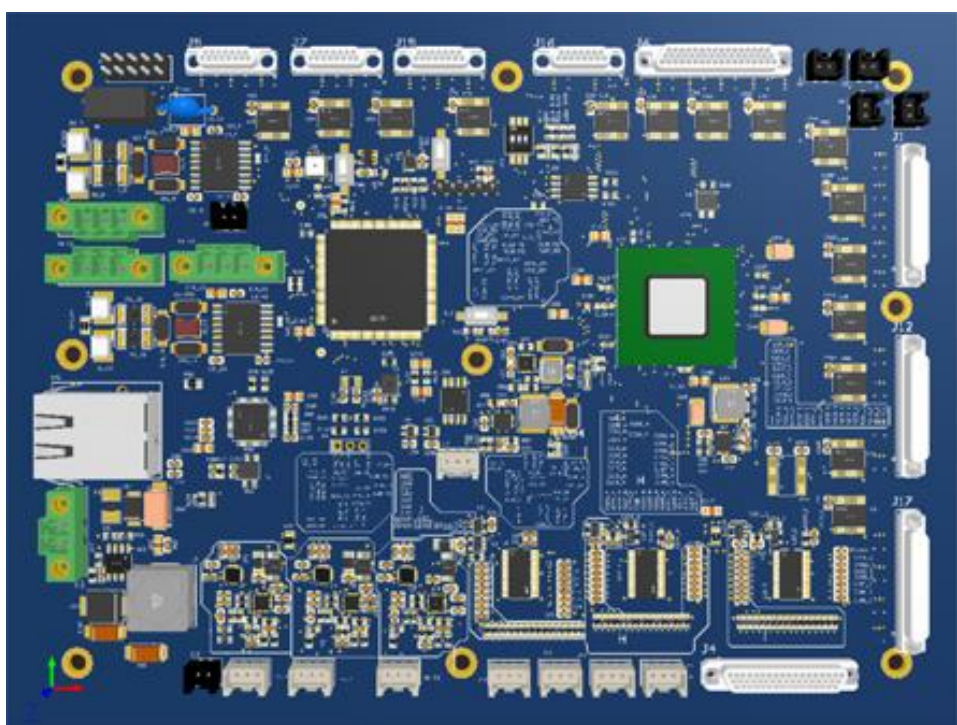
This product is an underwater electronic module (SEM) for underwater HIPPS and underwater oil production trees, mainly used for data collection of various types of underwater sensors and driving of various types of underwater solenoid valves. The HSEM system has 11 boards, including main function boards, power boards, and power boards.

System function

Architecture	System architecture	Double redundancy, 2001 mode; Hot backup operation of each power supply of the dual system; Dual system key card data synchronization
	Chip architecture	ARM + FPGA
Power supply	Working voltage	220VAC±10%
	Power supply function	4 DC power supplies are isolated output. Voltage and current detection and protection
Communication	Communication type	Power carrier
	Voltage level	400~800VAC
	Communication speed	>20.0kb/s
	communication distance	35km
Interface	Analog acquisition	42 channels 4-20mA; loop power supply; All channels with active shutdown function
	Digital output	8-channel solenoid valve drive with 24V and 12W; all channels are equipped with overcurrent protection, overheat protection, drive status feedback, and drive current collection; 12 channels are equipped with an active shutdown function
	Digital communication	6 channels of CAN; 2 channels of RS422; 8-way RS485
Upper computer	upper computer	Configure the upper computer, Remote diagnostics, remote firmware upgrade
Functional safety	Loop	The pressure of the three channels of PT is Signalis. When the pressure is over, the four channels of solenoid valve is shut off in emergency
	Grade	SIL3
	Institutions	Norwegian Classification Society(DNV)
Certified	Standard	API STD 17F-2023 includes temperature, vibration, shock, and electromagnetic compatibility
	Institutions	Norwegian Classification Society(DNV)

SEM system board composition

Main control board card	X 1	Digital communication board	X 1	Interface card (SIL)	X 1
Carrier card	X 1	Analog acquisition board	X 1	Solenoid valve drive card	X 3
Power board card	X 1	Interface card	X 1	Solenoid valve drive card (SIL)	X 1



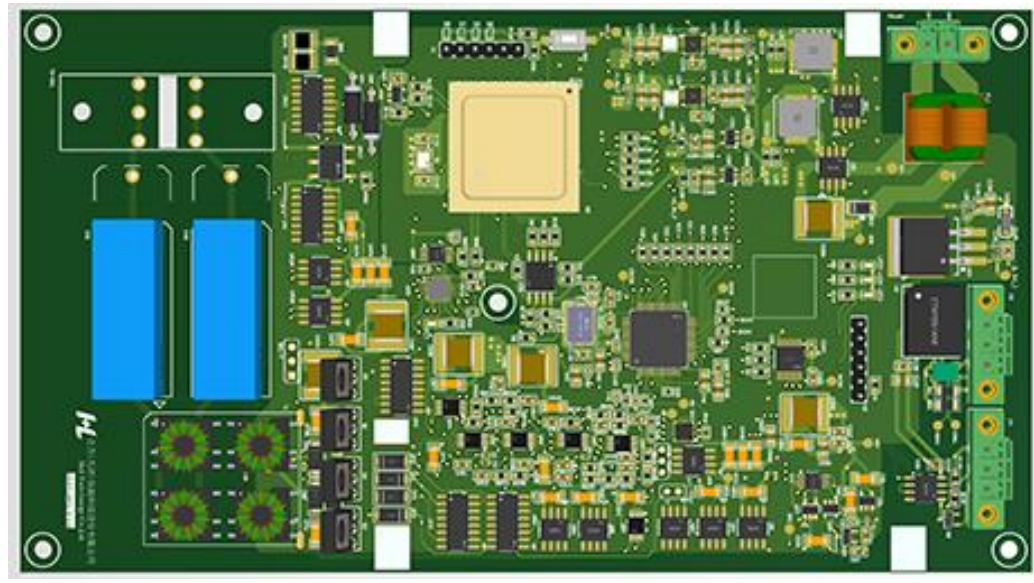
Main control board card

The main control board is the core processing unit of the SEM system. It adopts the ARM+FPGA dual-chip architecture and is equipped with 256Mbit storage space. It also has various external interfaces, such as CAN, RS485, and Ethernet.

Main control card function

1. Safety features: Detect the pressure sensor data of the special channel and shut off the solenoid valve of the special channel when the threshold is exceeded.
2. Collection function: Collect and process data from multiple PT sensors, and send it to the carrier board. The key data is stored in itself.
3. Control functions: Control opening and closing of multiple solenoid valves.
4. Monitoring function: Monitor the status of external interfaces (communication, PT, solenoid valve, etc.) and monitor the status of the system itself.

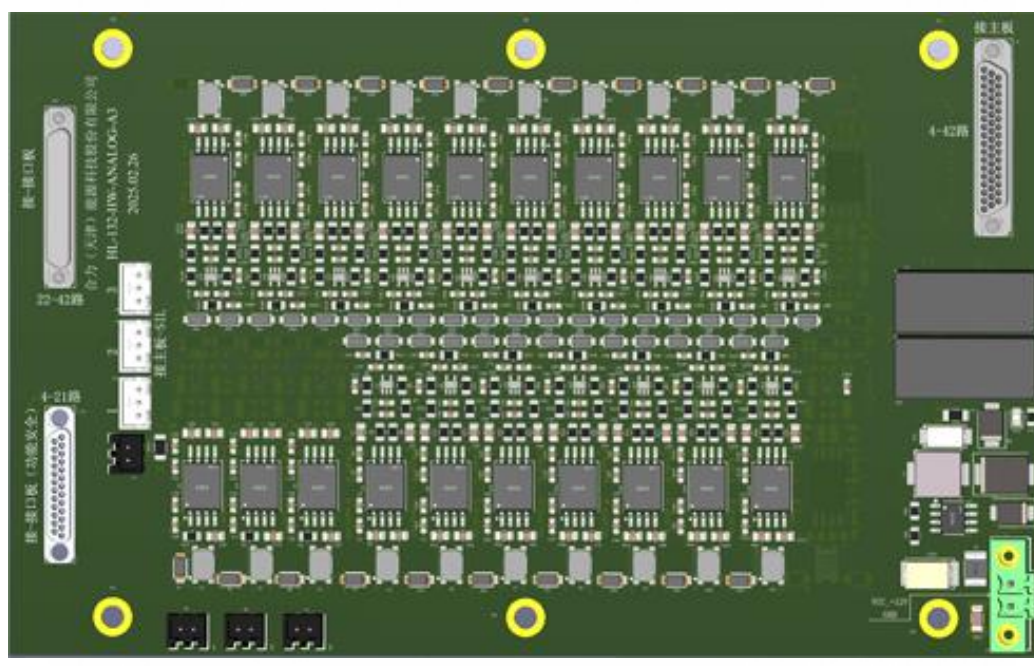
Power supply voltage(VDC)	12
Power(W)	5
Architecture	ARM + FPGA
Main frequency(MHz)	168
Storage(Mbit)	2*128
Interface	CAN / RS485 / Ethernet
Size(mm)	170x125
Working temperature(°C)	-18~70
Storage temperature(°C)	-35~85



Carrier card

The carrier board is the external communication device in the SEM system, which sends data to the Control station on the water surface through the power carrier. The carrier board has built-in multiple modulation modes such as FSK, BPSK, QPSK, and OFDM, and automatically selects the optimal debugging mode.

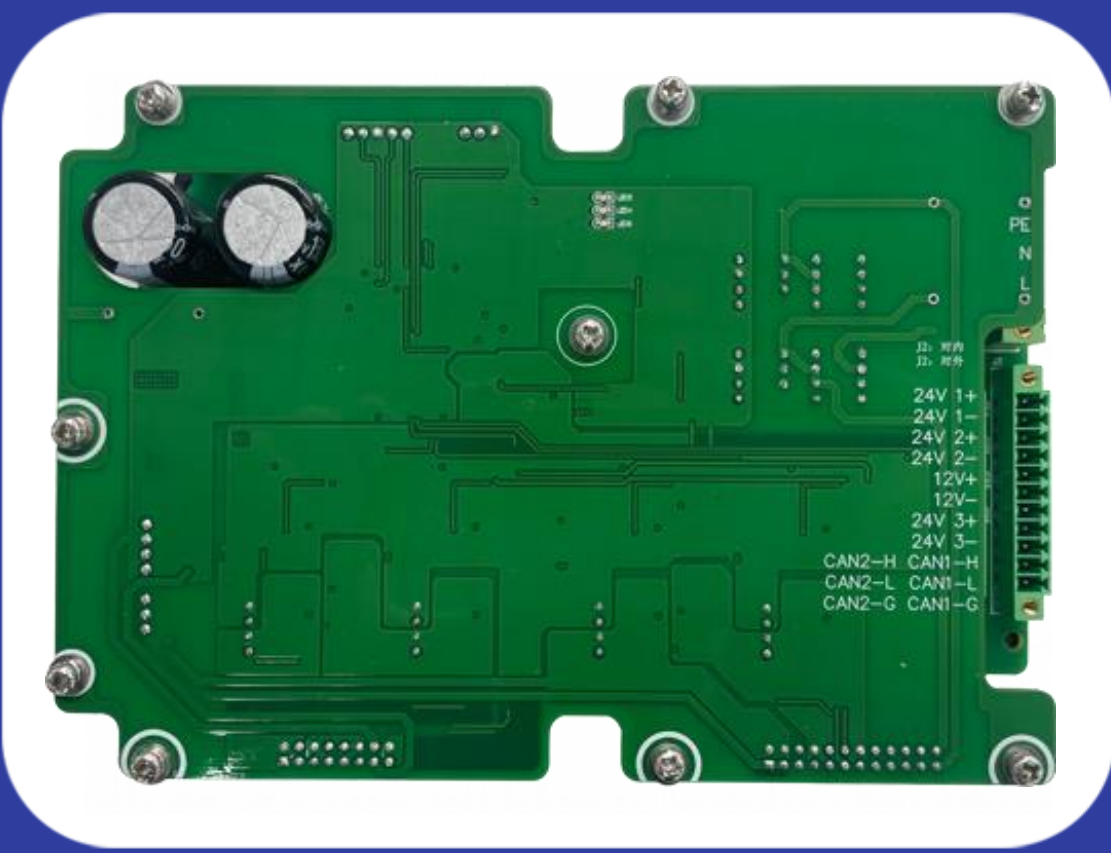
Power supply voltage(VDC)	24
Current consumption(A)	0-2 momentary
Cable voltage(VAC)	110~1000
Communication distance(Km)	35 (related to cable parameters)
Communication rate(Kbit/s)	20
Modulation mode	FSK, BPSK, QPSK, OFDM
Interface	CAN
Size(mm)	180x100x12
Working temperature(°C)	-18~70
Storage temperature(°C)	-35~85



Analog acquisition board

The analog acquisition card is used to process the PT sensor in the SEM system. The signal is amplified and output to the main control card. There are a total of 42 collection channels, of which 39 are normal collection channels and 3 are functionally safe collection channels.

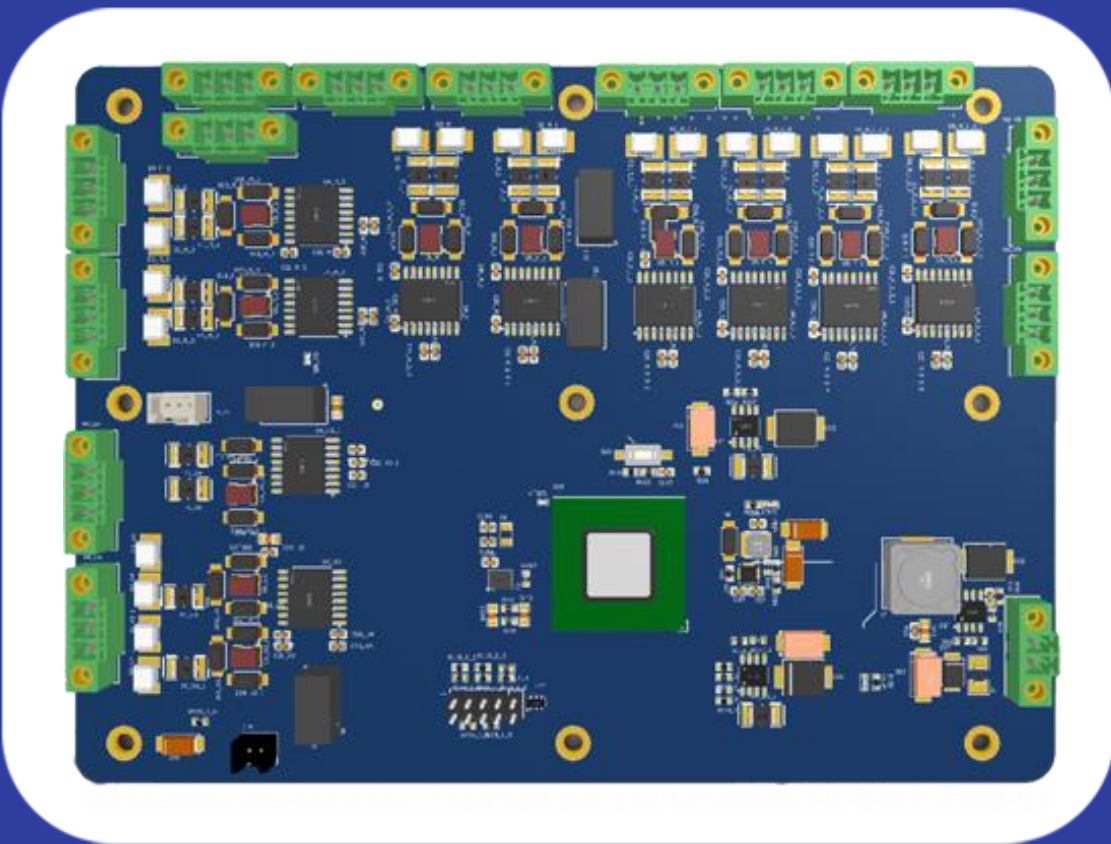
Power supply voltage(VDC)	12
Current consumption(W)	3
Channel number	39+3 channels functional safety
Accuracy	±0.5%
Signal acquisition(mA)	4-20 (0~26)
Accuracy of acquisition(mA)	±0.08
Size(mm)	160x100
Working temperature(°C)	-18~70
Storage temperature(°C)	-35~85



Power board card

The power board provides various power supplies for the SEM system. The powersupplies are hot backup and redundant, and the power supplies are isolated from each other. The power and sensor output are adjustable. Equipped with multiple protections of software and hardware. It is integrated with an EMC filter. Communicating Control and obtaining status through CAN.

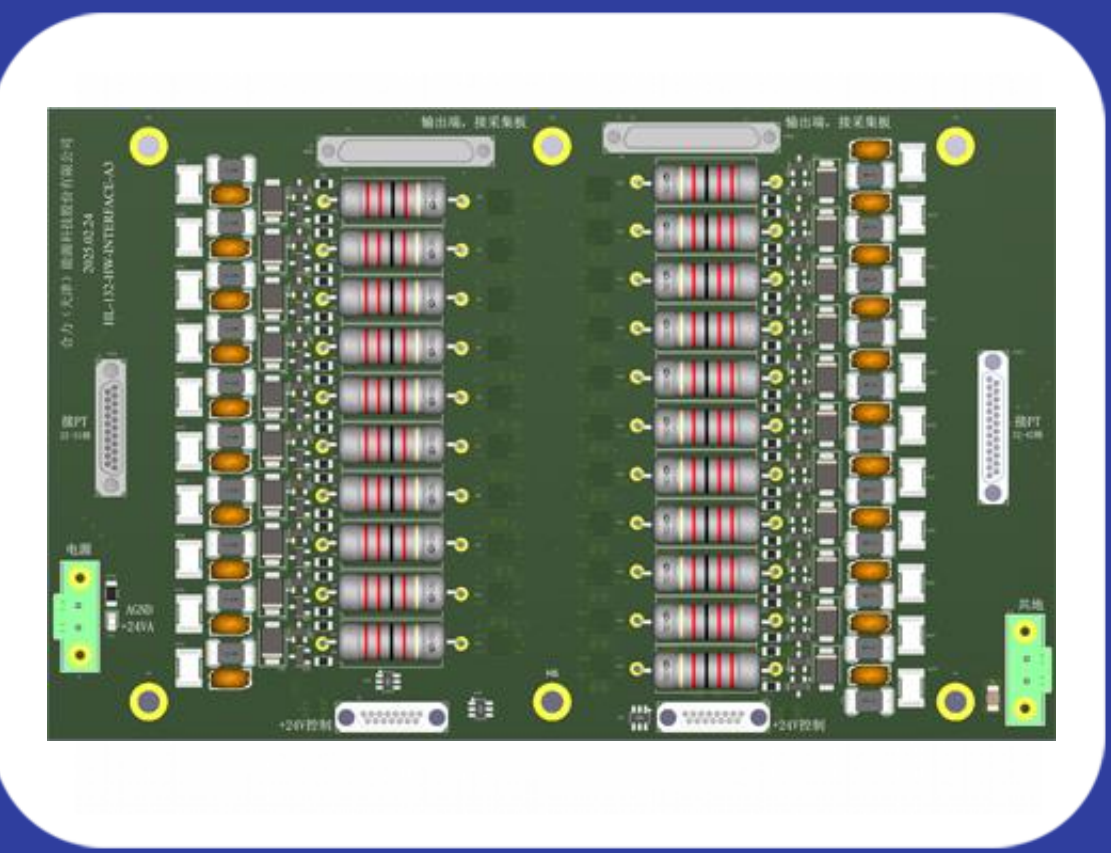
Power supply voltage(VDC)	220
Power supply channel	24V-4.2A-100W(20-27VDC)
Sensor power supply channel	24V-2.1A-50W(20-27VDC)
Communication power supply channel	24V-2.1A-50W
Control power supply channel	12V-4.2A-50W
Voltage accuracy	1%
Filtering	Integrated EMC filters
Control	CAN communication control
Protection function	Input overvoltage/undervoltage/output overvoltage/output overcurrent/output short circuit/overtemperature protection
Size(mm)	180×118×65
Working temperature(℃)	-18~70℃
Storage temperature(℃)	-35℃~85℃



Digital communication board

The digital communication board is responsible for the Control and acquisition of the digital sensor of the SEM system. With FPGA as the core of Control, it integrates multiple digital communication interfaces.

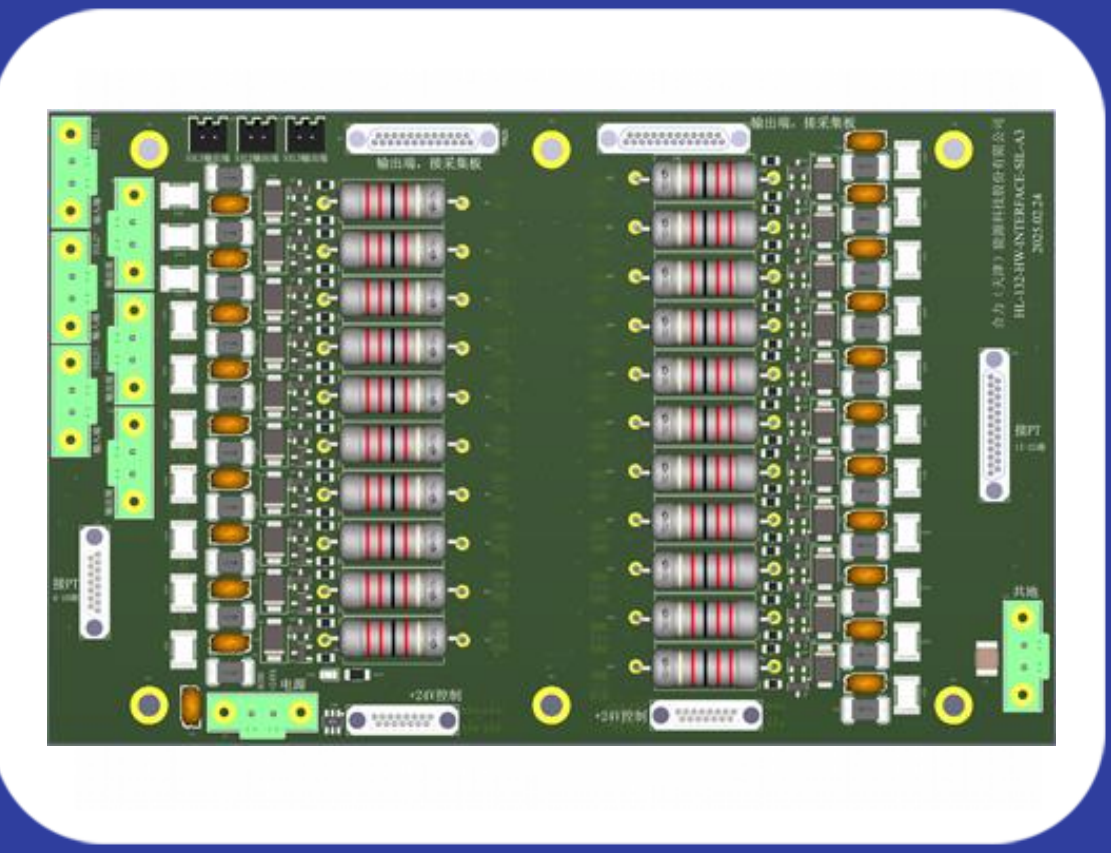
Power supply voltage(VDC)	12
Current consumption(W)	5
Architecture	FPGA
Storage(Mbit)	128
Interface	8*RS485; 2*RS422; 6*CAN
Size(mm)	175×130
Working temperature(℃)	-18~70
Storage temperature(℃)	-35~85



Interface card

The interface card is the first-level processing of the Signalis sensor in the SEM system. It converts the current Signalis of the PT sensor into voltage Signalis and sends it to the next-level analog acquisition card for processing. All channels are equipped with an active shut-down function, which can actively shut down the power supply in the event of an external PT failure to protect the system.

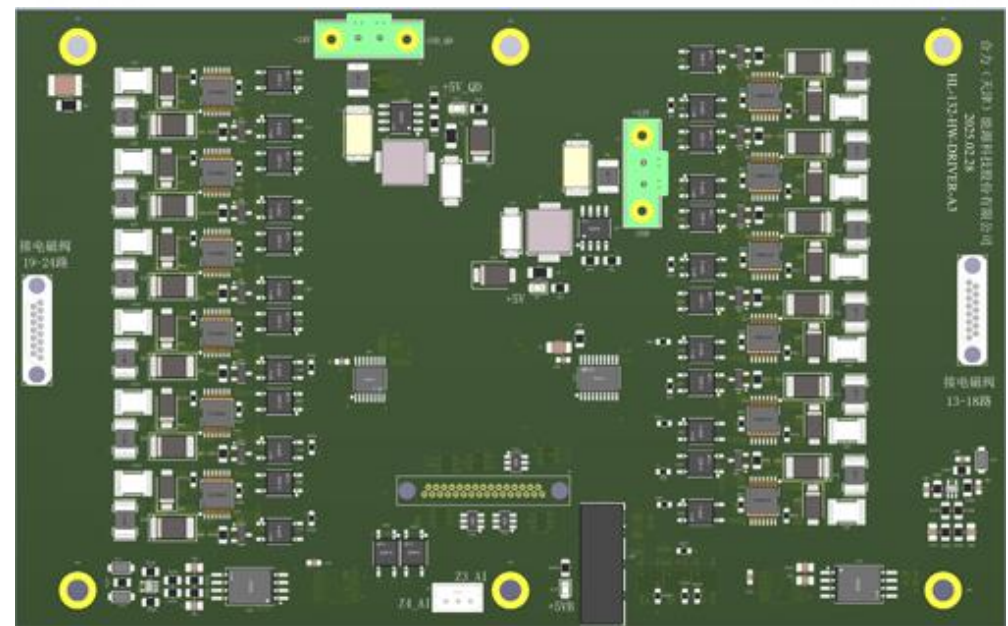
Power supply voltage(VDC)	24
Enter the Signalis type(mA)	4-20 (0~26) Loop supply
Output Signalis type(V)	0-2 Simulating Signalis
Channel number	21
Function	Active shutdown
Size(mm)	160×100
Working temperature(℃)	-18~70
Storage temperature(℃)	-35~85



Interface card (SIL)

The interface board card serves as the first - stage processing for the PT sensor signals in the SEM system. It converts the current signals of the PT sensors into voltage signals through sampling resistors and then sends them to the subsequent - stage analog acquisition board card for processing. All channels are equipped with an active shutdown function, which can actively cut off the power supply when an external PT fails to protect the system's safety. Additionally, 3 channels are added as functional safety channels.

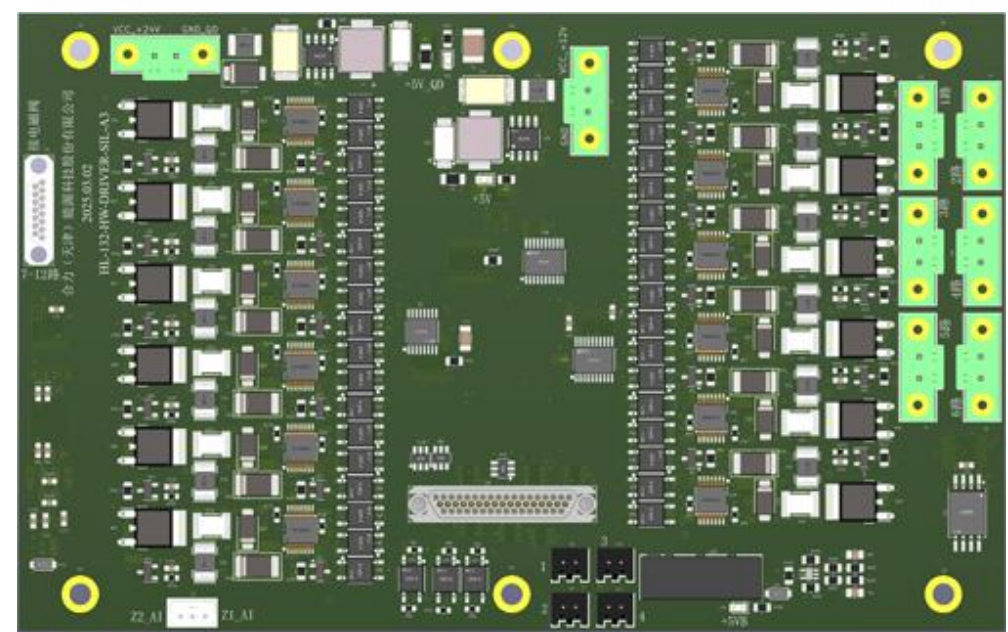
Power supply voltage(VDC)	24
Enter the Signalis type(mA)	4-20 (0~26) Loop supply
Output Signalis type(V)	0-2 Simulating Signalis
Channel number	18+3 channels functional safety
Function	Active shutdown
Size(mm)	160×100
Working temperature(℃)	-18~70
Storage temperature(℃)	-35~85



Solenoid valve drive card

The solenoid valve drive board is the board for driving the solenoid valve of the SEMsystem, with 24V-0.5A output. Each channel is equipped with overheat protection,overcurrent protection, output status collection, and output current detectionfunction.

Power supply voltage(VDC)	12
Current consumption(W)	3
Driving ability	24V-0.5A-12W
Channel number	12
Monitoring	Output status monitoring / Output current monitoring
Protection	Overheat protection / Overcurrent protection
Size(mm)	160×100
Working temperature(℃)	-18~70
Storage temperature(℃)	-35~85



Solenoid valve drive card (SIL)

The solenoid valve drive board is the board for driving the solenoid valve of the SEMsystem, with a 24V-0.5A output. Each channel is equipped with overheat protection,overcurrent protection, output status collection, and output current detectionfunctions. Four channels are functional safety channels. All channels are equippedwith an active shut-off function, which can actively shut down the power supply incase of external solenoid valve failure to protect the system.

Power supply voltage(VDC)	12
Current consumption(W)	3
Driving ability	24V-0.5A-12W
Channel number	8+4 channels functional safety
Monitoring	Output status monitoring / Output current monitoring
Protection	Overheat protection;Overcurrent protection;Active shutdown
Size(mm)	160×100
Working temperature(℃)	-18~70
Storage temperature(℃)	-35~85



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