

High-power controller

P 301



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User Manual

Version: Av9

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User Manual

Controller

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Version

Version	Date	Release	Author	Changes
Av1	2021/8/11	N	Chenmo	First Edition
Av2	2021/8/13	N	Chenmo	Modify technical parameters
Av3	2021/9/3	N	Wang Haiyang	Add model number
Av4	2021/11/28	N	Wang Haiyang	Update material number
Av5	2021/11/28	N	Wang Haiyang	Update 8A(DOH) Port Specification
Av6	2022/1/12	N	Wang Haiyang	Delete AO
Av7	2022/3/8	N	Wang Haiyang	Version Alignment
Av8	2022/10/26	N	Wang Haiyang	Update parameter space size Update PI Port Description Update UBP Description Update Indicator Description
Av9	2023/7/25	Y	Chen Mo	Modifying Pin Definitions

1. Security instructions

1.1. Copyright

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1.2. Statement

This manual has been verified and reviewed for accuracy. The instructions and descriptions contained in this manual are accurate for the P301 controller at the time of publication. However, future P301 controllers and their manuals are subject to change without notice. Xuzhou Mook Electro-Hydraulic Control Co.,Ltd. shall not be liable for damages arising directly or indirectly from errors, omissions, or discrepancies between the product and the manual.

1.3. Signs and meanings used in the manual

Logo	Meaning	Details
	Danger	Predictable leading to unavoidable serious injury, death or property damage
	WARNING	Likely to result in unavoidable serious injury, death or property damage
	Caution	May result in minor injuries and damages
	Hints	Non-safety related use instructions and information
	Note	Additional instructions or recommendations for use

2. Products

2.1. Products

P301 High Power Controller is a vehicle power intelligent distribution and control unit, using intelligent power devices, pin assignable, integrated control, power distribution and safety management, suitable for most complex working conditions.

2.2. Technical Parameters

Technical Parameters	
Operating Voltage	8~36V DC
Operating Temperature	-40℃~+70℃
Storage Temperature	-40℃~+85℃
Relative Humidity	45%~90%
Maximum Load Current	80A
Processor Unit	32Bit 180MHz
Parameter space	8KB FRAM
Protection class	IP65
Communication Interface	CAN2.0B*1
Test Standards	
Low temperature test	Execution standard: GB/T2423.01/IEC60068-2-1 -40℃ low temperature start test, 10 times, start normal -40℃ low temperature working test 16h -40℃ low temperature storage test 72h
High temperature test	Execution standard: GB/T2423.02/IEC60068-2-2 +70℃ high temperature full load working test 16h +85℃ high temperature storage test 72h
Temperature shock test	Execution standard: GB/T2423.22/IEC60068-2-14 Low temperature -40℃, high temperature 85℃, high and low temperature conversion time 3min, cycle times 10 times
Temperature and humidity cycle test	Execution standard: GB/T2423.34/IEC60068-2-38 High temperature $65 \pm 2^{\circ}\text{C}$, $93 \pm 3\%$; room temperature $25 \pm 2^{\circ}\text{C}$, $93 \pm 3\%$; low temperature -10°C , 24h for a cycle, for ten cycles
Vibration test	Execution standard: GB/T2423.10/IEC60068-2-6 Vibration (sinusoidal) 30Hz, 4g, 4h vertically, 2h horizontally left and right, front and back, total 8h Executive standard: GB/T2423.56/IEC60068-2-64 10Hz~25Hz Amplitude 3mm 50Hz~2000Hz, peak acceleration 50m/s ² . Sweep frequency 1oct/min, according to the up and down direction, front and back direction, left and right direction of the number of times in order to sweep the frequency 2 times, for 24h
Shock test	Execution standard: GB/T2423.5/IEC60068-2-27 100g/11ms, half sine wave, 100 times in each of the three axial directions
Drop test	Execution standard: GB/T2423.8/IEC60068-2-32 Transportation status (with bubble bag packaging), drop height 1000mm, 2 times
Salt spray test	Execution standard: GB/T2423.17/IEC60068-2-11 Under 35℃, 5% sodium chloride salt spray environment, 96h test in uncharged state, no rust and corrosion of shell, connector and other parts

	after the test, and work normally after connecting to the test voltage.
EMC	EN 61000-6-2:2005; EN 61000-6-4: 2011; ISO 7637 immunity; ISO 11452 immunity; IOS 16750 immunity

2.3. Port Overview

Input Port	Number of Ports	Port Description
DIH	18	High effective switching input
DIL	2	Low effective switching input
CI/VI	4	Default is 0~25mA current type analog signal input; Can be multiplexed to 0~5V voltage type analog input.
RI	3	0~10K Ω resistance type analog input.
PI	4	Frequency input;
Output Ports	Number of Ports	Port Description
DOH (2A)	18	2A High Side Output
DOH (8A)	9	8A high side output
DOH (20A)	6	20A high side output, three ports to form a 20A output
DOH/PWM	2	2A high side output; Can be multiplexed to PWM output (no current feedback)
DOL (5A)	2	5A low-side output

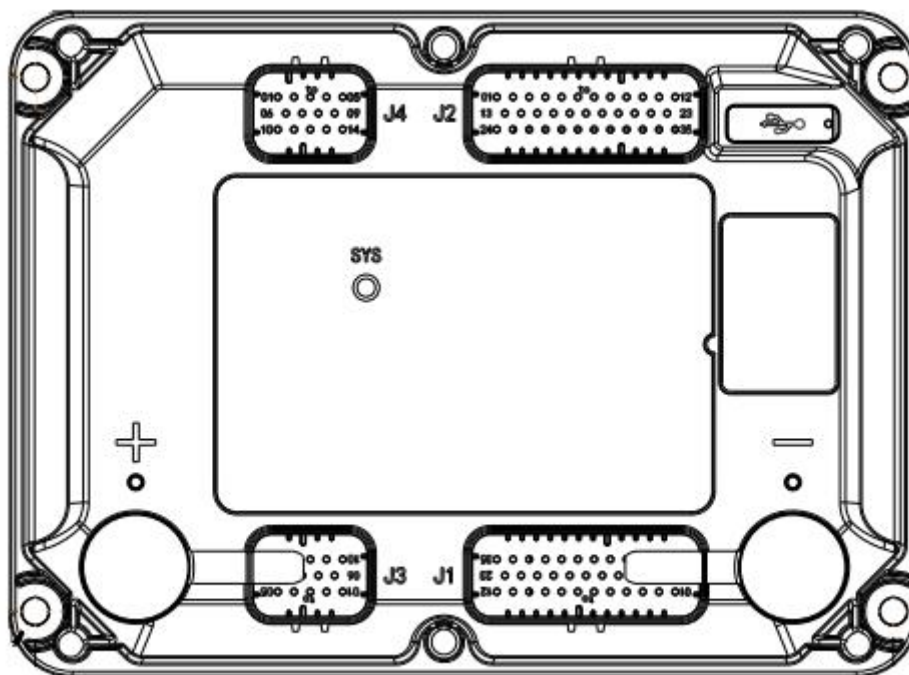
2.4. Order number

Serial No.	Material No.	Material Description
1	231493	Controller, P301

3. Port Description

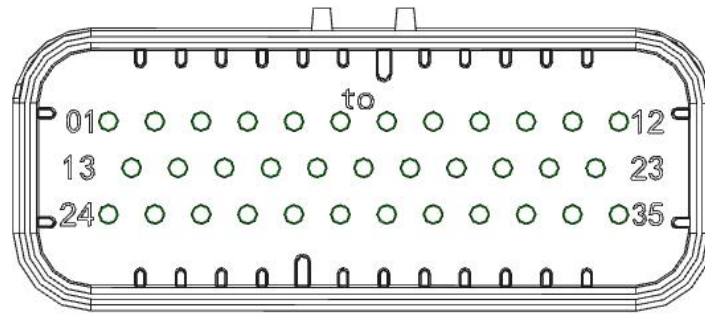
3.1. Connectors

Serial Number	Position Marker	Connector Description
1	J1	35 pole pin socket
2	J2	35 pole pin socket
3	J3	14 pole pin socket
4	J4	14 pole pin socket
5	+	Positive to power supply
6	-	Negative Power Connection
7	USB plug	USB flash drive interface



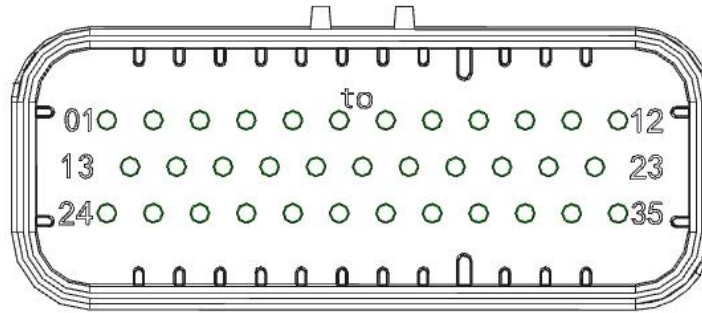
3.2. Pin Definition

3.2.1. J1



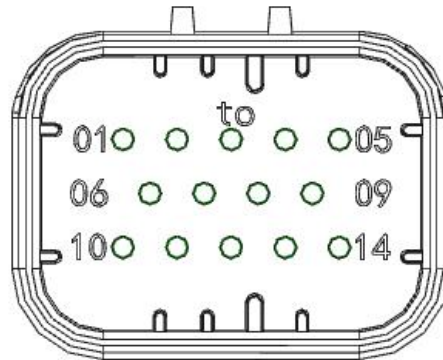
Pin Number	Pin Definition	Signal Type	Function Description
J1_1	DOL37	DOL	Low Side Output_5A
J1_2	DOL36	DOL	Low Side Output_5A
J1_3	DI9	DIH	High valid (this port can be configured to KL15 by software for delayed power off)
J1_4	DI10	DIH	Highly effective
J1_5	UBS	UBS	Alternate
J1_6	AGND	AGND	Analog Ground
J1_7	DI11	DIH	High Active Input
J1_8	DI12	DIH	High Active Input
J1_9	DI13	DIH	High active input
J1_10	DI14	DIH	High active input
J1_11	DI15	DIH	High valid input
J1_12	DOH25	DOH	High Side Output_8A
J1_13	DOH9	DOH	High Side Output_2A
J1_14	DI16	DIH	High effective input
J1_15	DI17	DIH	High Active Input
J1_16	DI18	DIH	High valid input
J1_17	DI19	DIH	High Active Input
J1_18	DI20	DIH	High effective input
J1_19	PI1	PI	10HZ-15KHZ, Frequency Inputs
J1_20	PI2	PI	10HZ-15KHZ, Frequency Inputs
J1_21	PI3	PI	10HZ-15KHZ, Frequency Inputs
J1_22	PI4	PI	10HZ-15KHZ, Frequency Input
J1_23	DOH21	DOH	High Side Output_8A
J1_24	DOH10	DOH	High Side Output_2A
J1_25	DOH19	DOH	High Side Output_2A
J1_26	DOH20	DOH	High Side Output_2A
J1_27	DOH7	DOH	High Side Output_2A
J1_28	DOH8	DOH	High Side Output_2A
J1_29	DOH17	DOH	High Side Output_2A
J1_30	DOH18	DOH	High Side Output_2A
J1_31	DI8	DIH	High Active Input
J1_32	DOH5	DOH	High Side Output_2A
J1_33	DOH6	DOH	High Side Output_2A
J1_34	DOH22	DOH	High Side Output_8A
J1_35	DOH26	DOH	High Side Output_8A

3.2.2. J2



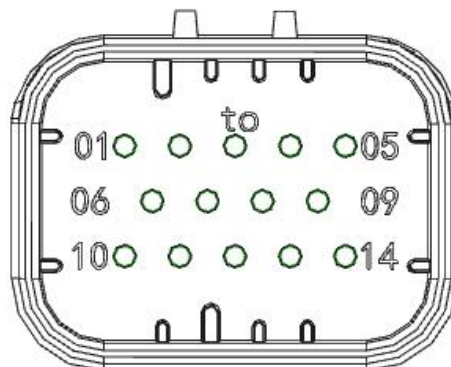
Pin Number	Pin Definition	Signal Type	Function Description
J2_1	DO27	DOH	High Side Output_8A
J2_2	-	-	-
J2_3	DI1	DIL	Low Active Input
J2_4	DI2	DIL	Low Active Input
J2_5	DI3	DIH	High Active Input
J2_6	DI4	DIH	High Active Input
J2_7	DI5	DIH	High Active Input
J2_8	DI6	DIH	High effective input
J2_9	DI7	DIH	High effective input
J2_10	-	-	-
J2_11	UBS	UBS	System Power
J2_12	AGND	AGND	Analog Ground
J2_13	DO23	DOH	High Side Output_8A
J2_14	AI_R_1	AI_R	Resistive analog 0~10K Ω
J2_15	AI_R_2	AI_R	Resistive analog 0~10K Ω
J2_16	AI_R_3	AI_R	Resistive analog 0~10K Ω
J2_17	AI_1	CI/VI	Voltage/current software available
J2_18	AI_2	CI/VI	Voltage/current software available
J2_19	AI_3	CI/VI	Voltage/current software available
J2_20	AI_4	CI/VI	Voltage/current software available
J2_21	CAN_H	CAN_H	CAN High
J2_22	CAN_L	CAN_L	CAN Low
J2_23	DO16	DOH	High Side Output_2A
J2_24	DO28	DOH	High side output_8A
J2_25	DO24	DOH	High Side Output_8A
J2_26	DO29	DOH	High Side Output_8A
J2_27	DO11	DOH	High Side Output_2A
J2_28	DO12	DOH	High Side Output_2A
J2_29	DO1	DOH	High Side Output_2A PWM without Current Feedback
J2_30	DO2	DOH	High Side Output_2A PWM without Current Feedback
J2_31	DO13	DOH	High Side Output_2A
J2_32	DO14	DOH	High Side Output_2A
J2_33	DO3	DOH	High Side Output_2A
J2_34	DO4	DOH	High Side Output_2A
J2_35	DO15	DOH	High Side Output_2A

3.2.3. J3



Pin Numbe	Pin Definition	Functional Description
1	AGND	Analog Ground, 1A
2	AGND	Analog Ground, 1A
3	AGND	Analog Ground, 1A
4	UBS	Alternate
5	UBS	Alternate
6、10、11	DO32	6, 10, 11 three-way pin in the controller internal shorting, combined into a 20A high-side output
7、8、12	DO31	7, 8, 12 three-way pin in the controller shorted, combined to 20A high-side outputs
9、13、14	DO30	9, 13, 14 three-way pin in the controller shorted, combined to 20A high side output

3.2.4. J4



Pin Numbe	Pin Definition	Functional Description
1	AGND	Analog Ground, 1A
2	AGND	Analog Ground, 1A
3	AGND	Analog Ground, 1A
4	UBS	Alternate
5	UBS	Alternate
6、10、11	DO35	6, 10, 11 three-way pin in the controller internal shorting, combined into a 20A high-side output
7、8、12	DO34	7, 8, 12 three-way pin in the controller shorted, combined to 20A high-side outputs
9、13、14	DO33	9, 13, 14 three-way pin in the controller shorted, combined to 20A high side output

The list of plug-ins

Serial number	Description of plug-in	Order number	Corresponding socket
1	AMP 35 pole plug, 776164-2	511294	J1
2	AMP 35 pole plug, 776164-4	505911	J2
3	AMP 14 pole plug, 776273-1	510217	J3
4	AMP 14 pole plug, 776273-2	511295	J4
5	Blind Plug, 770678-1	503217	
6	Wiring Terminals, 770520-1	503218	

3.3. Port Detailed Parameters

3.3.1. DI

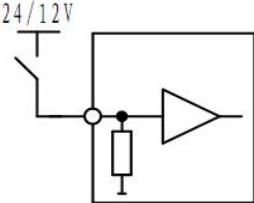
➤ Port Type: DIH

(1) Function Description: Highly effective switching input

(2) Pin number: J1: 3、4、7~11、14~18、31

J2: 5~9

(3) Port Parameters:

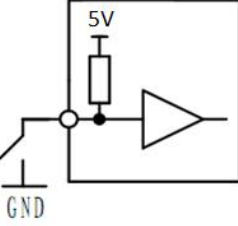
schematic	
Threshold Voltage	>4V judged as having a high level, <1V judged as having a low level
Maximum Input Voltage	36V

➤ Port Type: DIL

(1) Function Description: Low valid switching input.

(2) Pin number: J2: 3, 4

(3) Port Parameters:

DIL	
schematic	
Threshold Voltage	>4V judged as having a high level, <1V judged as having a low level
Pull-up reference voltage	5V
Maximum Input Voltage	36V

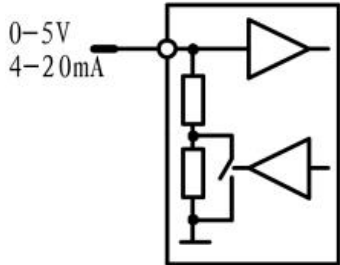
3.3.2. AI

➤ Port Type: CI/VI

(1) Function Description: Current-type analog input that can be multiplexed to voltage-type analog input.

(2) Pin number: J2: 17~20

(3) Port Parameters:

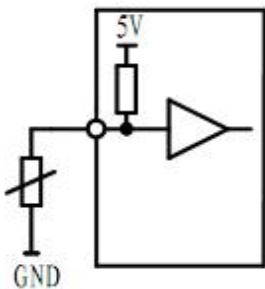
Schematic	
Input Range	CI: 4~20mA; VI: 0~5V
Input Impedance	CI: 200Ω; VI: 100.2KΩ
Sampling accuracy	1% FS
Maximum Input Voltage	36V

➤ Port Type: RI

(1) Function Description: Resistive analog input.

(2) Pin number: J2: 14~16

(3) Port Parameters:

Schematic	
Input Range	0~10KΩ
Input impedance	2KΩ
Accuracy	0~1K: 1% FS 1~5K: 2% FS 5~10K: 5%FS
Maximum Input Voltage	36V

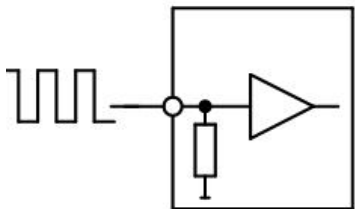
3.3.3. PI

➤ Port Type: PI

(1) Function Description: Frequency Input

(2) Pin number: J1: 19~22

(3) Port Parameters:

Schematic	
Signal Type	square wave
Threshold Voltage	2V
Input frequency	10Hz~15000Hz
Maximum Input Voltage	36V

3.3.4. DO

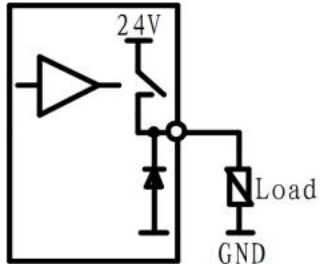
➤ Port Type: DOH (2A)

(1) Function Description: High side output.

(2) Pin number: J1: 13、24~30、32、33

J2: 23、27、28、31~35

(3) Port Parameters:

Schematic	
Maximum load current	2A
Continuous current diode	Yes
Overcurrent and Thermal Protection	Yes
Port Diagnostics	Shorted to ground, disconnected

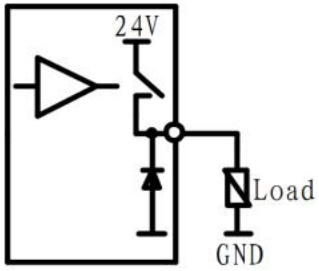
➤ Port type: DOH (8A)

(1) Function Description: High side output.

(2) Pin number: J1: 12、23、34、35

J2: 1、13、24~26

(3) Port Parameters:

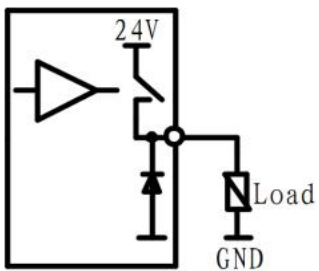
Schematic	
Maximum load current	8A
Continuous current diode	Yes
Overcurrent and Thermal Protection	Yes
Port Diagnostics	Short circuit to ground, broken wire

➤ Port Type: DOH (20A)

(1) Function Description: High side output.

(2) Pin No.: J3: 6, 10 and 11 are a set of 20A high side outputs (DO32), 7, 8 and 12 are a set of 20A high side outputs (DO31), 9, 13 and 14 are a set of 20A high side outputs (DO30)
J4: 6, 10 and 11 are a set of 20A high side outputs (DO35), 7, 8 and 12 are a set of 20A high side outputs (DO34), 9, 13 and 14 are a set of 20A high side outputs (DO33)

(3) Port Parameters:

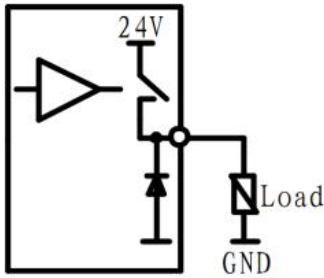
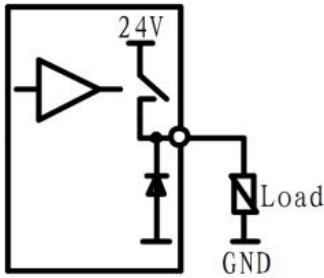
Schematic	
Maximum load current	20A
Continuous current diode	Yes
Overcurrent and Thermal Protection	Yes
Port Diagnostics	Short circuit to ground, broken wire

➤ Port Type: DOH/PWM

(1) Function Description: High-side output, can be multiplexed to PWM output.

(2) Pin number: J2: 39, 30

(3) Port Parameters:

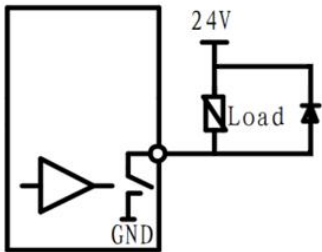
When used as DOH	
Schematic	
Maximum load current	2A
Continuous current diode	Yes
Overcurrent and Thermal Protection	Yes
Port Diagnostics	Shorted to ground, disconnected
When multiplexed to PWM	
Schematic	
Maximum Load Current	2A
Output internal resistance	62m Ω
Current feedback range	-
Duty Cycle	0~100%
Frequency range	50~600Hz
Continuous current diode	Yes
Overcurrent Protection	Yes
Port Diagnostics	Short circuit to ground, broken wire, overcurrent detection

➤ Port Type: DOL

(1) Function Description: Low-side output.

(2) Pin number: J1: 1, 2

(3) Port Parameters:

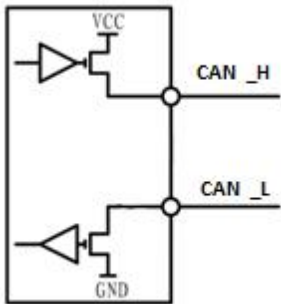
Schematic	
Maximum load current	5A
Continuous current diode	Yes
Overcurrent and Thermal Protection	Yes
Port Diagnostics	Short circuit to ground, broken wire

3.4. Communications port

3.4.1. CAN

(1) Pin number: J2: 21, 22

(2) Port Parameters:

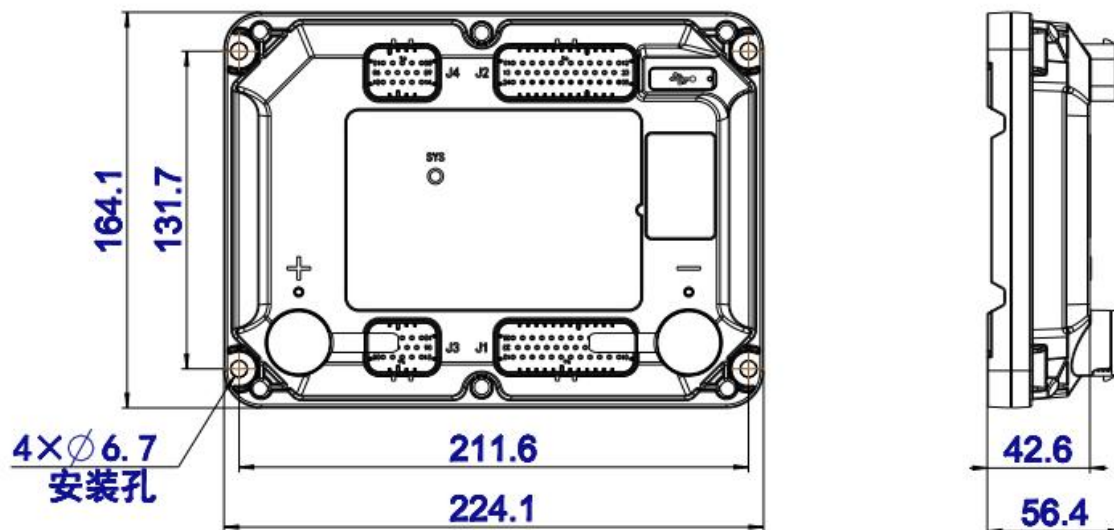
Schematic	
Communication Type	CAN2.0B
Port Protection	CAN_H and CAN_L have short circuit protection for UB and GND respectively.
Termination Resistor	No built-in termination resistor

4. Installation Instructions

4.1. Pre-installation inspection

	Tip. Before installation, please check whether the power supply and wiring are complete and correspond to each other, and whether the product is in good condition and free of bumps.
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4.2. Outline and Installation Dimension Drawing



4.3. Mounting accessories

P301 controller choose 4xM6 bolts for fixed installation, please ensure that the mounting surface is flat and free of foreign objects during installation. The mounting position in the direction of the connector should be reserved at least 100mm of installation space, to facilitate the connector plug pulling.

	Caution. Please use appropriate screws for installation to prevent the product from being damaged during placement and fastening.
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5. Burning Instructions

P series controllers need to be burned in via a USB flash drive. The specific burning method is as follows:

- (1) Copy the P301_app.bin file into the USB flash drive.
- (2) Insert the USB flash disk into the USB socket (only supports USB2.0).
- (3) After powering on, the controller automatically performs the burn-in, and the SYS indicator lights up when the burn-in is completed.
- (4) Unplug the USB flash disk and re-power on.