Controllers

F101

User manuals

Versions： Av2

Document No.0000265288

Contents

User manual
Contents

1.Historical records

Version	Date	Release	Editor	Description
Av 1	2021/8/29	N	Wang	First edition
Av2	2022/3/5	Y	Wang	Add wiring schematic
Av3	2022/5/26	Y	Wang	Add some parameters to the detailed parameters

2.Security instructions

2.1.Copyright

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2.2.Preface

This manual has been verified and reviewed for accuracy. The instructions and descriptions contained in this manual are accurate for the F101 controller at the time of publication. However, future issues of the F101 controller and its manual are subject to change without notice. Xuzhou Mook Electro-Hydraulic Co., Ltd. assumes no liability for damages arising directly or indirectly from errors, omissions or discrepancies between the product and the manual.

2.3.Marking of notices

Icon	Meaning	Detailed instructions
	DANGEROUS	It can be predicted to cause unavoidable serious injury, death or property damage
	WARNING	May result in unavoidable serious injury, death or property damage
	NOTE	This may result in minor injuries and losses
	INSTRUCTION	Non-safety-related usage guidance and information
	ANNOTATION	Additional instructions or usage recommendations

3.Product introduction

3.1.Product Description

The F101 is a powerful controller designed and developed specifically for the construction machinery industry and suitable for most complex working conditions. The product has an integrated high-speed computing chip, with port diagnostic functions, to make fast and accurate judgments on various types of faults, to facilitate the inspection of port faults and to improve maintenance efficiency and costs. A variety of communication interfaces facilitate the use of the network, and high-speed communication facilitates the improvement of the system's real-time performance. This improves the self-diagnosis and safety of the vehicle's electronic control system, effectively reducing service frequency and improving service efficiency.

The F101 controller meets the requirements of EN ISO 13849-1:2015, PLd safety class, and is safe and reliable for use in the complex environment of the construction machinery industry.

3.2.Product features

- Cast aluminium housing with AMP 154PIN waterproof connector;
- 300M main frequency 3-core automotive grade processor for faster program response;
- Recordable operation data, easy to trace operation data;
- 124 IO ports, 4 channels of CAN communication, 1 Ethernet option, good control and networking;
- The external output ports can detect short-circuit to power, ground and cable disconnection, providing a wealth of information for on-site problem solving and safety diagnosis.

providing a wealth of information for on-site problem solving, safety diagnosis and disconnection;

- Control parameter checks and backups to avoid the dangers of products working under illegal parameters;
- Reasonable layout, more reasonable heat dissipation, more stable work in high temperature environments;;
- Good port reusability, flexible configuration through software.

3.3.Technical parameters

Technical parameters	
Operating Voltage	8~36V DC, rated 24V
Operating temperature	-40℃~+85℃
Storage Temperature	-40℃~+85℃
Processor Unit	32Bit 300MHz, 3 core processor
RAM capacity	4MB
Parameter space	32KB FRAM, 1 billion erasures
Flash space	6MB
Status indicators	2 pcs
Protection level	IP66/67

Environmental testing	
Low temperature test	Standard: GB/T2423.01/IEC60068-2- 1 Low temperature test. -30℃ low temperature start-up test, 10 times, normal start-up -30℃ low temperature working test 16h
High temperature test	Execution standard: GB/T2423.02/IEC60068-2-2 High temperature test +85℃ high temperature full load working test 16h

Temperature shock	Standard：GB/T2423.22/IEC60068-2- 14 Temperature change test: Low temperature -40℃, high temperature 85℃; high and low temperature changeover time 3min, cycle times 10 times
Temperature and humidity cycle	Execution standard: GB/T2423.34/IEC60068-2-38 Combined temperature and humidity cycle test method High temperature 65±2℃, 93±3%; room temperature 25±2℃, 93±3%; low temperature - 10℃ 24h for one cycle, ten cycles
Vibration tests	Sine vibration standard: GB/T2423.10/IEC60068-2-6; vibration (sine) 30Hz, 4g, vertical 4h, horizontal 2h left, right, front and back, total 8h; Random vibration implementation standard: GB/T2423.56/IEC60068-2-64 10Hz~25Hz amplitude 3mm 50Hz~2000Hz, peak acceleration 50m/s2, sweep frequency 1oct/min, according to the number of up and down direction, front and back direction, left and right direction in turn Sweep frequency 2 times, for 24h
Impact testing	Standard：GB/T2423.5/IEC60068-2-27 Impact 100g/1 1ms, half sine wave, 100 shocks in each of the three axes
Drop test	Standard: GB/T2423.8/IEC60068-2-32 Free fall Transport condition (with bubble wrap), drop height 1000mm, 2 times
Salt spray	Standard: GB/T2423.17 / IEC60068-2- 1 1 The controller shall be tested at 35℃, 5% sodium chloride salt spray environment, without electricity for 96h, after the test, the shell, connectors and other parts shall be rust-free, and the controller shall work normally after connecting to the test voltage
Conductive emission	EN 61000-6-4 : 2007+A1:2011 EMC Emission Conducted emission (CE) power line 0. 15~0.50 MHz , QP<79dB (uV/m) 0 50~30 MHz , QP<73dB (uV/m)
Radiation emission	EN 61000-6-4 : 2007+A1:2011 EMC Emission Radiated Emission (RE), 10m method 30~230MHz, QP<40dB (uV/m) 230~1000MHz , QP<47dB (uV/m) ISO 14982-2009 Electromagnetic compatibility of agricultural and forestry machinery EN 13309:2000 Electromagnetic compatibility of construction machinery ISO 13766-2006 Electromagnetic compatibility of earth-moving machinery Broadband radiated emission (BRE) limits 30~75MHz , QP 64~54dB (uV/m) 75~400MHz, QP 54~65dB (uV/m) 400~1000MHz, QP 65dB (uV/m)
	Narrowband Radiated Emission (NRE) Limits 30~75MHz, QP 54~44dB (uV/m)

	75~400MHz, QP 44~55dB (uV/m) 400~1000MHz, QP 55dB (uV/m)
Immunity testing	EN 61000-6-2 : 2005 EMC immunity IEC 61000-4-2 : 2008 Electrostatic discharge CD: ±8KV, 25 times/point AD: ±15KV, 10 times/point IEC 61000-4-3 : 2010 Radiation immunity (RS) 80~1000MHz 20V/m 1400~2000MHz 10V/m 2000~2700MHz 3V/m IEC 61000-4-4 : 2012 Electrical fast pulse train (EFT) DC Power Port: ±2kV 5/50ns 5kHz 1min IEC 61000-4-5 : 2005 Surge DC Power Port: ±1kV 1 2/50us waveform, 60s repetition, 20 times

	IEC 61000-4-6 : 2008 Conducted Immunity (CS) 0. 15 to 80MHz, AM 80%, 1kHz sine wave, 10V IEC 61000-4-8 : 2009 Working frequency magnetic fields (PFM) 50/60Hz, 30A/m
ISO 7637 Immunity	ISO 7637-2 Transient disturbances along power lines 24V Test Level IV Pulse 1 , -600V , Criterion:C Pulse 2a , +1 12V, Criterion:A Pulse 2b , +20V , Criterion:C Pulse 3a , -300V , Criterion:A Pulse 3b , +300V , Criterion:A ISO 7637-3 Transient disturbances along signal lines 24V Test Level IV Slow Pulses , ICC method , ±10V , Criterion:A Fast Pulses , CCC method , ±80V , Criterion:A
ISO11452 Immunity	ISO 14982-2009 Electromagnetic compatibility of agricultural and forestry machinery ESA immunity EN 13309:2000 Electromagnetic compatibility of construction machinery ESA immunity ISO 13766-2006 Electromagnetic compatibility of earth moving machinery ESA immunity ISO 11452-2 : 2005 Absorption chambers Conducted immunity 100 V/m ISO 11452-4 : 2005 Large volume current injection (BCI) 100mA
CAN port immunity	DC withstand voltage value ±58V IEC61000-4-2:VESD ±8KV

3.4.Order Number

No.	Order No.	Product Name	Model No.	Remarks
1	231635	Controller	F101	4-channel PWMCC 2A 10-channel PWMCC 3A 4-channel PWMCC 4A 6-channel PWMCC 2A,DOL 4-channel PWMCC 4A,DOL
2		Controller	F101	8-channel PWMCC 3A 6-channel PWMCC 2A,DOL 4-channel PWMCC 4A,DOL
3		Controller	F101	4-channel PWMCC 2A 10-channel PWMCC 3A 4-channel PWMCC 4A 6-channel PWMCC 2A,DOL 4-channel PWMCC 4A,DOL 1 x Ethernet

4.Port Description

4.1.Electrical interface

➢The F101 controller has an AMP 154-cell waterproof connector with the following port type, number and description of parameters:

Input ports	Number of ports	Parameters
DIH/DIL	16	Default to high active switching inputs; May be multiplexed to a low active switch input;
DIH	26	Highly effective switching inputs;
VI(0~36V)/DIH	2	0 to 36V voltage type analogue signal input by default; May be multiplexed as a high effective switching input; Diagnosable short circuit to ground
CI/VI/DIH	19	4 to 20mA current type analog signal input by default; Multiplexable to 0~5V voltage type analog signal input, software settable; Multiplexable to high effective switch input, software settable; Diagnosable short-circuit fault to power supply
RI/DIL	4	Default 10 Ω to 1500 Ω resistive type analogue signal input; Multiplexable as low valid switch input, software settable; Diagnosable short circuit to ground and to power supply, with power supply short circuit protection
PI/DIL	4	PI inputs by default, PI1 and PI2 can be configured as dual pulse input circuits, PI3 and PI4 can be configured as dual pulse input circuits; Multiplexable as low active switching inputs, accuracy: ±0 2V
PI/DIH	6	PI input by default, PI5 and PI6 can be configured as a dual pulse input circuit; multiplexable as a high effective switching input, accuracy: ±0.2V; Multiplexable as 0 to 36V voltage type analogue signal input
Output ports	Number of ports	Parameters
AO (0~5V)	2	0V to 5V analogue output signal, diagnostic for short circuit to power or ground
PWM 2A/DOH	4	Maximum current 2A PWM output, diagnostic for short to power or ground, load overrun; can be multiplexed as high-side switch output
PWM 3A/DOH	10	Max. current 3A PWM output, diagnostic for short to power or ground, load overrun; can be multiplexed as high-side switching output
PWM 4A/DOH	4	4A PWM output max. current, diagnostic for short to power or ground, load overrun; multiplexable as high-side switched output
PWM 2A/DOL	6	Max. 2A PWM output, diagnostic for short to power or ground, load overrun; multiplexable as low-side switched output
PWM 4A/DOL	4	Max. 2A PWM output, diagnostic for short to power or ground, load overrun; multiplexable as low-side switched output
DOH 2A	14	High-side output with max. 2A current, diagnostic for short to power or ground, load overrun, wire break

4.2.Pin definition

➢The 154-pin connector used in the F101 controller can be divided into a 60-pin socket and a 94-pin socket:

4.2.1.Connector 1(60 pin)

Serial No.	Port Function	Main Function	Alternative Function 1	Alternative Function 2
101	PGND	Power ground		
102	PGND	Power ground		
103	PGND	Power ground		
104	+5VOUT	5V reference supply		
105	+10VOUT	10V reference supply		
106	AO1	Analogue output, 0-5V		
107	AO2	Analogue output, 0-5V		
108	+5VOUT	5V reference supply		
109	AI1	AI 0~36V	DIH	
110	AI2	AI 0~36V	DIH	
111	AI3	AI 4~20mA	AI 0~5V	DIH
112	KL15	Key start switch		
113	DOUT32	PWM (100~1000HZ) 4A	DOH 4A	
114	DOUT17	HS DO 2A		
115	DOUT18	PWM (100~1000HZ)3A	DOL 3A	
116	PGND	Power ground		
117	CAN2_L	CAN2_L		
118	CAN2_H	CAN2_H		
119	AI4	AI 4~20mA	AI 0~5V	DIH
120	AI5	AI 4~20mA	AI 0~5V	DIH
121	AI6	AI 4~20mA	AI 0~5V	DIH
122	AI7	AI 4~20mA	AI 0~5V	DIH
123	AI8	AI 4~20mA	AI 0~5V	DIH
124	AI9	AI 4~20mA	AI 0~5V	DIH
125	AI10	AI 4~20mA	AI 0~5V	DIH
126	AI11	AI 4~20mA	AI 0~5V	DIH

Serial No.	Port Function	Main Function	Alternative Function 1	Alternative Function 2
127	AI12	AI 4~20mA	AI 0~5V	DIH
128	AI13	AI 4~20mA	AI 0~5V	DIH
129	AI14	AI 4~20mA	AI 0~5V	DIH
130	DOUT36	PWM (100~1000HZ) 4A	DOL 4A	
131	AI24	AI 0~15K	DIL	
132	AI25	AI 0~15K	DIL	
133	AI15	AI 4~20mA	AI 0~5V	DIH
134	AI16	AI 4~20mA	AI 0~5V	DIH
135	AI17	AI 4~20mA	AI 0~5V	DIH
136	AI18	AI 4~20mA	AI 0~5V	DIH
137	AI19	AI 4~20mA	AI 0~5V	DIH
138	AI20	AI 4~20mA	AI 0~5V	DIH
139	AI21	AI 4~20mA	AI 0~5V	DIH
140	AI22	AI 0~15K	DIL	
141	AI23	AI 0~15K	DIL	
142	RXD	RS232 RXD		
143	TXD	RS232 TXD		
144	DOUT19	HS DO 2A		
145	DOUT20	PWM (100~1000HZ)3A	DOH 3A	
146	AGND	Analog Ground		
147	DOUT21	HS DO 2A		
148	DOUT22	PWM (100~1000HZ) 4A	DOH 4A	
149	DOUT23	HS DO 2A		
150	DOUT24	PWM (100~1000HZ)3A	DOH 3A	
151	DOUT25	HS DO 2A		
152	DOUT26	PWM (100~1000HZ)3A	DOH 3A	
153	DOUT27	HS DO 2A		
154	DOUT28	PWM (100~1000HZ)3A	HS DO 3A	
155	DOUT29	PWM (100~1000HZ) 2A	HS DO 2A	
156	DOUT30	PWM (100~1000HZ)3A	HS DO 3A	
157	PI7	Pulse Input 1HZ~15KHZ	DIH	
158	PI8	Pulse Input 1HZ~15KHZ	DIH	
159	AGND	Analog Ground		
160	DOUT31	PWM (100~1000HZ) 2A	HS DO 2A	

4.2.2. Connector 2 (94 pin)

Serial No.	Port Function	Main Function	Alternative Function 1	Alternative Function 2
201	UBP	Power supply, max 5A		
202	UBP	Power supply, max 5A		
203	UBP	Power supply, max 5A		
204	UBP	Power supply, max 5A		
205	UBP	Power supply, max 5A		
206	UBP	Power supply, max 5A		
207	DOUT33	PWM (100~1000HZ) 2A	LS DO 2A	
208	DOUT34	PWM (100~1000HZ) 4A	LS DO 4A	
209	DOUT35	PWM (100~1000HZ) 2A	LS DO 2A	
210	DI1	DIH		
211	DI2	DIH		
212	DI3	DIH		
213	DI4	DIH		
214	DI5	DIH		
215	DI6	DIH		
216	DI7	DIH		
217	DI8	DIH		
218	DI9	DIH		
219	DI10	DIH		
220	DI11	DIH		
221	DI12	DIH		
222	DI13	DIH		
223	DI14	DIH		
224	PGND	Power Ground		
225	PGND	Power Ground		
226	PGND	Power Ground		
227	UBS	System supply, max 5A		
228	DOUT1	HS DO 2A		
229	DOUT2	PWM (100~1000HZ) 4A	HS DO 4A	
230	DI15	DIH		
231	DI16	DIH		
232	DI17	DIH		
233	DI18	DIH		
234	DI19	DIH		
235	DI20	DIH		
236	DI21	DIH		
237	DI22	DIH		
238	DI23	DIH		
239	DI24	DIH		
240	DI25	DIH		
241	DI26	DIH		
242	DI27	DIH	DIL	
243	DI28	DIH	DIL	
244	DI29	DIH	DIL	
245	DI30	DIH	DIL	
246	DI31	DIH	DIL	
247	DI32	DIH	DIL	

(Continue to table on previous page)

Serial No.	Port Function	Main Function	Alternative Function 1	Alternative Function 2
248	DI33	DIH	DIL	
249	DI34	DIH	DIL	
250	DOUT3	HS DO 2A		
251	DOUT37	PWM (100~1000HZ) 2A	LS DO 2A	
252	DOUT38	PWM (100~1000HZ) 4A	LS DO 4A	
253	DI35	DIH	DIL	
254	DI36	DIH	DIL	
255	DI37	DIH	DIL	
256	DI38	DIH	DIL	
257	PI1	PI，1HZ~15KHZ	DIH	DIL
258	PI2	PI，1HZ~15KHZ	DIH	DIL
259	PI3	PI，1HZ~15KHZ	DIH	DIL
260	PI4	PI，1HZ~15KHZ	DIH	DIL
261	PI5	PI，1HZ~15KHZ	DIH	
262	PI6	PI，1HZ~15KHZ	DIH	
263	CAN1_H	CAN1_H		
264	CAN1_L	CAN1_L		
265	DGND	Digital Ground		
266	BSL	Bootloader Select Line		
267	CAN3_H	CAN3_H		
268	CAN3_L	CAN3_L		
269	CAN4_H	CAN4_H		
270	CAN4_L	CAN4_L		
271	DOUT39	PWM (100~1000HZ) 2A	LS DO 2A	
272	DOUT4	PWM (100~1000HZ) 3A	HS DO 2A	
273	DOUT40	PWM (100~1000HZ) 4A	LS DO 4A	
274	DOUT41	PWM (100~1000HZ) 2A	LS DO 2A	
275	DOUT42	PWM (100~1000HZ) 2A	LS DO 2A	
276	DI39	DIH	DIL	
277	DI40	DIH	DIL	
278	DI41	DIH	DIL	
279	DI42	DIH	DIL	
280	PI9	PI，1HZ~15KHZ	DIH	
281	PI10	PI，1HZ~15KHZ	DIH	
282	DGND	Digital Ground		
283	DOUT16	PWM (100~1000HZ) 2A	HS DO 2A	
284	DOUT15	HS DO 2A		
285	DOUT14	PWM (100~1000HZ) 2A	HS DO 2A	
286	DOUT13	HS DO 2A		
287	DOUT12	PWM (100~1000HZ) 4A	HS DO 4A	
288	DOUT11	HS DO 2A		
289	DOUT10	PWM (100~1000HZ) 3A	HS DO 2A	
290	DOUT9	HS DO 2A		
291	DOUT8	PWM (100~1000HZ) 3A	HS DO 3A	
292	DOUT7	HS DO 2A		
293	DOUT6	PWM (100~1000HZ) 3A	HS DO 3A	
294	DOUT5	HS DO 2A		

4.3.Wiring schematic

Fuse selection instructions：

 Please select the appropriate fuse for your specific port usage.

The rated output current of the controller is 35A, a fuse of less than or equal to 35A should be used. The fuse calculation formula is as follows:

Fuse rated current = (Number of 2A PWM channels x 2A PWM actual load current + Number of 3A PWM channels x 3A PWM actual load current + Number of 4A PWM channels x 4A PWM actual load + Number of 2A switching output channels x 2A switching output actual load current) × K. K is the selection factor, range: 1.5~2.5.

For example: 2 x 4A PWM with 3.2A load current, 4 x 3A PWM with 2.5A load current, 2 x 2A output with 1A load current, the recommended fuse current rating is: (2 x 3.2 + 4 x 2.5 + 2 x 1) × 1.5 = 27.6A. 27.6A is less than 35A, so we recommend using a fuse with a rated current of 35A.

4.4.List of plug-ins

➢Connector 1(60 pin)：

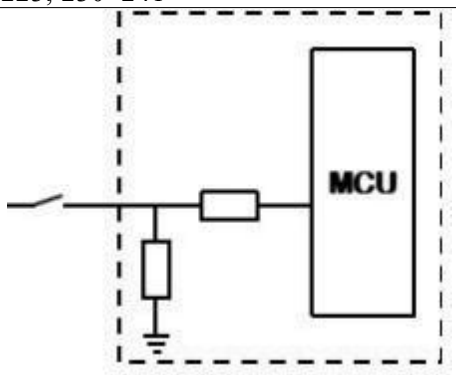
Serial number	Management Number	Description of the insert material	Number
1	510436	Sixty-hole plug, 2209544-9	1
2	510430	Sixty pole outlet cover, 2137753-1	1
3	510431	Sixty-pole secondary lock, 6-1355118-1	1
4	510437	Spanner, 2137752-1	1
5	509285	Hole terminal, 1241608-1	24
6	509284	Hole terminals, 968221-1	36

➢Connector 2 (94 pin)：

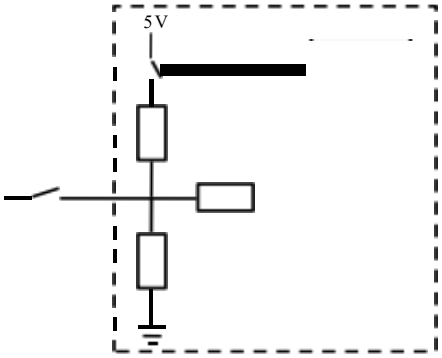
Serial number	Management Number	Description of the insert material	Number
1	510435	Ninety-four pole hole type plug, 2209545-9	1
2	510434	Ninety-four pole outlet cover, 2137755-1	1
3	510433	Ninety-four pole secondary lock, 6-1355134-1	1
4	510432	Ninety-four pole secondary lock, 6-1355135-1	1
5	510437	Spanner, 2137752-1	1
6	509284	Hole terminal, 1241394-1	6
7	509285	Hole terminal, 1241608-1	4
8	508984	Hole terminal, 968221-1	84
9	509289	Waterproof plugs, 828905-1	6
10	509288	Blind plugs, 828922-1	and water plug 2 options, max. 6

4.5.Detailed port parameters

4.5.1.DIH

DIH	Parameters
Pin	94-pin socket: 210~223, 230~241
Schematic	
Signal type	DIH
Max. input voltage	36V
Threshold voltage	>2 V judged as high, <0.7V judged as low

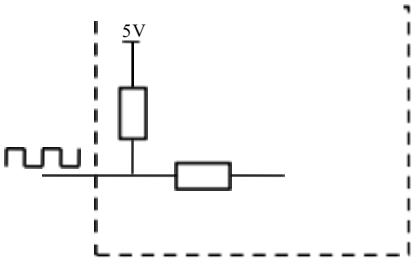
4.5.2.DIH/DIL

DIH/ DIL	Parameters
Pin	94-pin socket: 242~249, 253~256, 276~279
Schematic	
Signal type	The default is DIH, which can be reused as DIL, and can be set by software.
Max. input voltage	36V
Threshold voltage	>2 V judged as high, <0.7V judged as low

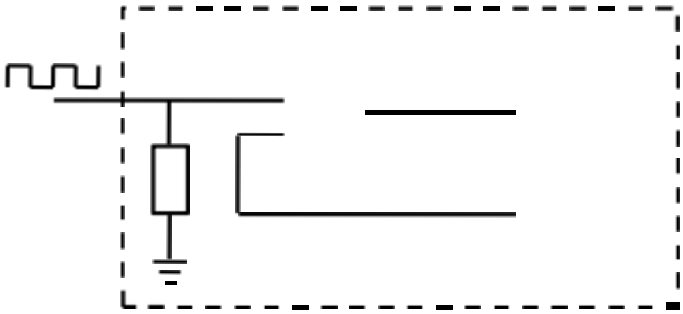
4.5.3.PI

- PI/DIL：

PI/ DIL	Parameters
Pin	94-pin socket: 257~260

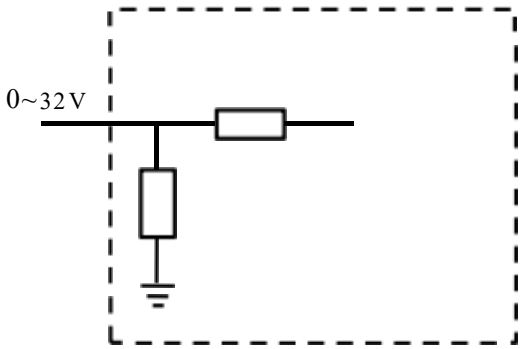
Schematic	
Signal type	Default is PI, which can be reused as DIL
Max. input voltage	Multiplexing to DIL >4V is judged high, <1V is judged low, software settable
Threshold voltage	1Hz~ 10000Hz
Schematic	36V
Signal type	PI1 and PI2 can be configured as a dual pulse input port; PI3 and PI4 can be configured as a dual pulse input port

PI/DIH：

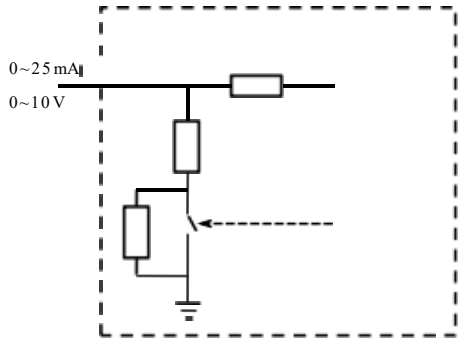
PI/ DIH	Parameters
Pin	94 pole pin socket: 157, 158, 261, 262, 280, 281
Principle diagram	
Signal Type	Default is PI, which can be reused as DIL
Threshold voltage	Multiplexing to DIH >2 V is judged high, <0.7 V is judged low, software settable
Input frequency	1Hz~ 10000Hz
Maximum input voltage	36V
Port Diagnostics	When multiplexed to VI the following diagnostic functions are implemented: <0.5V short circuit to ground; 0.5V to 9.5V Normal operation; >9.5V short circuit to power supply.
Dual pulse input port	PI5 and PI6 can be configured as a dual pulse input port

4.5.4.AI

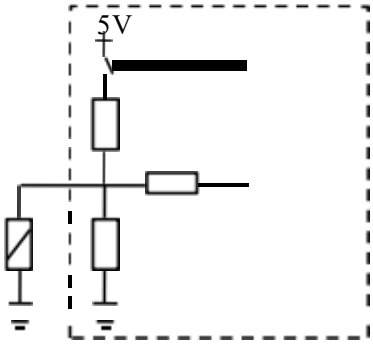
➢VI(0~36V) /DIH：

VI(0~36V)/DIH	Parameters
Pin	60-pin socket: 109, 1 10
Schematic	
Signal type	Default is VI (0~36V), which can be multiplexed to DIH
Signal input range	0~36V
Maximum input voltage	36V
Resolution	12bit
Threshold voltage	Multiplexing to DIH >4V is judged to be valid, software can be set
Port Diagnostics	The following diagnostic functions are implemented as VI: <0.5V short to ground, this port is mainly used to monitor the battery voltage and does not need to detect short to power faults.

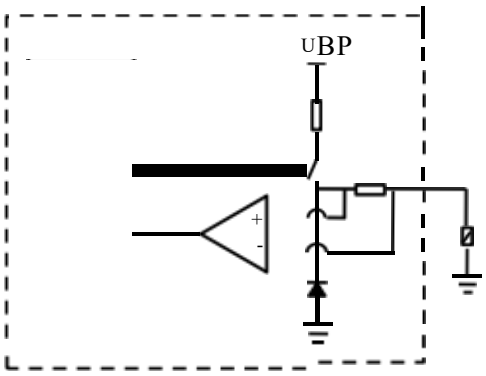
➢CI/VI/DIH：

CI/ VI/ DIH	Parameters	
Pin	60-pin socket: 1 1 1, 1 19~129, 133~139	
Schematic		
Maximum input voltage	36V	
Signal type	Default is CI, which can be reused as VI (0~5V) or DIH	
Input Range	0~25mA	
Resolution	12bit	
Threshold voltage	Multiplexing to DIH >4V is judged to be valid, software can be set	
Port Diagnostics	The following diagnostic functions are implemented as CIs: 0~4mA , short circuit to ground; 4~20mA , normal operation; 20~25mA , short-circuit to power.	When multiplexed to VI the following diagnostic functions are implemented: <0.5V short to ground; 0.5V to 9.5V Normal operation; >9.5V short circuit to power supply.

➢RI/DIL：

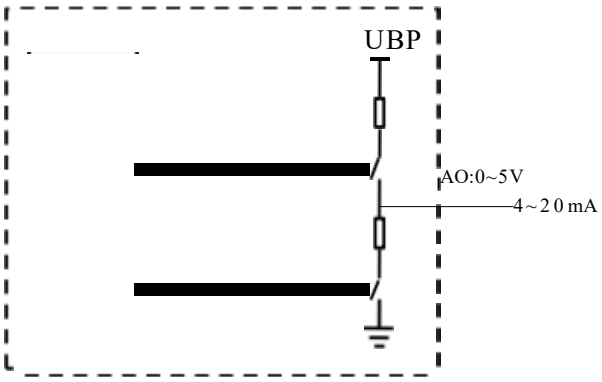
RI/ DIL	Parameters
Pin	60-pin socket: 131, 132, 140, 141
Schematic	
Maximum input voltage	36V
Signal type	Default is RI and can be multiplexed to DIH
Input Range	0Ω~ 1500 Ω
Input impedance	RI: 499 Ω pull-up resistor, 100 KΩ pull-down resistor
Resolution	DIL: to power supply 499Ω
Threshold voltage	12bit

4.5.5.DO

DOH	Parameters
Pin	60-pole pin socket: 2A output: 1 14, 144, 147, 149, 151, 153; 94-pole pin socket: 2A Output: 228, 250, 284, 286, 288, 290, 292, 294;
Schematic	
Driving capability	2A Output: 2A
Continuity diodes	Available
Float Voltage	<10V , 10KΩ load can be pulled down to <0.5V
Port diagnostics	Short to power; short to ground; load overrun (2A, 30s); disconnected.

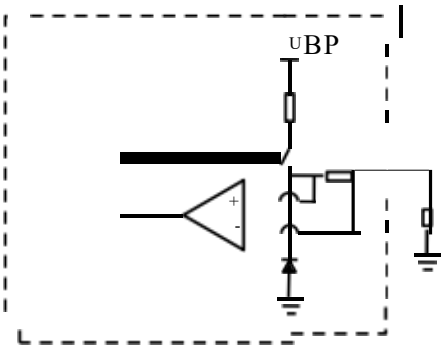
4.5.6.AO

➢AO (4~20mAor 0~5V)：

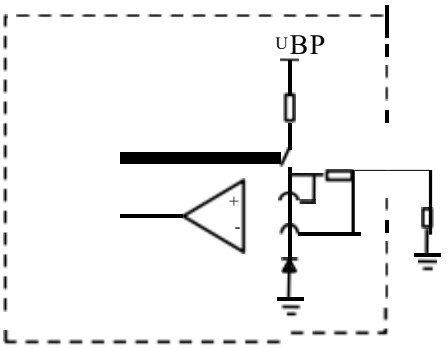
AO (0~5V)	Parameters
Pin	60-pin socket: 106, 107
Schematic	
Signal type	0V~5V output signal
Port Diagnostics	Short circuit to power supply, short circuit to ground, output voltage deviation of 5% or more

4.5.7.PWM

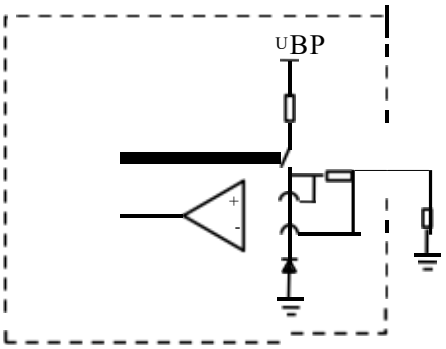
➢PWM 2A/DOH：

PWM2 A/ DOH	Parameters
Pin	60-pin socket: 155, 160; 94-pole pin socket: 283, 285;
Schematic	
Signal type	Default is PWM and can be reused as DOH
Drive capability	2A
Current feedback range	50~2000mA
Duty cycle	0~ 100%
Frequency range	100~ 1000HZ
Current sampling accuracy	1% FS
Float Voltage	<10V, 10KΩ load can be pulled down to <0.5V
Port diagnostics	Diagnostic functions implemented as PWM_2A: short circuit to power supply; short circuit to ground; load overrun (2A, 30s); wire break.

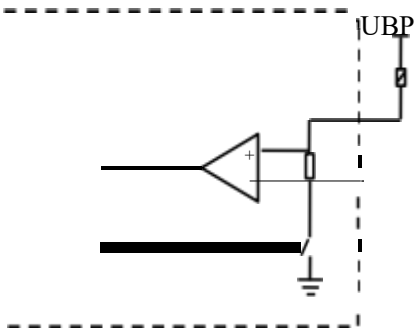
➢PWM 3A/DOH：

PWM3 A/ DOH	Parameters
Pin	60-pin socket: 1 15, 145, 150, 152, 154, 156; 94-pole pin sockets: 272, 289, 291, 293;
Schematic	
Signal type	Default is PWM and can be reused as DOH
Drive capability	3A
Current feedback range	50~3000mA
Duty cycle	0~ 100%, adjustable
Frequency range	100~ 1000HZ
Current sampling accuracy	1% FS
Float Voltage	<10V, 10KΩ load can be pulled down to <0.5V
Port diagnostics	Diagnostic functions implemented as PWM_3A: Short circuit to power supply; Short circuit to ground; Load overrun (3A, 30s); Wire break

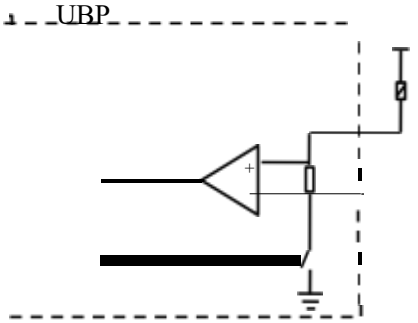
➢PWM 4A/DOH：

PWM4 A/ DOH	Parameters
Pin	60-pin socket: 1 13, 148 94-pin socket: 229, 287
Schematic	
Signal type	Default is PWM and can be reused as DOH
Drive capability	4A
Current feedback range	50~4000mA
Duty cycle	0~ 100%, adjustable
Frequency range	100~ 1000HZ
Current sampling accuracy	1% FS
Float Voltage	<10V, 10KΩ load can be pulled down to <0.5V
Port diagnostics	Diagnostic functions implemented as PWM_4A: Short circuit to power supply; Short circuit to ground; Load overrun (4A, 30s); Wire break

➢PWM 2A/DOL：

PWM2 A/ DOL	Parameters
Pin	94 芯针式插座：207 、209 、251 、271 、274 、275
Schematic	
Signal type	Default is PWM and can be reused as DOL
Drive capability	2A
Current feedback range	50~2000mA
Duty cycle	0~ 100%, adjustable
Frequency range	100~ 1000HZ
Current sampling accuracy	1% FS
Float Voltage	<10V, 10KΩ load can be pulled down to <0.5V
Port diagnostics	Diagnostic functions implemented as PWM_2A: Short circuit to power supply; Short circuit to ground; Load overrun (2A, 30s); Wire break

➢PWM 4A/DOL：

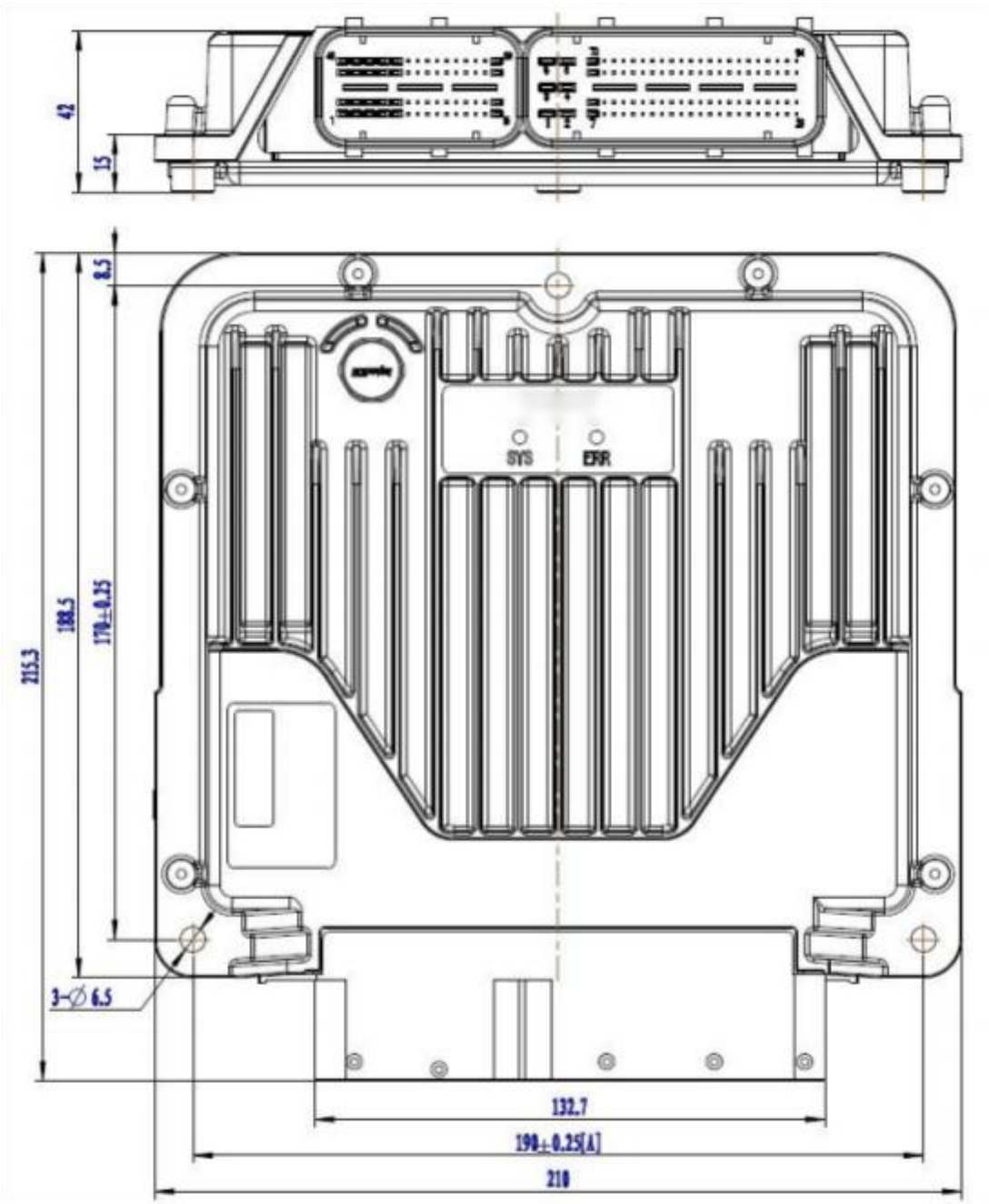
PWM4 A/ DOL	Parameters
Pin	60-pin socket: 130 94-pin socket: 208, 252, 273
Schematic	
Signal type	Default is PWM and can be reused as DOL
Drive capability	4A
Current feedback range	50~4000mA
Duty cycle	0~ 100%, adjustable
Frequency range	100~ 1000HZ
Current sampling accuracy	1% FS
Float Voltage	<10V, 10KΩ load can be pulled down to <0.5V
Port diagnostics	Diagnostic functions implemented as PWM_4A: Short circuit to power supply; Short circuit to ground; Load overrun (4A, 30s); Wire break

5.Mounting instructions

5.1.Pre-installation inspection

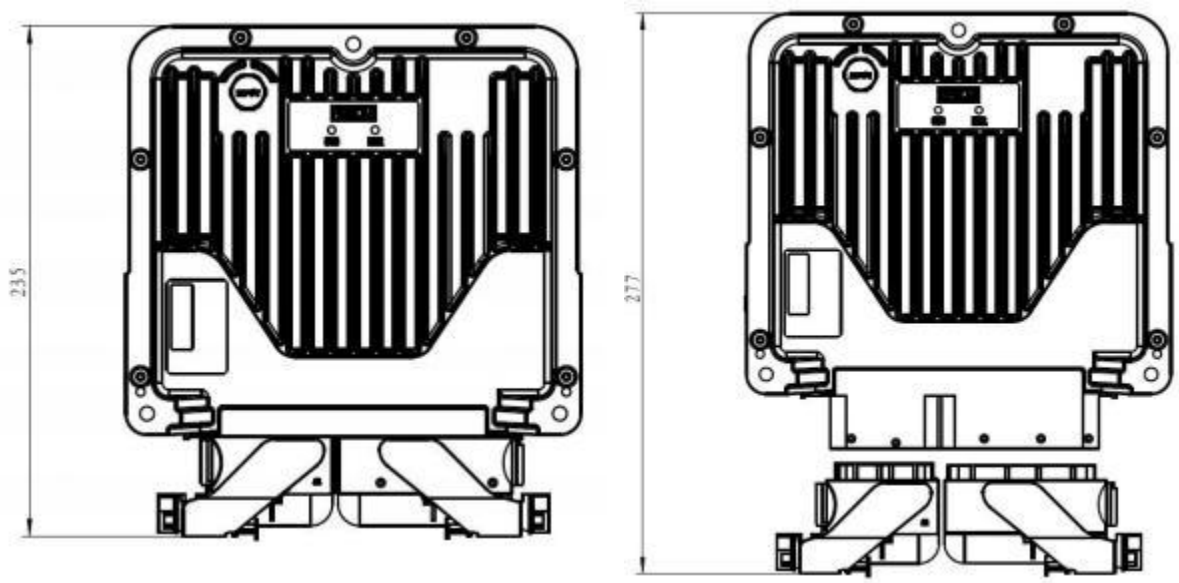
Before installation, please check that the power supply and wiring are complete and that the product is in good condition and free from bumps.

5.2. External and installation dimensions

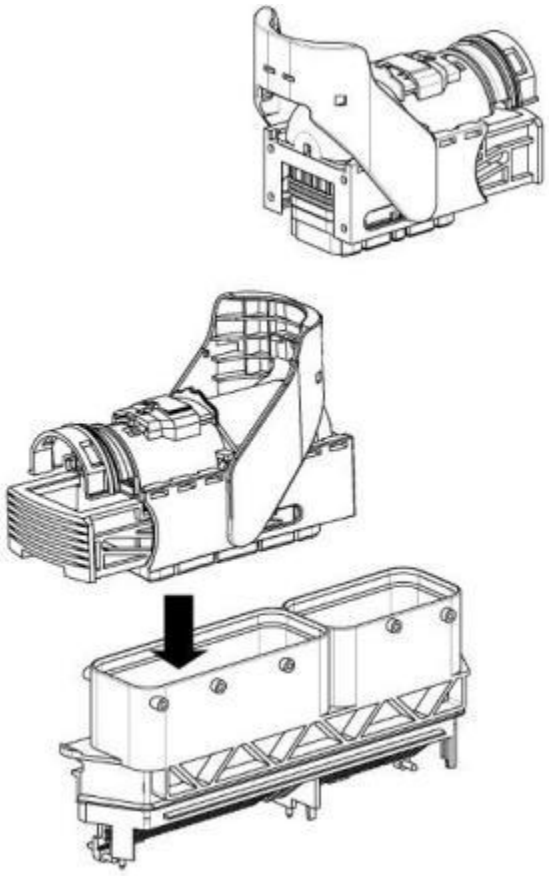


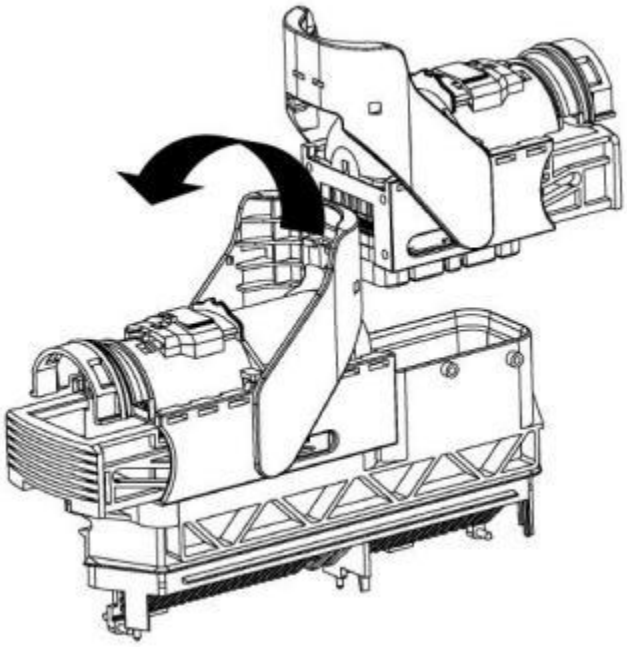
5.3.Mounting accessories

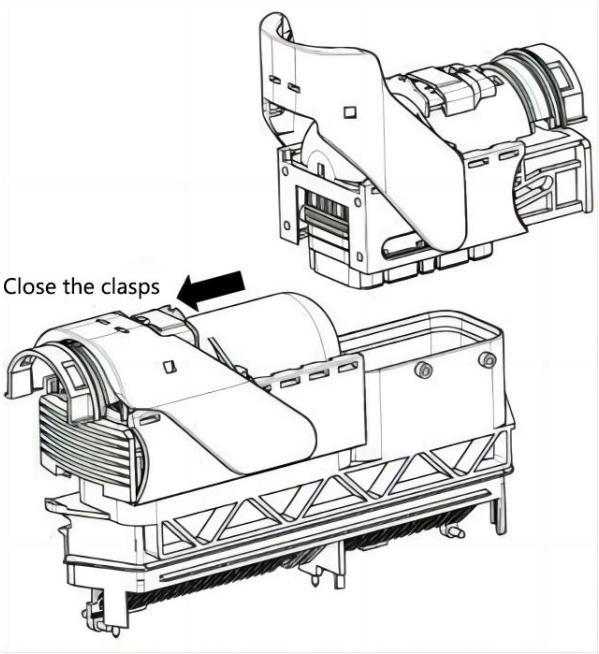
The F101 controller is mounted with 3 x M6 bolts/screws. The overall length of the controller is 235 mm with the butt connector attached, so it is recommended to leave at least 60 mm of mounting space at the controller interface for easy extraction.



Installation method for butt connectors：

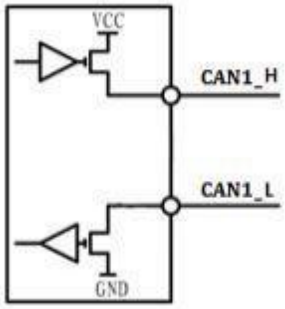




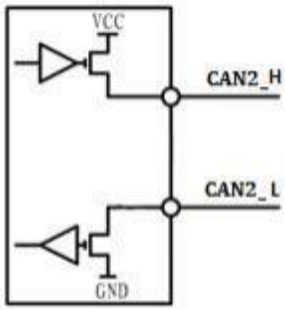


6.Communication ports

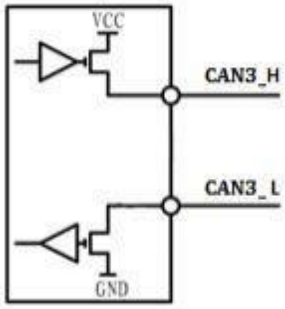
6.1.CAN1

CAN1	Parameters
Pin	94-pin socket: 263, 264
Schematic	
Baud rate range	50K, 100K, 125K, 250K, 500K, 1Mbit/s, software configurable
Default Baud Rate	250Kbit/s
Port Protection	CAN1_H and CAN1_L are protected against short-circuiting to UB and GND respectively
Terminating resistor	No built-in termination resistor

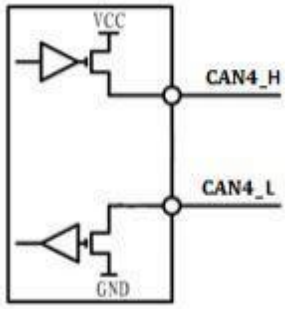
6.2.CAN2

CAN2	Parameters
Pin	60-pin socket: 1 17, 1 18;
Schematic	
Baud rate range	50K, 100K, 125K, 250K, 500K, 1Mbit/s, software configurable
Default Baud Rate	250Kbit/s
Port Protection	CAN2_H and CAN2_L are short-circuit-proof to UB and GND respectively
Terminating resistor	No built-in termination resistor

6.3.CAN3

CAN3	Parameters
Pin	94-pin socket: 267, 268
Schematic	
Baud rate range	50K, 100K, 125K, 250K, 500K, 1Mbit/s, software configurable
Default Baud Rate	250Kbit/s
Port Protection	CAN3_H and CAN3_L are protected against short circuit to UB and GND respectively
Terminating resistor	No built-in termination resistor

6.4.CAN4

CAN4	Parameters
Pin	94 pole pin socket: 269, 270
Schematic	
Baud rate range	50K, 100K, 125K, 250K, 500K, 1Mbit/s, software configurable
Default Baud Rate	250Kbit/s
Port Protection	CAN4_H and CAN4_L are short-circuit-proof against UB and GND respectively
Terminating resistor	No built-in termination resistor

7.Common Troubleshooting

7.1.Common hardware faults and solutions

Serial number	Frequently Asked Questions	Solutions
1	No output from the port after power on	First check whether the power supply is normal, if it is, please contact our service staff for a solution.
2	No signal collected at the port after power on	First check if the signal voltage is normal, if it is, please contact our service staff for a solution.
3	CAN communication failure after power on	First check that the external CAN cable is correctly connected, if it is, please contact our service staff for a solution.

7.2. Common software failures and solutions

Serial number	Frequently Asked Questions	Solutions
1	CodeSys Online Failed	(1) Make sure that the CAN device or serial port driver is installed; (2) Make sure that the CAN device or serial port is not occupied, if it is, close the application and restart the Gateway; (3) Please replace the Gateway.cfg file in the correct path.
2	The controller stops running after loading the App	Please check if there are any divisions or overflows in the application, if so the PLC program will stop and the error message "May be div 0 or Overflow" will be checked in the Device log.

7.3.Status indicator description

➢SYS light indicates controller operating status：

Indicator status	Description
Off	Not powered
White always on	Controller in BLS grounded boot mode or control dead
Green light blinking	System is running normally
Red light flashing	No App program
Blue flashing	CAN port failure or warning

The ERR indicator can be controlled by the customer according to their own product software.