Analog Output Module

QJ-AO8 Manual V3.0

（High-precision Current Mode）

System Parameters==========

Voltage: Direct current 18-28V, support reverse connection protection(The switching power supply is preferred.)

Power consumption: 1 W under the condition of static current output

6W under the condition of full power output with the current output mode

3W under the condition of full power output with the voltage output mode.

Number of Channels: two channels, 4 channels and 8 channels(optional)

Output scope： 0～20mA；4～20mA；0～10V；0～5V；1～5V optional

Resistance: in the case of current output, the resistance is ≤500Ω

In the case of voltage output, the resistance is ≥500Ω

Resolution: 16 bits

Output precision: 0.2%

Communication interface: RS485 port, insulaton of 1500V DC , ±15kV ESD protection and over-current protection.

Communiction protocol : Modbus RTU

Transmission distance: ≥800M (Twisted - pair cable)

Baud rate： 1200/2400/4800/9600/19200/38400/57600/115200 bps

Communication data format: 1 start bit , 8 data bit , No parity checking, 1 or 2 stop bits.

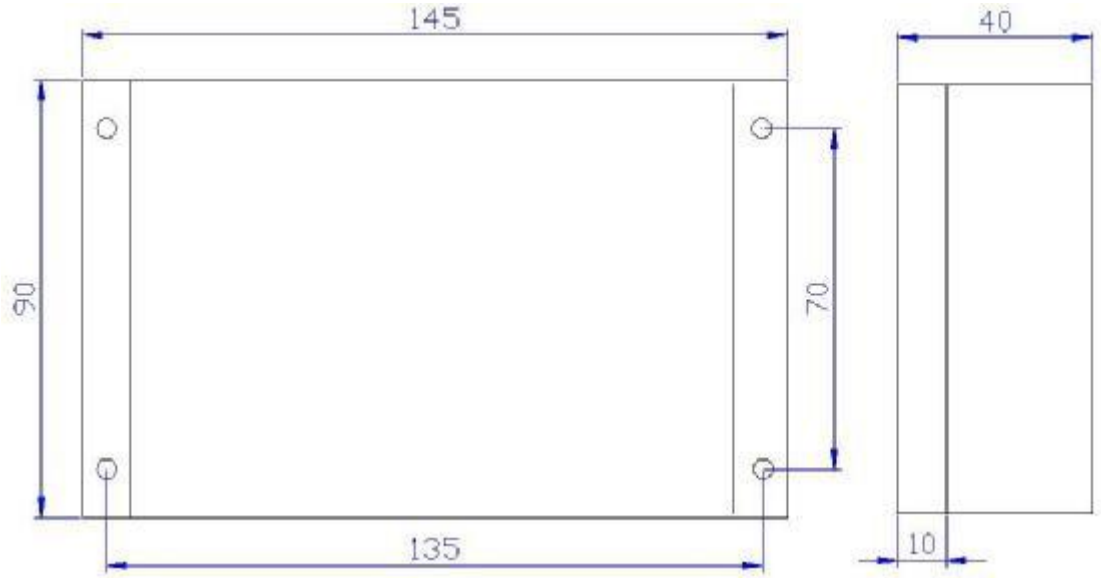
Working Temperature: -10℃～60℃

Storage temperature: -10℃～60℃, Humidity : 5%～95%, no dew.

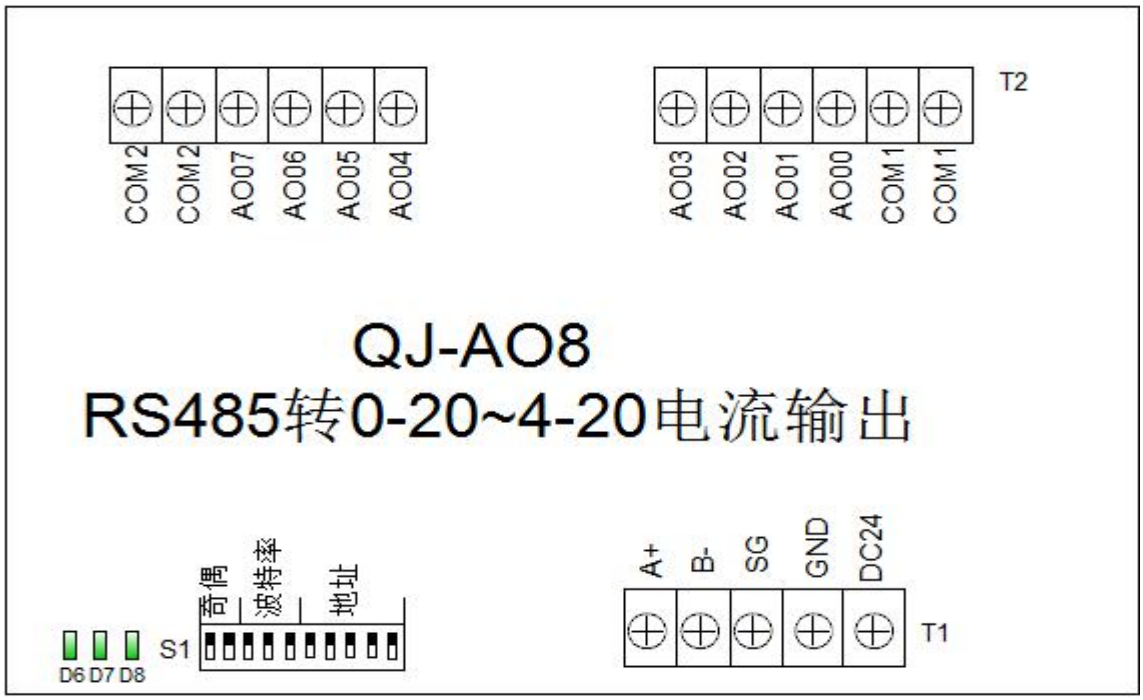
Dimension and Terminal Layout========

Cover material: ABS engineering plastic

Dimensions: 145mm(length) * 90mm(width) * 40mm(height)



Installation: the device is fixed with standard DIN35 lead rail and screws(see the following sketch as a reference)



转： turn 电流输出： current output 奇偶： parity 波特率： Baud rate 地址： address

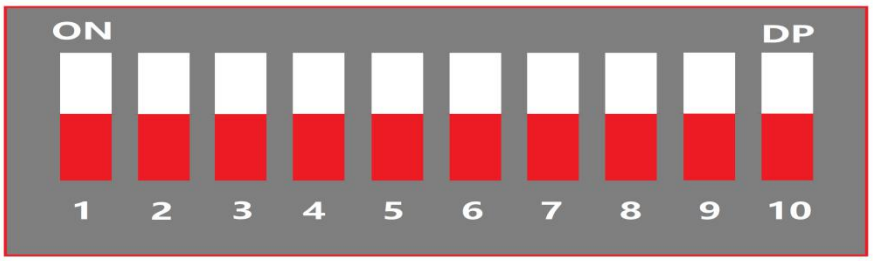
Terminal Definition==========

T1	Definition	Explanation
1	+24V	Output power supply voltage 18-28 V DC， DC 24V is recommended (Reverse connection protection is optional)
2	GND	
3	A	RS485+
4	B	RS485-
5	SG	RS485 signal ground

T2	Definition	Explanation
1	COM1	Analog quantity public side
2	COM1	Analog quantity public side
3	AOO0	1st channel analog output
4	AO01	2nd channel analog output
5	AO02	3rd channel analog output
6	AO03	4th channel analog output
7	AO04	5th channel analog output
8	AO05	6th channel analog output
9	AO06	7th channel analog output
10	AO07	8th channel analog output
11	COM2	Analog quantity public side
12	COM2	Analog quantity public side

Dial Switch ==========

Dial switch is used to adjust the baud rate, data format, mudbus hardware address, and etc. The dial switches have to be pre-set to initianize all the 485 communication modules developed by our company. Restart is necessary once the state of the dial swithch is changed.



Communication data verification	S1	S2
No verification 1 stop	0FF	OFF
No verificaiton 2 stops	0FF	ON
ODD verification 1 stop	ON	0FF
EVEN verfication 2 stops	ON	ON

Baud rate	S3	S4	S5
1200	OFF	OFF	OFF
2400	OFF	OFF	ON
4800	OFF	ON	OFF
9600	OFF	ON	ON
19200	ON	OFF	OFF
38400	ON	OFF	ON
57600	ON	ON	OFF
115200	ON	ON	ON

Module hardware address set-up	S6	S7	S8	S9	S10
0	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	ON	ON
4	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	ON	OFF	ON
6	OFF	OFF	ON	ON	OFF
7	OFF	OFF	ON	ON	ON
8	OFF	ON	OFF	OFF	OFF
9	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON
16	ON	OFF	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON
18	ON	OFF	OFF	ON	OFF
29	ON	OFF	OFF	ON	ON
20	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON
22	ON	OFF	ON	ON	OFF
23	ON	OFF	ON	ON	ON
24	ON	ON	OFF	OFF	OFF
25	ON	ON	OFF	OFF	ON
26	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON
28	ON	ON	ON	OFF	OFF
29	ON	ON	ON	OFF	ON
30	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON

Indicator==========

From left to right: the power supply indicator (ON with the electricity)

Communication indicator (The indicator flickers when the data are transmitted. The flickering speed changes with the frequency of communication data)

Error indicator(OFF at the normal state and ON at the abnormal state)

Register==========

Output register	Modbus address (hexadecimal)	PLC address	Description	Attributes	Supported function code
channel 0	0x0009	400010	Output is controlled directly by input data. The ultimate output is decided by the state of maximum register and on-work register.	(Read and write)	03、06、16
channel 1	0x000A	400011			
channel 2	0x000B	400012			
channel 3	0x000C	400013			
channel 4	0x000D	400014			
channel 5	0x000E	400015			
channel 6	0x000F	400016			
channel 7	0x0010	400017			

Maximum register	Modbus address (hexadecimal)	PLC address	Description	Attributes	Supported function code
Maximum register channel 0	0x7594	430101	Factory default：0xFFFF The module provides the output scope automatically when the maximum data are input. For example, in the case of maximum register channel 1 the maximum value is 10000. The maximum value will be displayed immediately if 10000 is input. That is to say, for the module of 0~20mA, 4-20mA and 0-10V, the maximum value 20mA, 20ma and 10V will be got respectively	Read /Write(automatic saving function activates in the case of power failure.)	03、06、16
Maximum register channel 1	0x7595	430102			
Maximum register channel 2	0x7596	430103			
Maximum register channel 3	0x7597	430104			
Maximum register channel 4	0x7598	430105			
Maximum register channel 5	0x7599	430106			
Maximum register channel 6	0x759A	430107			
Maximum register channel 7	0x759B	430108			

Output mode Register	Modbus address (hexadecimal)	PLC address	Description	Attributes	Supported function code
Output mode Register Channel 0	0x7530	430001	Factory default: 0x0000 (4~20mA) Default setting :0*0000, i.e. 4-20mA Compatible with the following modes: 0x0000=4~20mA 0xFFFF=4~20mA 0x0001=0~20mA 0x0002=1~ 5V 0x0003=0~5V 0x0004=0~10V Attention: hardware jumper wire is necessary for the switch between voltage and current	Read /Write(automatic saving function activates in the case of power failure.)	03、06、16
Output mode Register Channel 1	0x7531	430002			
Output mode Register Channel 2	0x7532	430003			
Output mode Register Channel 3	0x7533	430004			
Output mode Register Channel 4	0x7534	430005			
Output mode Register Channel 5	0x7535	430006			
Output mode Register Channel 6	0x7536	430007			
Output mode Register Channel 7	0x7537	430008			

Overtime Time Register	Register Address (hexadecimal)	Register Address (decimal)	Remarks	Attributes
High order	0x7540	30016	Communication overtime time (with power failure protection) (Default time: 10 seconds)	Read/write
Low order	0x7541	30017		Read/write

For example, with the mode of 0-20mA register, whose maximum value of the register is 0*FFFF, the output current 20mA and 10 mA will be got if 0*FFFF and 0*8000 are input respectively.

Remarks:

The maximum value can be decided by the customers within the scope of 0-65535.

Tips: users can also set the maximum value to be 20000(i.e. 0*4E20). As a result, what users need

to do is just input 20000, users get the 20mA output current properly without complicate calculation.

If he wants to get better output resolution rate(0-65535),User just needs to input 0*FFFF into the register. By doing this, the scope of the device will be changed into 0-65535.

Format of calculating current:

4-20mA mode : output current=20ma*(value *0.2+Val*0.8)/value

0-20mA mode: Output current=20mA*val/value

Val refers to the value of the register(decimal)

Value refers to the value of the channel of maximum register(decimal)

E.g.

In the condition of 4-20mA with Channel 0, its maximum value of the register 30100 is 15000. If 0x0BBB(3000)is input, the output current is 7.2mA(15000*0.2+3000*0.8).

In the condition of 0-20mA with the channel 0, the maximum value of the register 30100 is 20000. The output current is 3.00mA(20*3000/20000) if 0x0BBB(3000) is input.

3：Overtime Transmission Register

Explanation:

The so-called overtime transmission refers to the state when the transmission is broken for some reason and the break-down time is longer than the set value for the register.

E.g. if the overtime sphere is set as 3 seconds, it is necessary to input two registers for the following reasons.

3 seconds =3000millisoconds(decimal)=0x0bb8(hexadecimal)

7530H=0x0000 and 7531H=0x0bb8

【0x0000(high 16 bits) *65536】+ 0x0bb8(low 16 bits) = 0x0bb8（i.e.3000mS）

Communication Protocol==========

QJ-AO8 module follows the Modbus RTU protocol and it is compatible with the following function codes.

Function	Write/Read	Function
03	Read	Multi-registers are readable
06	Write	Only read one register
16	Write	Multi-registers can be written.

No. 03 Function Code

No.03 function code is used to read the contents in the register and can read one register or several ones successively.

Attentions: 03 code can not read the register that doesnot exist. Otherwise the module will give an alarm.

E.g.the main station demands the values from the channel 0 and channel 1 in the register.

1） The main station demands message

Message contents	Length	Scope	Sample
Sub-station address	1 bit	0x00～0x1F	0x01
Function code	1 bit	0x03	0x03
Initial address	2 bits	Refer to the address in the register	0x0009
Input quantity	2 bits	The quantity of registers that need to be read successively	0x0002
CRC verification	2 bits	0x0000～0xFFFF	0x1409

Remarks 1: the sample of the main station demanding message of two registers starting from 9.

2） The normal reaction of the sub-station

Message contents	Length	Scope	Sample
Sub-station address	1 bit	0x00～0x1F	0x01
Function	1 bit	0x03	0x03
Bit quantity	1 bit	N	0x04
The current data in the register	N bits		0x1388
The current data in the register	N bits		0x8000
CRC verification	2 bits	0x0000～0xFFFF	0x1F5D

Remarks 1： N= bit quantity of data

Remarks 2: the sample of the sub station reaction. The actual value is 0x1388(channel 0) and 0x8000(channel 1)

3） Abnormal reaction of sub-station

Message contents	Length	Scope	Sample
Sub-station	1 bit	0x00～0x1F	0x01
Function code	1 bit	0x83	0x83
Error	1 bit	0x01（not a supported function code）	0x01
		0x02（initial address is out the range of 0x0009-0x0010）	
		0x03（the number of registers is out the range of 0x0001-0x0008）	
		0x04（data verification error）	
CRC verification	2 bits	0x0000～0xFFFF	0x80F0

No. 06 Function Code

No.06 function code is used to write one holding register. The specified holding register must exist and can be written in ordor to input. Otherwise, the module will give an alarm.

E.g. The value of channel 1 of the output register is 0x0002.

1） The main station demanding message

Message contents	Length	Scope	Sample
Sub-station address	1 bit	0x00～0x1F	0x01
Function code	1 bit	0x06	0x06
Initial address	2 bits	refer to the address table in the register	0x7531
Register value	2 bits	0x0000～0xFFFF	0x0002
CRC verification	2 bits	0x0000～0xFFFF	0x43C8

2） Normal message of the sub-station

Message contents	Length	Scope	Sample
Sub-station address	1 bit	0x00～0x1F	0x01
Function code	1 bit	0x06	0x06
Initial address	2 bits	0x0000～0x0007	0x7531
Register value	2 bits	0x0000～0xFFFF	0x0002
CRC verification	2 bits	0x0000～0xFFFF	0x43C8

3） Abnormal message of the sub-station

Message contents	Length	Scope	Sample
Sub-station address	1 bit	0x00～0x1F	0x01
Function code	1 bit	0x86	0x86
Error code	1 bit	0x01（not a supported function code）	0x01
		0x02（initial address is out the range of 0x0000～0x0007）	
		0x03（the register is out the range of 0x0000～0xFFFF ）	
		0x04（data verification error）	
CRC verification	2 bits	0x0000～0xFFFF	0x83A0

No.16 Function code

No.16 function code is used to write single or multiple registers. The specified holding register must exist and can be written in order to input. Otherwise, the module will give an alarm.

E.g. the values of the channel 1 of output register 0-3 are 0x0000，0x2710，0x1388，0x8000

1）The main station demanding message

Message contents	length	Scope	Sample
Sub-station	1 bit	0x00～0x1F	0x01
Function code	1 bit	0x10	0x10
Initial address	2 bits	Refer to the register	0x0009
Register quantity	2 bits	N	0x0004
Bit quantity	1 bit	2*N	0x08
Register value	2*N bits		0x0000， 0x2710， 0x1388, 0x8000
CRC verification	2 bits	0x0000～0xFFFF	0x881C

Remarks: the table above is a sample of demanding message from the main station when 2 registers are written starting from 30016. 0x00002710 means 10000ms。

2）Normal message of the sub-station

Message contents	Length	Scope	Sample
Sub-station address	1 bit	0x00～0x1F	0x01
Function code	1 bit	0x10	0x10
Initial address	2 bits		0x0009
Register quantity	2 bits	N	0x0004
CRC verification	2 bits	0x0000～0xFFFF	0x11C8

3） Abnormal message of the sub-station

Message contents	Length	Scope	Sample
Sub-station address	1 bit	0x01～0x1F	0x01
Function Code	1 bit	0x90	0x90
Error Code	1 bit	0x01（not a supported function code）	0x01
		0x02（initial address is out the range of specification）	
		0x03（out range of the registers)	
		0x04（data verification error）	
CRC Verification	2 bits	0x0000～0xFFFF	0x8DC0

The demos of all brands of PLCs and configurition softwares of touch screens and the solutions are available in our company. Please contact us without hesitation if you want to know more details about the products.

Foshan Qingjun Electronics Co., Ltd.
Address：Room 307，the 3rd floor， Building B，Chaofa Chuangyi Park，2# Lianhe Road，Nanhai District，Foshan city， Guangdong， China。
TEL：（86）0757 81809248
FAX：（86）0757 81809249
Company website：fsqjkj.en.alibaba.com