HQ Proportional Control Unit (PCU-A)
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*Thanks for purchasing our HQ series electric actuator. Before installing or operating actuator, please read this manual to thoroughly know how to install and operate this device.

The contents of this manual are subject to change without notice due to continuously ongoing improvements.
Section 1: Check point before using actuator

1. Check if specification (Model No., Main Power, Control Power, Options) of delivered
actuator meets your requirements or not.
2. Check the application such as valve, damper & etc.
3. Check if mounting of actuator on application is correct and tight enough.
4. Check if settings of actuator such as limit switch, stopper bolts, indicator is correct or
not.
5. Check if electric wiring is correct or not.
   — Check rotating direction of actuator
   — Open actuator about 50% by manual, supply power to actuator for 2-3
seconds.
   — Push close button and check if actuator closing direction is correct or not.
   — If actuator is moving in the wrong direction, turn off power supply to the
actuator and reverse the open and close lines from the PCU card.
7. Generally, all PCU functions are set in the factory before delivery and there is no need
to set the functions again.
   — Only in special cases where the customer wants to adjust the limit switches, is
PCU function setting required.
   — Setting is simple and only requires the pushing of the AUTO SETTING button
after putting actuator in 50% open (or close) position.
   — PCU automatically sets all the functions by itself.
8. Disassembly or modification without the factory’s consent may affect the performance
of the actuator.

Section 2: General Performance

The PCU is the local actuator controller, using 12-bit A/D converter and an 8-bit Microproces-
sor, which operates the open and close functions according to the input signal from main
controller.
After operating the actuator, the PCU detects the current position and transmits position
feedback signals to the main controller.
Section 3: Standard Specification

1. Model: PCU REV A4
2. Power: 85V-260VAC +10% 50/60Hz 4VA Max (New Wide range of voltage)
3. Input signal: 4-20mA DC, 2-10V DC, 0-5V DC, 0-10V DC, 1-5V DC
   Input resistance: 250 Ohms, Feedback signal: 100 - 10K Ohm
4. Output signal: 4-20mA DC, 2-10V DC, 0-5V DC, 0-10V DC, 1-5V DC
5. Load resistance: 500 Ohms Max.
6. Control output: TRIAC contact 250VAC 16A Max (Inductive load)
7. Number of output contact: 2 each (Open and close contact)
8. Delay time adjustment: 0.05-7.5 sec (0Step 50msec 0-15 Step)
   1-4 Step (Step Number X200msec) 5-15 Step (Step Number X 500msec)
9. Dead Band adjustment: 0.12mA DC MAX
10. Resolution Adjustment: 0 Step: 0.068mA 0-15 Step (Step Number +0.068mA)
11. Position conversion accuracy: +0.5 - +1.5% (Depends on installation)
12. Ambient temperature: 25°C - +80°C
13. Ambient humidity: 90% RH Max (Non-condensate)
14. Dielectric strength: 1500V AC 1 Min (Input to output, Power to Ground)
15. Insulation resistance: Min. 500V DC 30Mohm
16. Vibration & Shock (X, Y, Z); 10g (6g based on RMF, Frequency: 0.2 - 34Hz, 30 Min)
17. LED Signal

Figure 1 PCB LED Panel

<table>
<thead>
<tr>
<th>LED</th>
<th>SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue On</td>
<td>Power On (AUTO)</td>
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<tr>
<td>Blue Flicker</td>
<td>AUTO SETTING</td>
</tr>
<tr>
<td>Green Flicker</td>
<td>Closing</td>
</tr>
<tr>
<td>Green On</td>
<td>Full Close</td>
</tr>
<tr>
<td>Red Flicker</td>
<td>Opening</td>
</tr>
<tr>
<td>Red On</td>
<td>Full Open</td>
</tr>
<tr>
<td>Yellow On</td>
<td>Manual Mode</td>
</tr>
<tr>
<td>Yellow Flicker</td>
<td>Fault in either</td>
</tr>
<tr>
<td></td>
<td>No input signal, Wrong input wiring, Wrong PIU setting</td>
</tr>
</tbody>
</table>

 VIEW A
Section 4: Function of a PCU and how to set and use it

4.1 Selecting of the input signal

User can select suitable input signal by adjusting DIP switches as follows.

![Figure 2: Input DIP switch](image)

NOTE:
If there is no instruction for the input signal, the default is 4-20mA.

4.2 Setting of fail position

In order to prevent issues when the signal fails, the user can set the fail position of actuator by setting of DIP switches as follows.

![Figure 3: Fail position DIP setting](image)
4.3 **Delay Time**

This prevents continuous operation of PCU card caused by abnormal signal input such as noise, microphone and other foreign frequency. Once the signal is detected, PCU follows that signal but if there is a preset time, PCU doesn't move within the time.

PCU can move when input signal lasts a certain time which is preset. Turning the switch clockwise, increases delay

Range 0.05-7.5 sec (0Step 50msec 0-15Step)  
1-4 Step (Step Number X 200msec)  
5-15Step (Step Number X 500msec)

**Figure 4 Delay rotary switch**

4.4 **Resolution adjustment**

This is set allowance between input signal and position of actuator and if turned clockwise, sets it wider and vice versa.

Please observe caution when turning this counter-clockwise because if it is too narrow, it could cause 'HUNTING'.

HUNTING is an issue where the actuator doesn't stop at a position and repeats the move of open and close

Dead Band adjustment: 0.12mA DC MAX

Resolution Adjustment: 0 Step: 0.068mA  
0-15Step (Step Number+0.068mA)

**Figure 5 Resolution adjustment switch**

**NOTE:**

HUNTING is one of the causes of motor burning and damage of potentiometer and PCU card.
### 4.5 Manual operation by PCU card

In order to operate actuator by card, press ZERO and SPAN buttons together for 2 seconds. The yellow LED will turn on to confirm manual operation mode.

If ZERO button is pushed, actuator will move to close and if the SPAN button is pushed, the actuator will move to open.

Left alone for 15 seconds without operation, PCU will come out from manual operation mode.

**NOTE:**
(During manual operation mode, input signal is ignored)

---

### 4.6 Special signal setting for full open and full closed

**Figure 6** Manual operation button

**Figure 7** Special setting switch

- **"3 Up"**
  - Signal: 4.3mA  
  - Full Closed
  - Signal: 19.7mA  
  - Full Open

- **"3 Down"**
  - Signal: 4mA  
  - Full Closed
  - Signal: 20mA  
  - Full Open
4.7 AUTO SETTING

If mounting between actuator and application is correct, and input signal, input power and wiring are correct, push AUTO SETTING button just once regardless of the position of actuator.

Then Blue LED flickers with indicating LED as following:

1) Opening with Red LED in 5 sec -> 2) Full Close with Green LED -> 2) Full Open with Red LED.

NOTE:
Please make sure that Limit Cam touches (Open/Close) Limit Switch while Autosetting.

4.8 Split range (CH1)

The Split range is a useful function that allows the customer to set the actuator to full close and full open position using a signal if the input signal is not precise.

If customer wants to set actuator to full close position at 5mA, supply 5mA DC and actuator moves to the position.

Then put CH1 DIP switch on and push ZERO button once. Then actuator acknowledges that position as full close position and transmits 4mA DC.

Open set is same but instead, push SPAN Button.

Once setting is done, put CH1 DIP switch off.

Adjustable range is:

- Close: 3 - 8mA DC
- Open: 16 - 21 mA DC

NOTE:
By using this DIP switch, the customer may set various positions at certain signal.
4.9 Reversal acting switch (CH2)

Generally, clockwise-rotating direction of actuator is to close but if user wants reverse action, please do the following:

Switch "5 " Up : Signal : 20mA Full Closed
                Signal : 4mA Full Open

Switch "5 " Down : Signal : 4mA Full Closed
                  Signal : 20mA Full Open

Put the actuator to 50% open (or close) position, and push the AUTO SETTING button. Supplying 4-20mA, check operation and rotating direction.
4.10 Selection of output signal

The user can select suitable output signal by adjusting DIP switches as follows:

**Figure 11 Output selection DIP switch**

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<thead>
<tr>
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<th>2</th>
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<tbody>
<tr>
<td></td>
<td>4 - 20mA DC</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>0 - 5V DC</td>
</tr>
<tr>
<td></td>
<td>1 - 5V DC</td>
</tr>
<tr>
<td></td>
<td>2 - 10V DC</td>
</tr>
</tbody>
</table>

**NOTE:**
If there is no instruction for the input signal, 4-20mA is the factory default signal setting.

Adjust zero or span volume switch to meet the exact value of output signal in accordance with input signal value.
Section 5: Special tools

1. L-Wrench 1 set (metric)
2. Screw driver(-)
3. Monkey spanner (1 set)
4. DC signal generator (0-24mA DC)
5. Multi-meter
6. mA DC meter (0-25mA DC)

Section 6: Setting potentiometer (Replacing and setting)

1. Put actuator into full close position
2. Take P1 and P2 and measuring its resistance, turn potentiometer until it reaches a value between 30 -100 Ohm.
3. Engage the potentiometer gear into main gear and tighten the screw.

Figure 12 Potentiometer schematic
Section 7: Limit switch setting

1. Pull over the lever for manual operation and turn hand wheel to move actuator to full close (or open) position.

2. Loosen the bolts tightening cam by L-wrench, and turn CLS (or OLS) cam to CW (or to CCW), so that cam may hit the lever of close (or open) limit switch. Then tighten the bolt by L-wrench.

Figure 13 Potentiometer internal switch layout
Section 8: Check operation of PCU

Table 1. PCU operation legend

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Full Close</th>
<th>Full Open</th>
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<tbody>
<tr>
<td>Input signal</td>
<td>4mA DC (1V DC, 2V DC)</td>
<td>20mA DC (5V DC, 10V DC)</td>
</tr>
<tr>
<td>Output signal</td>
<td>4mA DC</td>
<td>20mA DC</td>
</tr>
<tr>
<td>Signal LED</td>
<td>Green LED on</td>
<td>Red LED on</td>
</tr>
<tr>
<td>Auto setting</td>
<td>Blue LED flicker</td>
<td>Yellow LED flicker</td>
</tr>
<tr>
<td>Input signal failure</td>
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Section 9: Layout of PCU Card

Figure 14 PCU Card component layout and function
Figure 15  PCU Card PCB layout and function highlight views
Section 10: Document Revision

Table 2. Revision Overview

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C.2 Dwg. No. HQ-1500-A, 1 Ph Wiring Diagram Std.
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<td>9/F Gateway Building</td>
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