

Proportional Control Unit (PCU)

Installation & Maintenance Manual

Version 1.1

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※ Caution : Please read this manual before installing or operating the actuator,

※ This manual is not a controlled document and is subject to alteration without notice.

(Check website for current version)

1. Check Point Before Using Actuator

- (1) Check the Specification of the Actuator to ensure that it meets your requirements. (Model No, Main Power, Control Power and Optional items)
- (2) Check the application such as Valve, Damper etc.
- (3) Check that mounting of actuator on application is correct and that it is tightly secured.
- (4) Check that settings of limit switches, Mechanical stop-bolts, Visual indicator is correct.
- (5) Ensure that the Actuator is wired correctly to the relevant wiring diagram.
- (6) The Dead band, Dead time set at factory before shipment
- (7) Any adjustments to the limit switches or potentiometer will require a recalibration of the Actuator (See Section 6).
- (8) Torque Switches: These are Factory set and should not be adjusted.

2. General performance

PCU is the actuator control card enabling the actuator to open and close according to the input signal supplied.

After operating the actuator, the PCU detects the position of the actuator and transmits an analogue feedback signal.

3. Standard specification

(1)MODEL : PCU-001

(2)POWER : MAIN: 110/220VAC , PCU: 24V ACDC, $\pm 10\%$, 50/60 Hz, MAX 4VA

(3)INPUT SIGNAL : 4~20mA DC, 1~5V DC , 2~10V DC

0~20mA DC, 0~5V DC, 0~10V DC

INPUT SIGNAL RESISTANCE: 250 Ω , POSITION RESISTANCE: 100~10K Ω

(4)OUTPUT SIGNAL: 4~20mA DC, 1~5V DC, 2~10V DC

0~20mA DC, 0~5V DC, 0~10V DC

(5)LOAD RESISTANCE: 500 Ω MAX.

(6)DEAD TIME : 0.2~7.5 sec (set from 0 step to 16 steps)

- Step 0 : 0.2 sec
- Step 1 ~ 4 : 0.25 ~ 1sec (0.25sec Step)
- Step 5 ~ F : 2.5 ~ 7.5sec (0.5sec Step)

(7)DEAD BAND : 0.3~7.5 % (set from 0 step to 16 steps)

- Step 0 : 0.1%
- Step 1 ~ 4 : 0.2% increase per step
- Step 5 ~ F : 0.5% increase per step

(8)FAULT MODE : FAIL CLOSE, FAIL OPEN, FAIL STOP

(9)POSTION CONVERSION ACCURACY: $\pm(0.2\sim 5)\%$ (It can be differed from environment)

(10) AMBIENT TEMPERATURE : -20 $^{\circ}\text{C}$ ~ 80 $^{\circ}\text{C}$

(11) AMBIENT HUMIDITY: 90% RH MAX. (NON-CONDENSING)

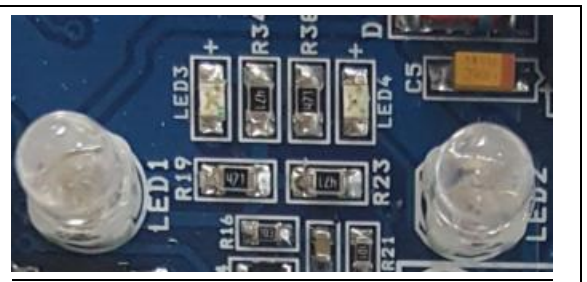
(12) DIELECTRIC STRENGTH: 1500V AC 1MINUTE.

(13) INSULATION RESISTANCE : 500V DC, 50 M-Ohm more

(14) Vibration& shock: Z direction 1g / 3g. Hz : 100 / 200 Hz, Time : 30minutes

(15) LED Signal

Color	Location	Signal
RED	LED1	CLOSE
GREEN	LED2	OPEN
BLUE	LED3	POWER OR AUTO
YELLOW	LED4	MANUAL OR FAULT

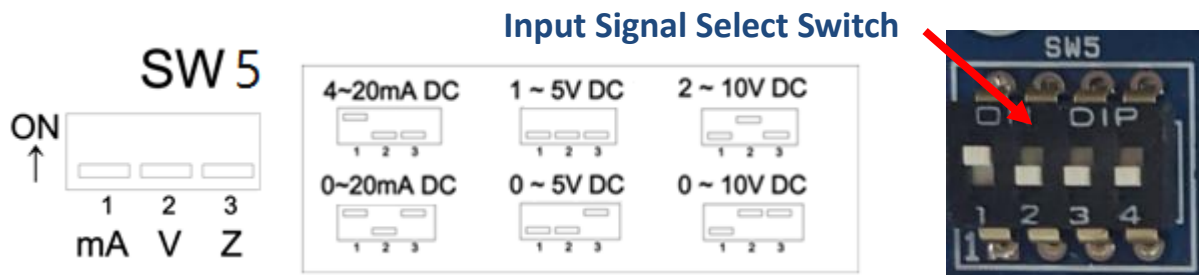


4. Main Functions and How to use

(1) Selection of input signal

A. Selection of input signal

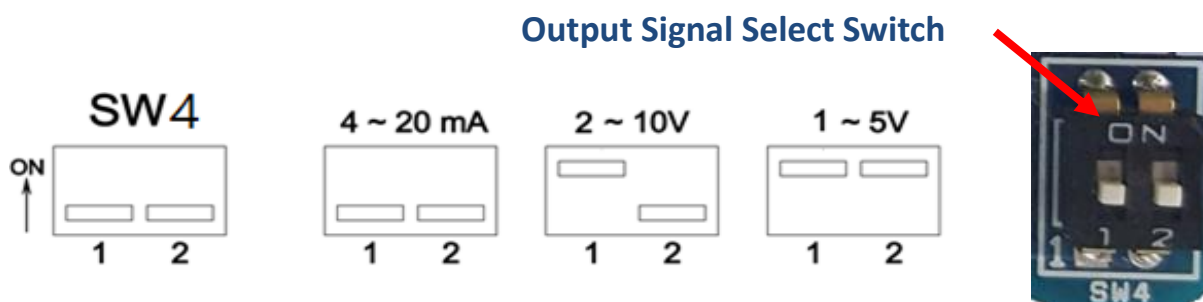
A suitable input signal can be achieved by adjusting DIP switches as follows.



※ NOTICE : The factory selects 4~20mA as the standard input signal.

(2) Selecting Output Signal

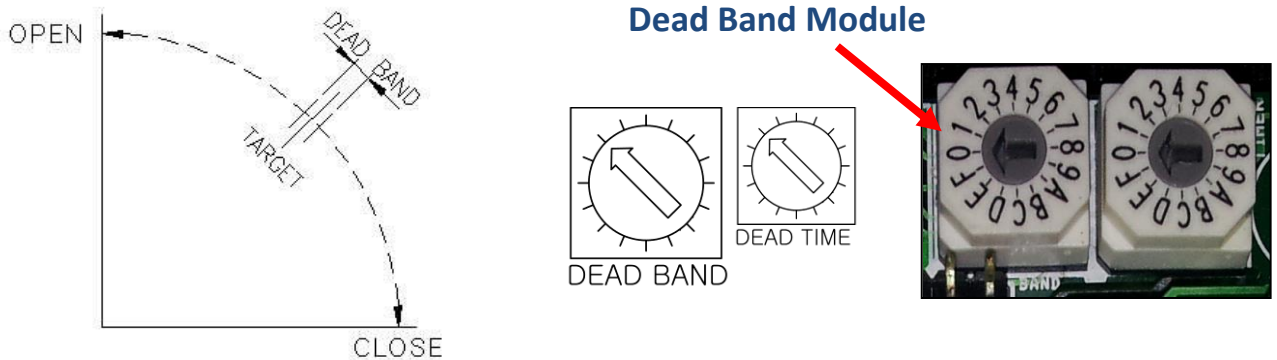
A suitable output signal (Feedback) can be achieved by adjusting Dipswitches as follows.



※ NOTICE : The factory sets 4~20mA as the standard output signal.

(3) DEAD BAND SETTING

- Max. Allowable value of error of actuator position by input command signal.
- Min. variation range of input command signal to start operating the actuator.



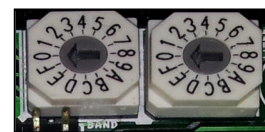
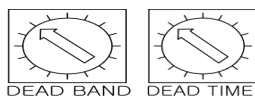
- Range of DEAD BAND setting : 0.3 ~ 7.5 % (setting available by 16 step)
- Step 0: 0.1%
- Step 1 ~ 4: 0.2% increase per step (1.0% ~ 1.8%)
- Step 5 ~ F: 0.5% increase per step (5.0% ~ 7.5%)
- Standard Setting Value ; “4”
- When DEADBAND is set too narrow, the Actuator may run back and forward repeatedly not finding the target position (Hunting).

DEADBAND should be properly adjusted to prevent the problem of hunting.

- ※ Continuous hunting can be the cause of actuator problems such as Motor, PCU Card, Potentiometer, etc.

(4) DEAD TIME

Dead Time Module

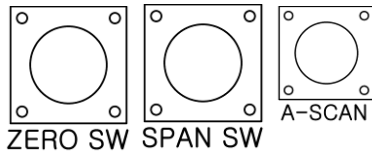


- DEAD TIME setting is to secure the reliability of command signal.
- Minimum duration time of input command signal satisfying DEAD BAND.
- Actuator is operated by recognizing input signals satisfying DEAD TIME as command signals
- It prevents malfunctioning of actuator by sources of disturbance such as noise.

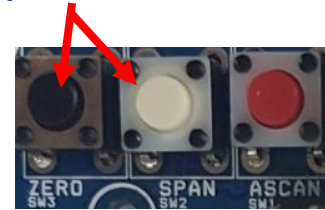
Range of DEAD TIME Setting: 0.2 ~ 7.5 sec (setting available by 16 steps)

- 1) Step 0 : 0.2 sec (the minimum value)
- 2) Step 1 ~ 4 : 0.25 sec increase per step (0.25 ~ 1 sec)
- 3) Step 5 ~ F : 0.50 sec increase per step (2.5 ~ 7.5 sec)
- 4) Standard Setting Value ; “4”

(5) MANUAL MODE



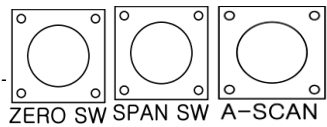
Manual Operation Button



- To operate the ACTUATOR manually.
Press “ZERO” BUTTON and “SPAN” BUTTON simultaneously for more than one second, YELLOW LED comes on to show that Manual Mode is ready.
- Press ZERO BUTTON (black): to operate actuator to CLOSE direction.
- Press SPAN BUTTON (white): to operate actuator to OPEN direction.

※ MANUAL MODE can be deactivated automatically when there is no new command signals for more than 10 seconds or when ZERO SW and SPAN SW are pushed for more than 1 second.

(6) AUTO CALIBRATION SETTING



Auto Setting Button



- Check status of wiring connections for electrical power and input /output signals after Actuator and Valve are correctly assembled.
- If all wiring connections are correctly made, Press “A-SCAN” (red) button on the PCU card once.
- Then PCU card will start the actuator calibration automatically, indicated by Auto setting light (Blue LED) flashing.

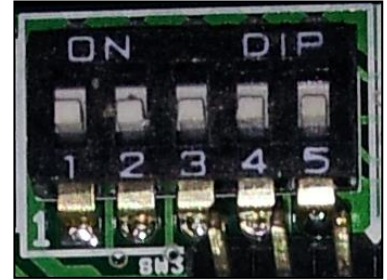
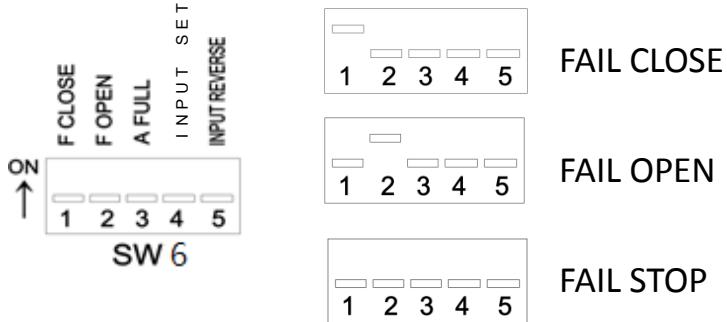
- AUTO SETTING:

- 1) BLUE LED flashes continuously.
- 2) Actuator is moving to CLOSE (Red LED Flashes) --> fully CLOSED (Red LED stays On) If Actuator is already closed position, Actuator will skip the process of CLOSING.
- 3) When OPENING (Green LED Flashes) --> fully OPENED (Green LED stays On)
- 4) When CLOSING (Red LED light Flashes) --> fully CLOSED (Red LED stays On)
- 5) Upon Completion (Blue LED stays On) --> it will then run to new position according to new signal.

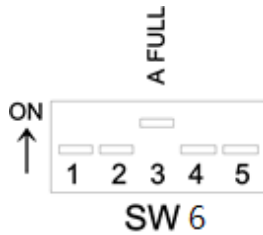
※ Auto setting command is cancelled automatically when any button of Zero, Span, Auto is pressed during Auto Setting.

(7) FAIL CLOSE, FAIL OPEN, FAIL STOP

The actuator automatically operates to open, close or stays put upon loss of input signal or incorrect input signal.

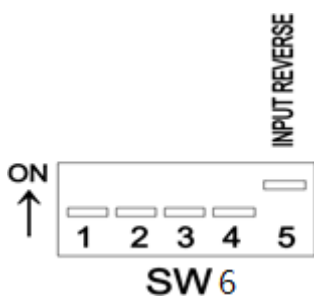


(8) A FULL (Auto Full Action)



When A FULL DIP SWITCH (#3) is ON, the actuator moves to full close position under 4.3mA input signal and full open position over 19.7mA input signal.

(9) REVERSE MODE

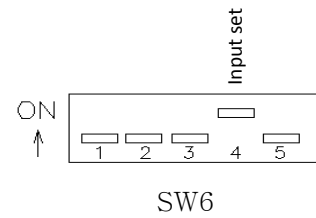
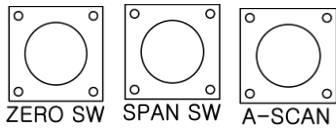


Used when the customer wants to use input and output signals opposite to standard.

ie: When command signal is 4mA the actuator moves to full open position and indicates 4mA as the output signal reading.

When command signal is 20mA the actuator moves to Full Close position and indicates 20mA as the output signal reading.

(10) Setting the Optional Set Point



1. Use when necessary to change ZERO(Full Close) signal and SPAN(Full Open) signal.
2. ZERO signal setting Range : generally 3 ~ 8 mA DC
3. SPAN signal setting Range : generally 16 ~ 21mA DC

※ Example

4. To set 5mA Close position signal and 19mA Open position signal.

- 1) Put #4 Dipswitch up on SW6.
- 2) Red / Green LED will turn off, wait until Red LED is flashing.
- 3) Set 5mA on command signal of input terminal.
- 4) Check 5mA is entered then press Black “ZERO” button.
- 5) Check the Yellow LED flashes once.
- 6) Check the Red LED is on and Green LED is flashing.

Set 19mA on command signal of input terminal.

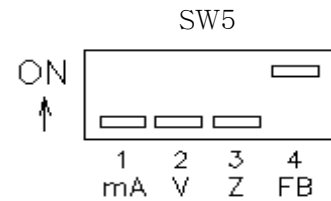
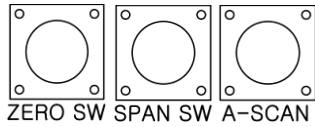
- 7) Press the white “SPAN” Button.
Check the Yellow led flashes once and Red LED is flashing.

- 8) Put #4 Dipswitch down on SW6 to finish the setting.
- 9) Set the Feedback to match the new input settings (See following page)

※ During the setting, if #4 Dipswitch is pressed down the setting will be cancelled.

※ During the setting process if no buttons are pressed for 2 minutes or if there is any input signal prior to completion then the setting will be cancelled.

(11) Setting the feedback



5. Setting the output signal as required.
6. ZERO BUTTON (Black): Decreases the Output signal.
7. SPAN BUTTON (White): Increases the Output signal.

※ Example

- 1) Required settings: Close Position 4mA, Open Position 20mA
- 2) Put #4 Dipswitch up on SW5.
- 3) The Red & Green LED's will flash and then only the Red LED will flash.
- 4) Press the "ZERO or SPAN" buttons to set the output signal to 4mA.
- 5) Check the 4mA output signal then press "ASCAN" button.
- 6) Check the Green LED is flashing and Red LED is on.
- 7) Press the "ZERO or SPAN" buttons to set the output signal to 20mA.
- 8) Check 20mA output signal and press the "ASCAN" button.
- 9) The Red & Green LED'S will flash together and then only the Red LED will be flashing.
- 10) Put #4 Dipswitch down on SW5.
- 11) The setting is complete.

※ During the setting if #4 Dipswitch is pushed down on SW5 then the setting will be cancelled.

※ During the setting, If there is any input signal during 2minutes the setting is cancelled.

(12) LED DISPLAY

LED	Color	Operation	Status	LED
CLOSE	LED1	RED	On	FULLY CLOSED
			Flashing	CLOSING
OPEN	LED2	GREEN	On	FULLY OPEN
			Flashing	OPENING
AUTO	LED3	BLUE	On	POWER ON
			Flashing	AUTO SETTING
FAULT	LED4	YELLOW	On	MANUAL MODE
			Flashing	MALFUNCTION

(13) ERROR DISPLAY : PCU CARD is in error condition(when the yellow led flashing).

When you push the black “zero” button you can check error condition with Led status.

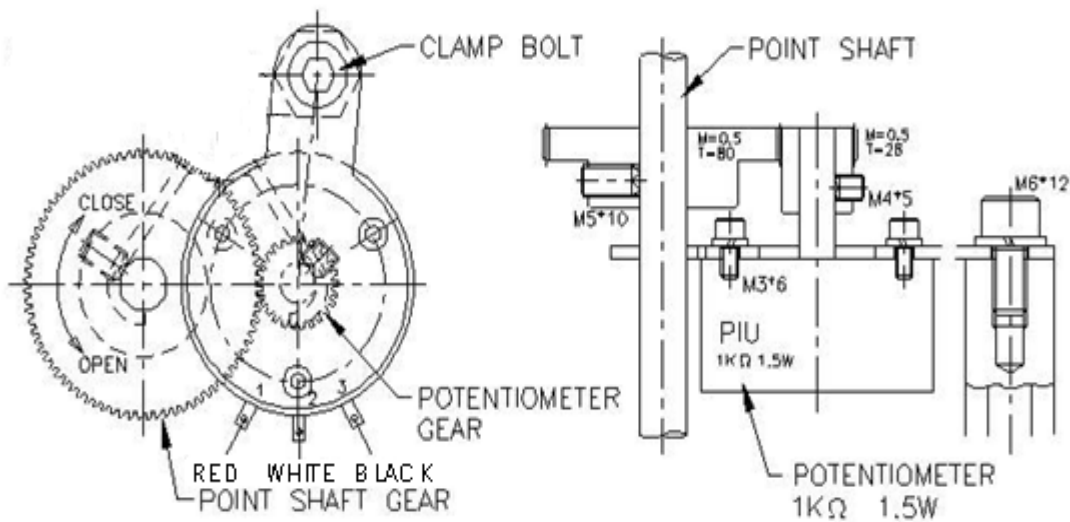
no	Sort of the Error.	LED Status			
		RED	BLUE	YELLOW	GREEN
1	Input signal initialization Error	OFF	OFF	OFF	ON
2	Output signal Error	OFF	OFF	ON	OFF
3	Auto setting initialization error.	OFF	OFF	ON	ON
4	Input command signal Error	OFF	ON	Flashing	OFF
5	Input DIP SW setting Error	OFF	ON	OFF	OFF
6	POTENTIOMETTER Error	OFF	ON	ON	OFF
7	Open position error	OFF	ON	ON	ON
8	Close position error	ON	OFF	OFF	OFF
9	Motor backlashing	ON	OFF	OFF	ON
10	EEPROM Error	ON	OFF	ON	OFF
11	TORQUE TRIP	ON	OFF	ON	ON

5. POTENTIOMETER SETTING ADJUSTMENT TOOLS

- (1) 1.5mm Allen Key
- (2) Digital loop calibrator (4 ~ 20mA DC, 0 ~ 10V DC)
- (3) Digital multimeter (Resistance measurement)

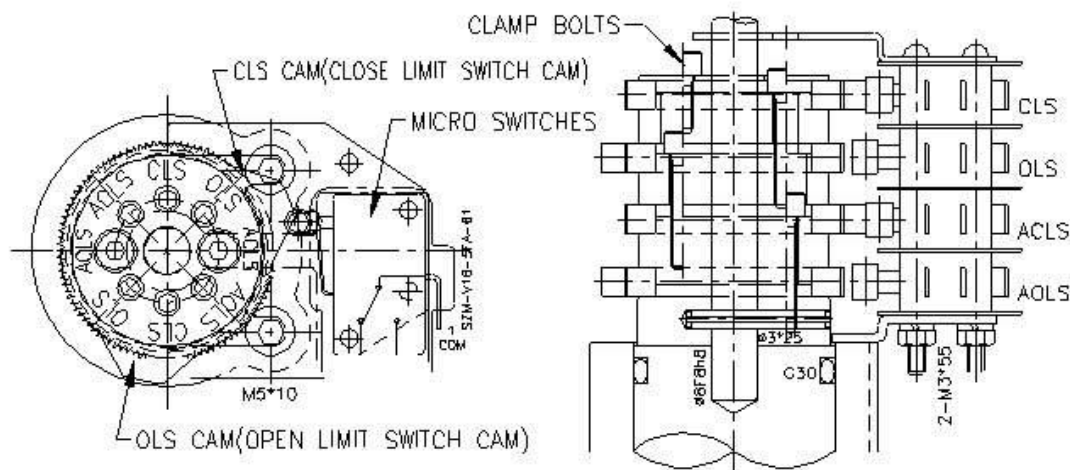
6. RESETTING of POTENTIOMETER.

- (1) Ensure that the actuator is in the fully closed position.
- (2) Use a 1.5mm Allen key to loosen grub screw in the gear on the actuator output shaft.
- (3) Connect an Ohms meter to the Red and White cables on the potentiometer, rotate the gear on the output shaft until a resistance value between 800 ~ 950Ω is achieved.
- (4) Tighten the grub screw in the output shaft gear.



7 LIMIT SWITCH SETTING

- (1) Lift up the lever for manual operation and turn the hand wheel CW to move actuator to full close position.
- (2) Loosen the grub screw in the CLS cam by using 2mm Allen key, and turn CLS cam CW so that the cam just operates the lever of close limit switch. Tighten the grub screw. The auxiliary limit switch (ACLS) cam should be set slightly in advance of the motor limit switch cam.
- (3) Turn the hand wheel CCW to move the actuator to full open position.
- (4) Loosen the grub screw in the OLS cam by using 2mm Allen key, and turn OLS cam CCW so that the cam just operates the lever of open limit switch. Tighten the grub screw. The auxiliary limit switch (AOLS) cam should be set slightly in advance of the motor limit switch cam.
- (5)



8. PCU CARD operating range

ACTUATOR position	FULL CLOSE	FULL OPEN
INPUT SIGNAL	4mA DC, 0V DC, 1V DC, 2V DC	20mA DC, 5V DC, 10V DC
OUTPUT SIGNAL	4mA DC, 1V DC, 2V DC	20mA DC, 5V DC, 10V DC
SIGNAL LED	RED LED On	GREEN LED On
AUTO SETTING	BLUE LED Off	
SIGNAL FAULT	YELLOW LED Flashing	
MANUAL MODE	YELLOW LED On	

9. Maintenance and Inspection

(1) Lubricant

The HQ-005 is lubricated for life and so no additional lubrication should be required. But, when you use it in an environment which is very dry and has humidity under 15%, or which is very hot with over 30°C, you need to penetrate proper amount of GREASE (EP TYPE GREASE) at the two grease nipples every two years.

(2) Periodical operation test

You need to provide power for Valve and Actuators even if they didn't operate for over a month. And for once a week, you need to have periodically the operation test.

(3) Periodical maintenance

Periodical maintenance and inspection is recommended. the actuators once a year through the comprehensive inspection (for how well it is operated, corrosion, fault of coating and etc).

(4) The operation manual

This manual relates to the HQ-005 fitted with a PCU (Proportional Control Unit). For On/off actuator refer to HKC Electric quarter turn actuator 'HQ' Series Instruction and Maintenance Manual.

(5) Other

Do not use walky-talky and cell-phone which cause to generate noise within 1m of ACTUATOR and CONTROL. It may cause damage and faulty operation of the products.

10. PCU CARD

