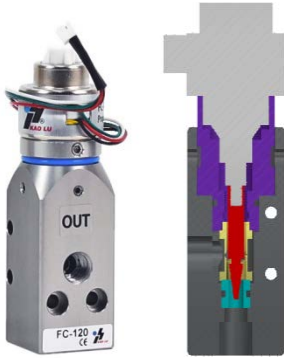


FC 流量比例閥組

Proportional Flow Control Valve



應用產業 Industrial application

- 氣體混合 Gas Mixing
- 分析儀器 Analytical Instrument
- 半導體設備 Semiconductor equipment
- 高精度、高分辨率流量控制 High Accuracy and High Resolution Flow Control
- 吹瓶機器 Blow Molding
- 本體有不鏽鋼、鋁合金及 Peek 可選擇 Stainless steel, aluminum and Peek body material.
- 密封件有 FFKM 及 FKM 可選擇 FFKM or FKM seals

流量比例閥組是由 PM 驅動控制器+FC 流量比例閥所組成的，透過輸入信號 0-10 V、4-20 mA、RS485 Modbus 三種信號中，選一種輸入至 PM 驅動器進而控制，FC 流量閥中的馬達來移動軸芯，達到閥體開度由小至大的變化，不管是氣體或液體的控制中，流量都可以呈線性度且精準與微小的控制流量，有助於對客人的機台設備提升。流量比例閥的開發，是針對隨時需要精準調控液體或氣體流量變化的產業。 Proportional Flow Control Valve consists of PM series driver and FC series proportional flow valve. With an input signal either through analogue or digital, the needle inside the proportional valve moves proportionally to the signal. This series is able to control the flow rate of air and liquid with high resolution, high accuracy, and high repeatability. It is developed for industries that require a high degree of adjustment in flow rate.

產品規格 Specifications

型號 Model	FC-10	FC-20	FC-120	FC-300
閥門類型 Valve Type	兩口兩位比例式針閥 2-Way Proportional Needle valves			
口徑 Port Size	G 1/8"			
流體 Medium	真空、惰性氣體、油、水...等液體 Vacuum, Compatible gases, oil, water and liquids			
壓力範圍 Pressure Range	-1~7bar			
流量範圍(空氣) Flow Range of air	0~18L/min @6bar	0~65L/min @6bar	0~230L/min @6bar	0~400L/min @6bar
流量範圍(水) Flow Range of water	0~0.3L/min @6bar	0~1L/min @6bar	0~4L/min @6bar	0~8L/min @6bar
重覆精度 Repeatability	±0.1% F.S.			
流量分辨率(空氣) Flow Resolution of air	0.1 L/min@3bar	0.1L/min@3bar	0.1L~0.2 L/min@3bar	0.3 L/min@3bar
流量分辨率(水) Flow Resolution of water	0.003L/min@3bar	0.003L/min@3bar	0.003~0.005L/min@3bar	0.008L/min@3bar
溫度範圍 Temperature Range	-20 ~84° C			
開關時間(全開到全關) Full stroke time	1.5 sec	1.5 sec	2 sec	2 sec
本體材質 Body material	不鏽鋼 Stainless steel	鋁合金、不鏽鋼或 Peek Aluminum, Stainless steel or Peek	鋁合金 Aluminum	鋁合金、不鏽鋼或 Peek Aluminum, Stainless steel or Peek
密封件 Seals	本體-鋁合金:全 VITON 或 VITON+EPDM Body- Aluminum : All VITON or VITON+EPDM 本體-不鏽鋼或 Peek : 全 FFKM 或 FFKM+EPDM Body- Stainless steel : All FFKM or FFKM+EPDM ----- **若用於真空或水，建議搭配 EPDM. ** For vacuum or water, it is recommended to choose EPDM.			
防護等級 Ingress Protection	IP 52			

FC 流量比例閥組

Proportional Flow Control Valve

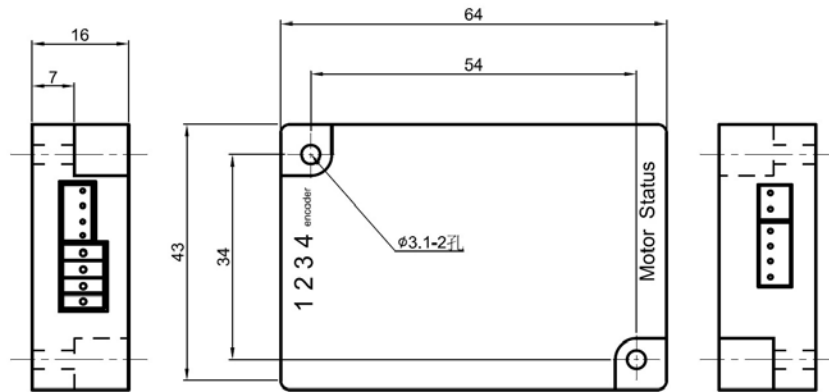


產品規格 Specifications

型號 Model	FC-1000	FC-1500	FC-2000	FC-3000
閥門類型 Valve Type	兩口兩位比例式針閥 2-Way Proportional Needle valves			
口徑 Port Size	G3/8"			PT 1/2"
流體 Medium	真空、惰性氣體、油、水...等液體 Vacuum, Compatible gases, oil, water and liquids			
壓力範圍 Pressure Range	-1~6bar	-1~3 bar	-1~15 bar	-1~20bar
流量範圍(空氣) Flow Range of air	0~1200L/min@5bar	0~1200L/min@3 bar	0~2700L/min@7 bar	0~5000L/min@10bar
流量範圍(水) Flow Range of water	0~28L/min@5bar	0~35L/min@3 bar	0~50L/min@7bar	0~94L/min@10bar
重覆精度 Repeatability	±0.1% F.S.			
流量分辨率(空氣) Flow Resolution of air	0.3~0.5 L/min @3bar	1~2 L/min @3bar	1~2 L/min @3bar	1~2 L/min @3bar
流量分辨率(水) L/min Flow Resolution of water	0.008 ~0.014 L/min @3bar	0.027~0.055 L/min @3bar	0.027~0.055 L/min @3bar	0.027~0.055 L/min @3bar
溫度範圍 Temperature Range	-20 ~84° C			
開關時間(全開到全關) Full stroke time	2.5 sec	2.5 sec	2.5 sec	5 sec
本體材質 Body material	鋁合金 Aluminum	鋁合金或不鏽鋼 Aluminum or Stainless steel	鋁合金或 Peek Aluminum or Peek	鋁合金或不鏽鋼 Aluminum or Stainless steel
密封件 Seals	本體-鋁合金:全 VITON 或 VITON+EPDM 本體-不鏽鋼或 Peek: 全 FFKM 或 FFKM+EPDM Body- Aluminum : All VITON or VITON+EPDM Body- Stainless steel or Peek : All FFKM or FFKM+EPDM ----- **若用於真空或水，建議搭配 EPDM. ** For vacuum or water, it is recommended to choose EPDM.			
防護等級 Ingress Protection	IP 52			
*牙口另有 NPT 牙，若有需請洽詢業務，謝謝!				
There are also NPT port. If you need it, please contact our sales representative, thank you!				

PM 驅動器

PM Series Proportional Valve Driver



PM 驅動器主要是提供了 FC 比例閥所需要的電源和控制信號(步驟和方向)，並以類比訊號 (0-10VDC/4-20mA/RS485 Modbus)轉換為雙極步進馬達之步驟控制。

Series PM driver provides series FC valve with the required power and control signal (step and direction). It controls the step of a bipolar stepper motor with an analogue signal (0-10 VDC/4-20mA/RS485 Modbus).

接線方式 Wiring



編號 No.	功能 Function
1	DC24V +
2	DC24V -
3	Signal + 、 RS485 +
4	Signal - 、 RS485-

產品特色 Features

- ◆ 體積小 compact
- ◆ 低成本 low cost
- ◆ 靈敏度高 High sensitive
- ◆ 類比/數位訊號 Analog / Digital signal
- ◆ 簡易控制 easy-control
- ◆ 線性全流量控制

Full scale linearity flow rate control

規格 Specifications

輸入訊號 Input signal	0-10V / 4-20mA / RS485
工作電源 Supply	DC24V (≤12W)
指示燈狀態 Indicator LED Status	on/off 燈亮表示馬達運轉(LED on is motor running) on/off 燈熄表示馬達停止(LED off is motor stopping) on/off 閃爍表示馬達故障(LED flashing is motor error)
馬達狀態輸出 Motor Status output	Sink 50mA
環境溫度 Ambient Temp.	0-60°C
線材長度 Cable Length	一米或五米 1 meter or 5 meter

FC 流量比例閥組

Proportional Flow Control Valve



型號選擇 Ordering Code

FC - - + PM - -

系列

10	0~18 LPM@6bar	G 1/8"
20	0~65 LPM@6bar	
120	0~230 LPM@6bar	
300	0~400 LPM@6bar	G 3/8"
1000	0~1200 LPM@5bar	
1500	0~1200 LPM@3bar	
2000	0~2700 LPM@7bar	PT 1/2"
3000	0~5000 LPM@10bar	

密封圈

本體-鋁合金	
-	VITON
E	VITON+EPDM
本體-不鏽鋼/Peek	
-	FFKM
E	FFKM+EPDM

系列

10	For FC-10
20	For FC-20
120	For FC-120
300	For FC-300
1000	For FC-1000
1500	For FC-1500
2000	For FC-2000
3000	For FC-3000

線長

L1	1m
L5	5m

*本體材質

-	Aluminum
SUS	Stainless steel
PK	Peek

*請參考產品規格裡各系列的本體材質。

輸入訊號

**E	0 - 10 V
A	4 - 20 mA
R	RS485 Modbus

**註 1：若控制訊號選擇 0-10V，請留意最小的驅動電流為 3mA。

For Command Signal type 0-10V, the minimum driving current is 3mA.

註 2：以上標示流量為用於空氣流量，若使用於液體，流量需另外計算。

The indicated flow rate is air, please consult for liquid flow rate.

註 3：如需訂製特別流量範圍，請洽詢本公司

Please contact us for customized flow range.

註 4：以上產品組合於出貨前皆一對一校正完成。安裝該產品時，需依產品序號一對一配對 (比例閥本體序號和控制器序號需相同)，避免混搭造成產品不良情形。

FC and PM series are calibrated in pair. Before operating, please ensure the serial numbers on FC and PM are in pair in order to prevent potential leakage issue.

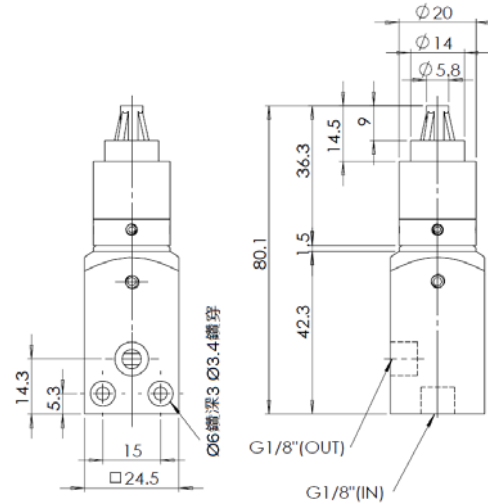
FC 流量比例閥組

Proportional Flow Control Valve

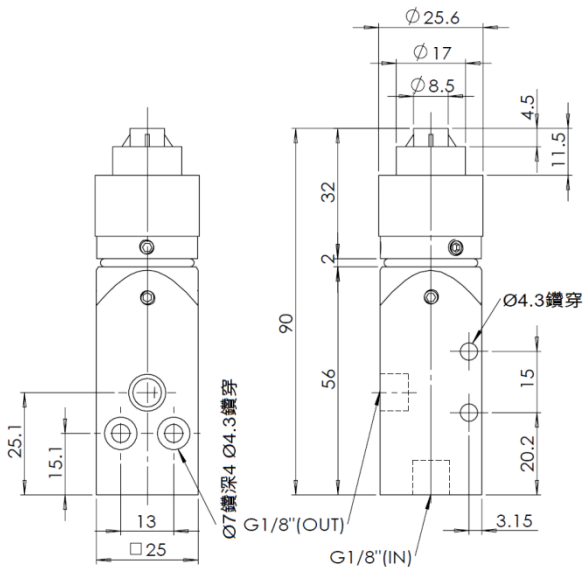


外觀尺寸 Dimensions

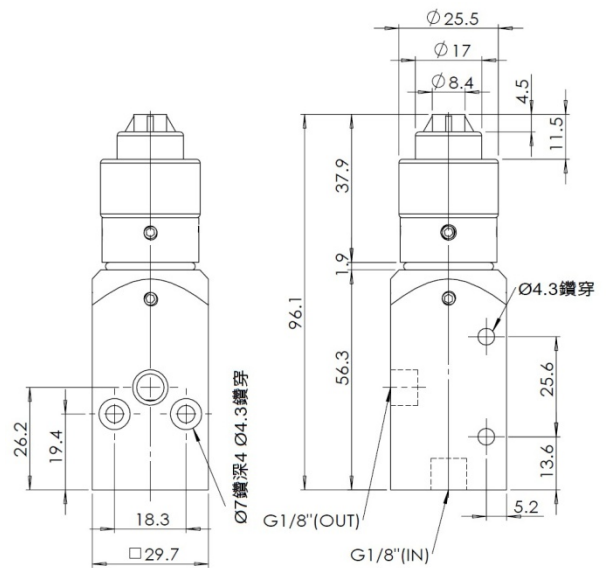
◆ FC-10 不鏽鋼/FC-20 鋁合金.不鏽鋼



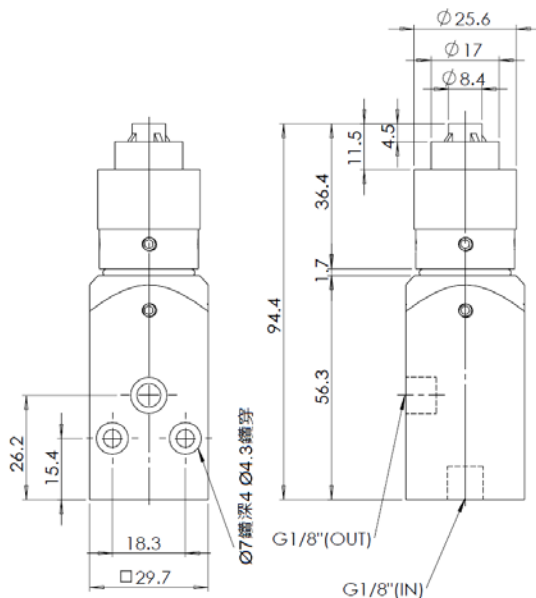
◆ FC-120 鋁合金



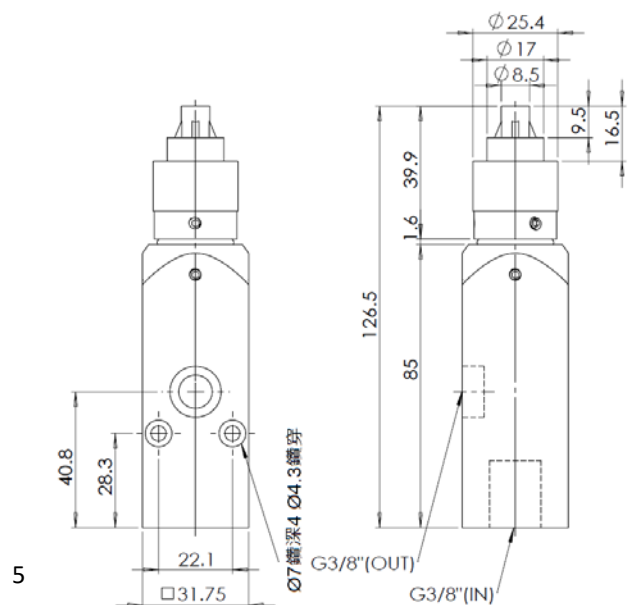
◆ FC-300 鋁合金



◆ FC-300 不鏽鋼



◆ FC-1000 鋁合金



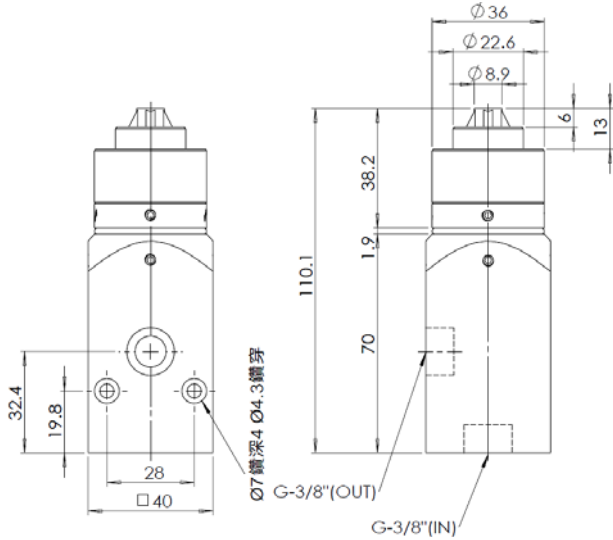
FC 流量比例閥組

Proportional Flow Control Valve

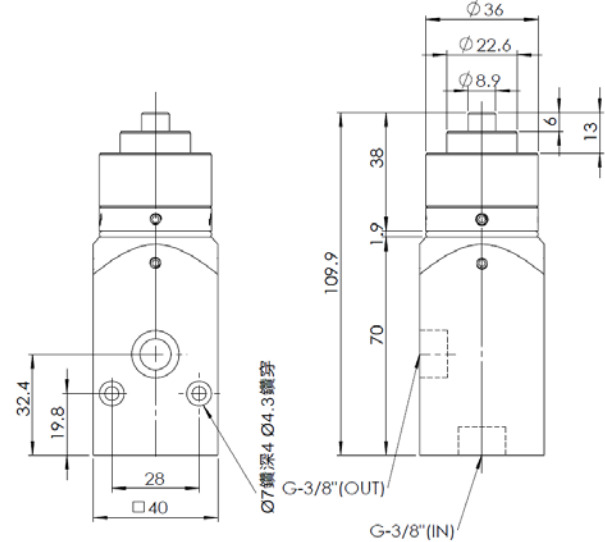


外觀尺寸 Dimensions

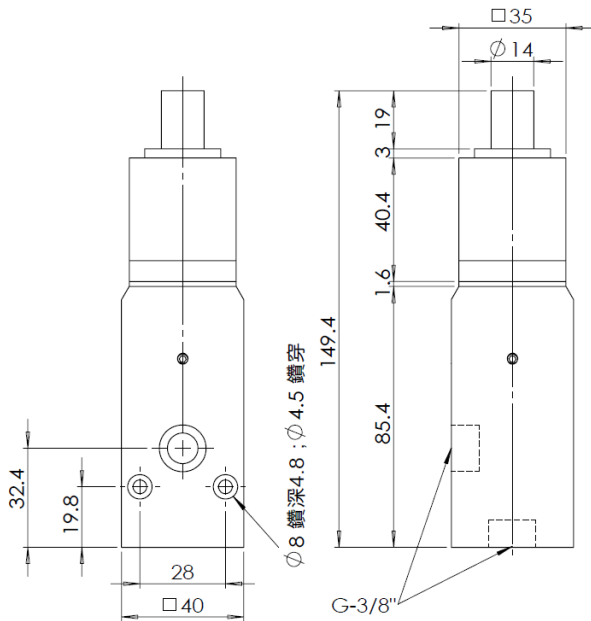
◆ FC-1500 鋁合金



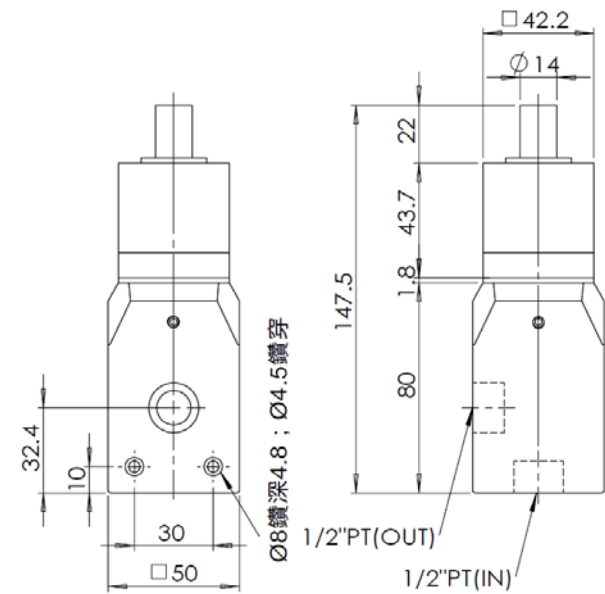
◆ FC-1500 不鏽鋼



◆ FC-2000 鋁合金



◆ FC-3000 鋁合金/不鏽鋼



FC 流量比例閥組

Proportional Flow Control Valve



型號 Model	FC300-MM3	FC300-MM5
閥門類型 Valve Type	兩口兩位比例式針閥 2-Way Proportional Needle valves	
口徑 Port Size	Inlet G3/8" ; Outlet G 1/4"	
流體 Medium	真空、惰性氣體、油、水...等液體 Vacuum, Compatible gases, oil, water and liquids	
壓力範圍 Pressure Range	-1~7bar	
流量範圍(空氣) Flow Range of air	0~400L/min @6bar	
流量範圍(水) Flow Range of water	0~8L/min @6bar	
重覆精度 Repeatability	±0.1% F.S.	
流量分辨率(空氣) Flow Resolution of air	0.3 L/min@3bar	
流量分辨率(水) Flow Resolution of water	0.008L/min@3bar	
溫度範圍 Temperature Range	-20 ~84° C	
開關時間(全開到全關) Full stroke time	2 sec	
本體材質 Body material	鋁合金 Aluminum	
密封件 Seals	本體-鋁合金:全 VITON 或 VITON+EPDM Body- Aluminum : All VITON or VITON+EPDM ----- **若用於真空或水，建議搭配 EPDM.	
防護等級 Ingress Protection	IP 52	

FC 流量比例閥組

Proportional Flow Control Valve



安裝前注意事項

1. 配管前處置：配管前請進行空氣吹拭(氣流沖洗)或清洗，以去除管內的切削粉、切削油、雜物等。
2. 密封帶的捲法：配管及接頭鎖緊時，不要讓配管螺牙的切削粉、密封帶進入閥內部。使用密封帶時，留下螺牙 1.5-2 牙距的位置進行纏繞。
- ★ 3. 產品組合於出貨前皆一對一校正完成。安裝該產品時，需依產品序號一對一配對(比例閥本體序號和控制器序號需相同)，避免混搭造成產品不良情形。



控制信號注意事項

1. 勿給超過 10V 或 20mA 以上的控制信號，避免馬達長時間運轉會卡住在最高點的位置。
2. 若 DC24 電源持續供給狀態下，需開關控制信號或是插拔馬達和控制器的連接線時，請確保開關動作前信號保持在 0V 或 4mA。因訊號開啟時，電路板會默認零點，因此若信號高於 0V 或 4mA 會造成零點默認錯誤，長時間運轉可能馬達會卡住。
**當不確定心軸位置是否偏移或已失步，請重新開啟 DC24 電源，讓馬達重新校正起始位置。
3. 如果斷開控制器和馬達的連接線時，請重覆開關電源，確保兩者有正確連接。



流量比例閥使用注意事項

1. 請勿在腐蝕性氣體、化學藥品、海水環境或附著上述物質的場所使用。
2. 經過的介質不管是氣體或液體，切勿殘有雜質。請設置過濾系統並取適當的保護對策。
3. 日光照射或潮濕場合，請用保護罩等遮蔽保護。

本產品不能用做緊急關閉裝置。應在系統中安裝安全系統，以防止嚴重傷害或生命損失。



保固

自出廠起一年以內為保固期限，請務必遵守使用注意事項。因人為因素造成的產品不良，則本公司對本保修不承擔任何責任。



Product Precautions

1. Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.
2. When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealing material do not get inside the piping. When sealant tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.
3. Do not operate in locations having an atmosphere of corrosive gases, chemicals, sea water, or where there will be contact with the same.
4. Ensure the fluid passing through the valve does not contain solid particles. Please use a filter before the inlet port.
5. In locations which receive direct sunlight, provide a protective cover etc.
6. KaoLu's product cannot be used as an emergency shutoff. A redundant safety system should be installed in the system to prevent serious injury or loss of life.
- ★ 7. FC and PM series are calibrated in pair. Before operating, please ensure the serial numbers on FC and PM are in pair in order to prevent potential leakage issue.



Precautions of control signal

1. Don't give the control signal over 10V or 20 mA. In order to avoid the motor being stuck at the highest position when it runs for a long time.
2. If the DC24V keep supplying during the control process, but there is an action of switching control signal or unplugging the motor and controller. Please make sure to control the signal in 0V or 4mA. When the signal turned on, the circuit board would default the zero point. Therefore, if the signal is higher than 0V or 4mA, it would cause the zero point get error. The motor would stuck if it runs for a long time.
**If you're not sure whether the position of needle valve swifts or not, please turn on the DC24V again to let the motor calibrate to the zero starting position.
3. When the connection between the controller and stepper motor is disconnected, please turn on and off the power repeatedly to ensure the both are connected successfully.



Warranty

KaoLu Enterprise Co. Ltd. products are warranted to the original purchaser only against defects in material or workmanship for 1year from the date of manufacture. The extent of KaoLu's liability under this warranty is limited to repair or replacement of the defective unit at KaoLu's option. KaoLu shall have no liability under this warranty where improper installation or filtration occurred.