Intelligent Electropneumatic Valve Positioner

PPV-A-PL1500 Series User's Manual

Contents

1 Overview

1.1. Product structure

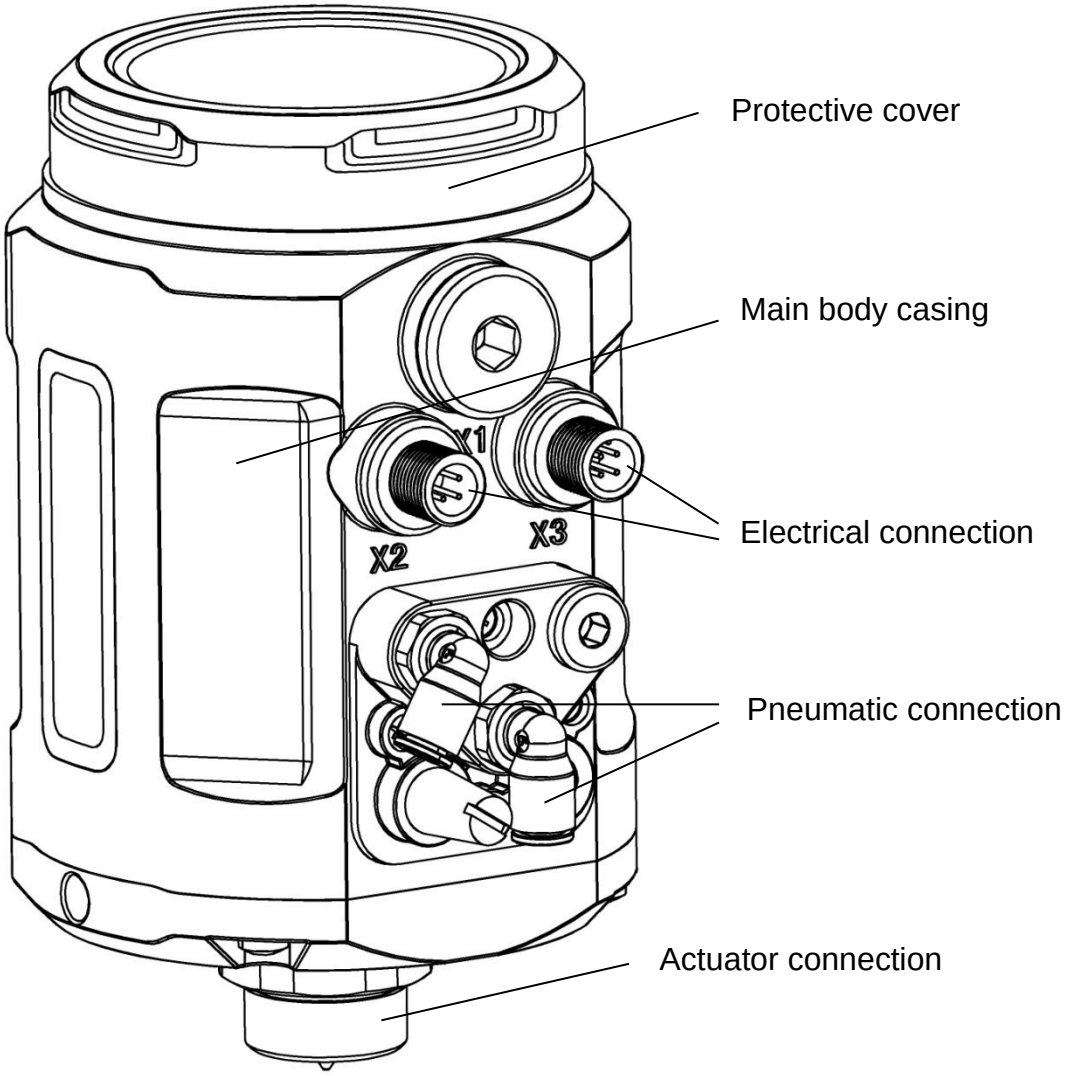

Figure 1. Positioner structure

1.2. Product description and application

PPV-A-PL1500 series intelligent electropneumatic valve positioner is a valve stroke controller based on microprocessor. The valve stroke can be set by external input signal. The positioner can adjust valve stroke quickly and accurately by using automatic control algorithm and PWM control technology. The product can be used in sealed space and controlled automatically and remotely. It is easy to install, operate, maintain and has low failure rate.

The positioner can combine with different pneumatically actuated valves for using. As shown in Figure 2.

with diaphragm valve

with angle seat valve

Figure 2. Combinations of positioner and pneumatically actuated valves

2. Installation

2.1. Mechanical dimensions

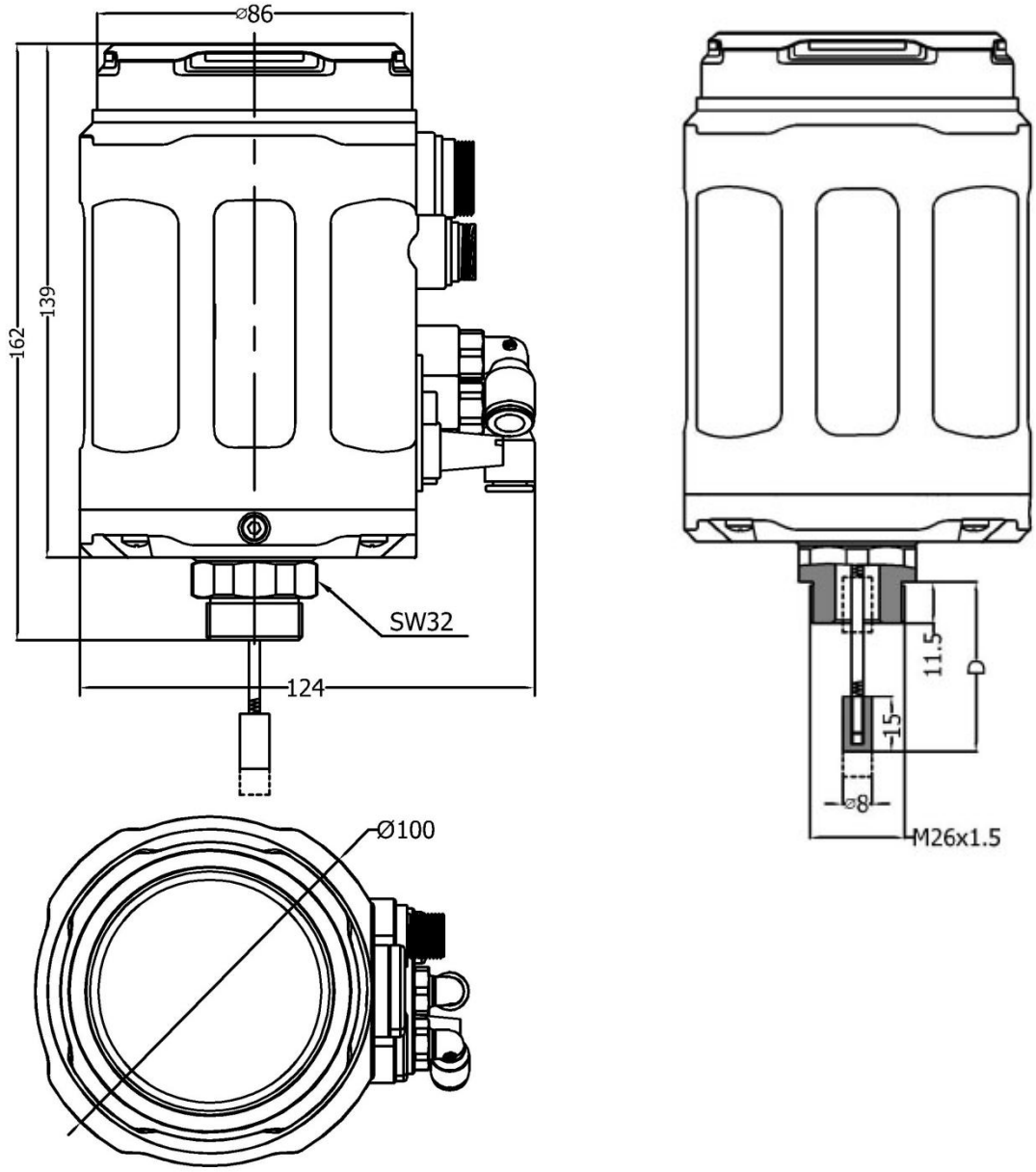

Figure 3. Mechanical dimensions

2.2. Actuator combination

1. Make sure that the stroke range and the screw thread size of the actuator which needs to combine meet the requirements.
2. Separately measure the C1 value when the valve is fully closed and C2 value when the valve is fully open by **the depth ruler**. The values are the distance between the stem top and the datum clamp face of the actuator. As shown in Figure 4.

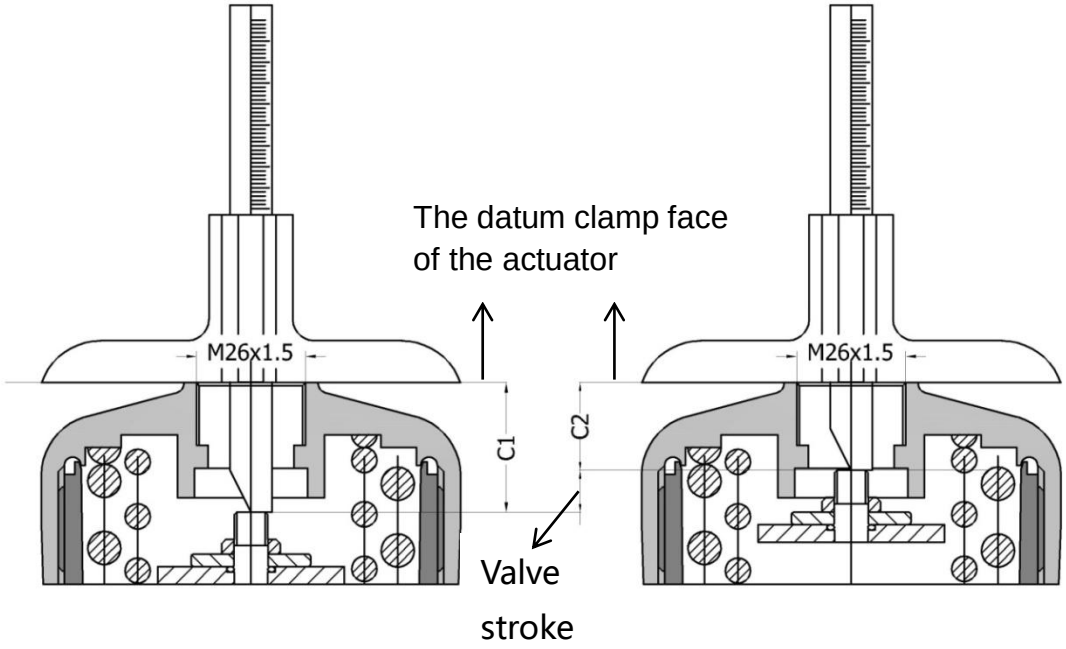

Figure 4. Actuator measurement

3. Adjust the adjusting nut of the displacement sensor. Then measure the D value (as shown in Figure 5) by **the depth ruler** in the state of the displacement sensor being completely loosened. Calculate the compression value L1 = D – C1, L2 = D – C2. It is recommended that the compression value L1 and L2 are both in the reference range which is showed in Table 1. If L1 value or L2 value is unable to meet the reference range, adjust the D value according to the actual situation.

NOTE！

The adjusted D value must ensure that L1 ＞ 0, L2 ＜ the maximum compression value of the displacement sensor. Otherwise, the positioner can not match the actuator.

Electrical stroke of displacement sensor	L1, L2 reference range
15 mm	2.5~14.5 mm
35 mm	3~33 mm
55 mm	3.5~53.5 mm

Table 1. The reference range of the compression value

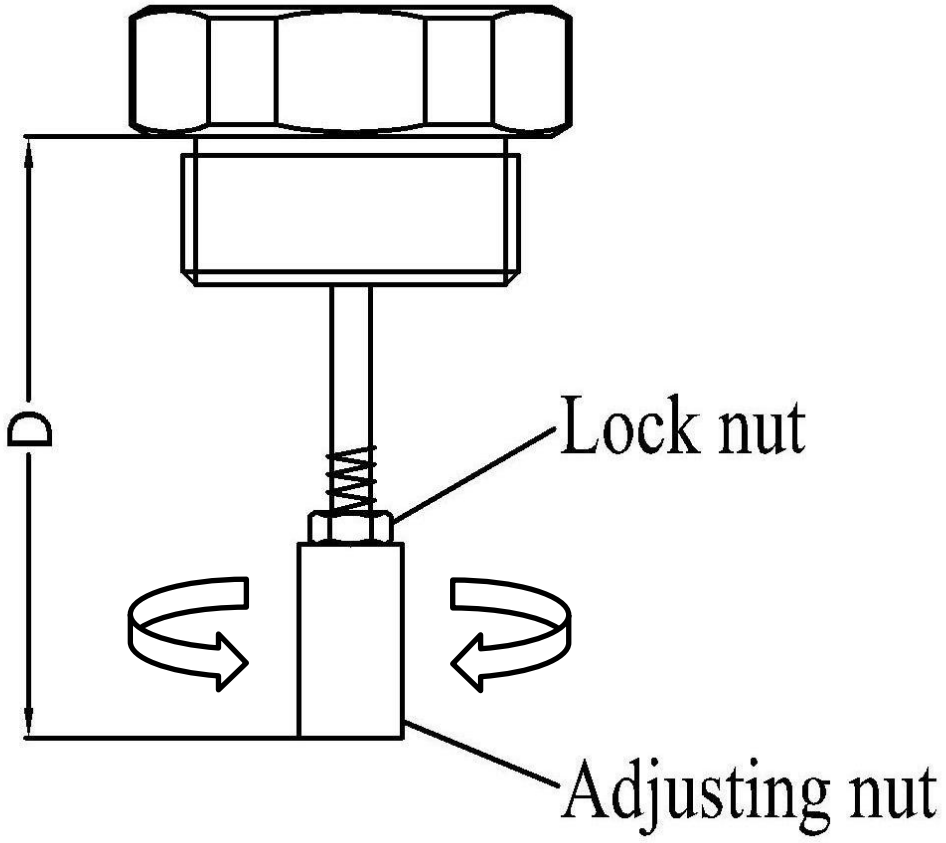

Figure 5. Travel sensor adjustment and measurement

4. Make the actuator connection of the positioner entering into the thread connection of the actuator by **NO.32 wrench**. As shown in Figure 6.

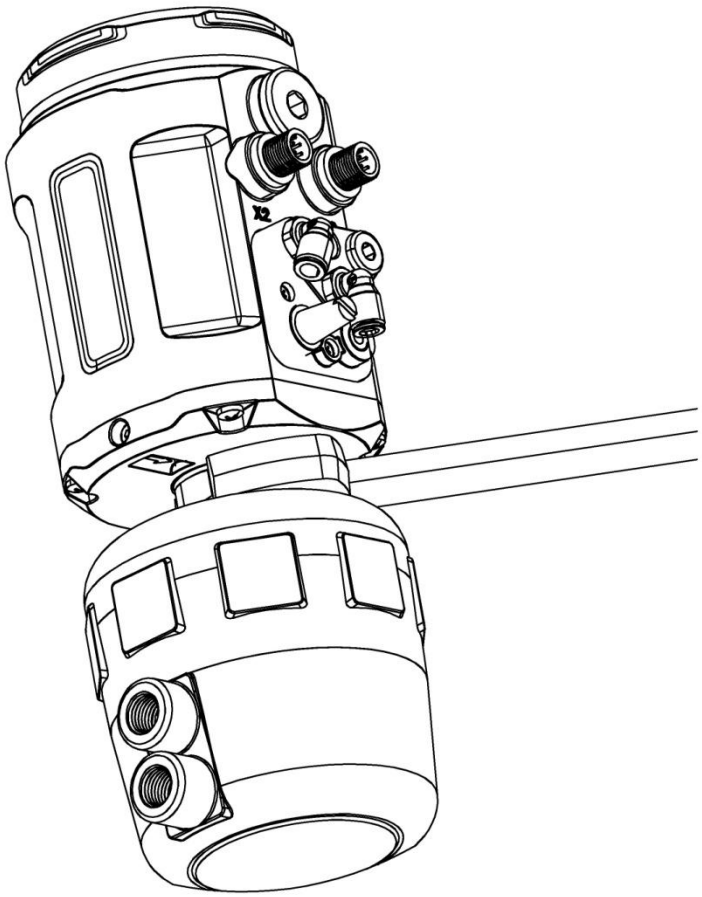

Figure 6. Actuator Combination

5. Power up the positioner, adjust the valve position manually and run the automatic adjustment function in the initial mode. Check that whether the whole valve stroke range is in the effective range of the displacement sensor. Refer to the Chapter 5 Section 5.2.1 and Section 5.3.1 for details. If not, repeat step 3.

2.3. Interface angle adjustment

If you need to adjust the interface angle, relax the hexagon screw in place A (As shown in Figure 7) first. Then adjust the angle clockwise or counter-clockwise in 180°range. After adjusting the angle, lock the angle by the hexagon screw.

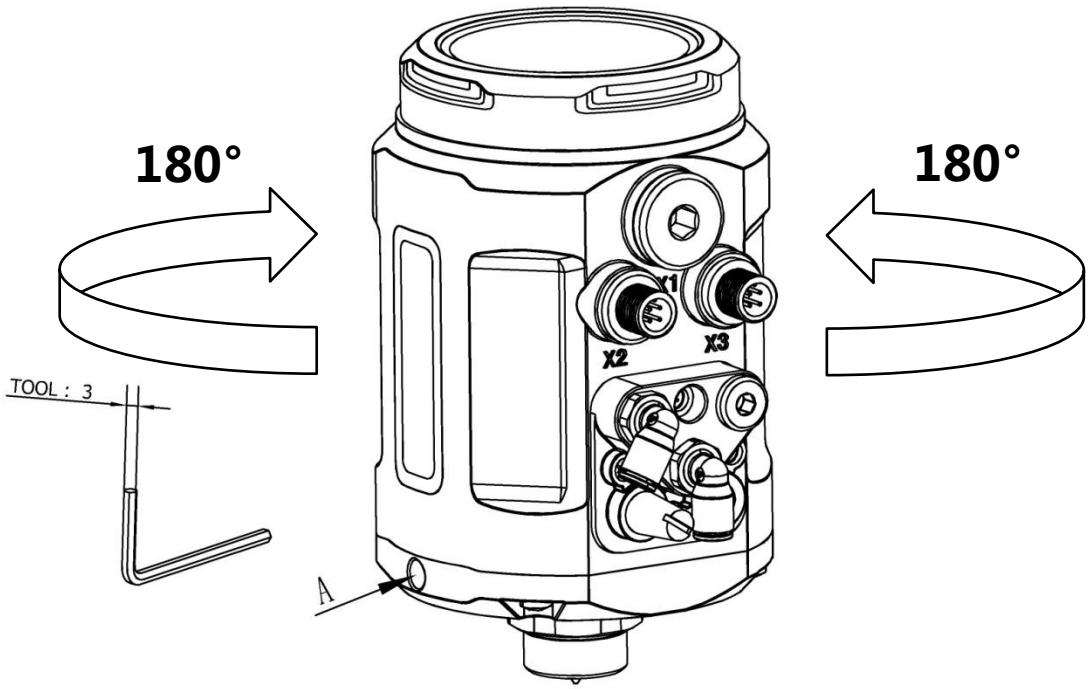

Figure 7. Graph operation

NOTE !

The positioner has rotation stopper mechanism. If it is restricted to rotate in one direction, please do not force to rotate continuously.

3. Connection description

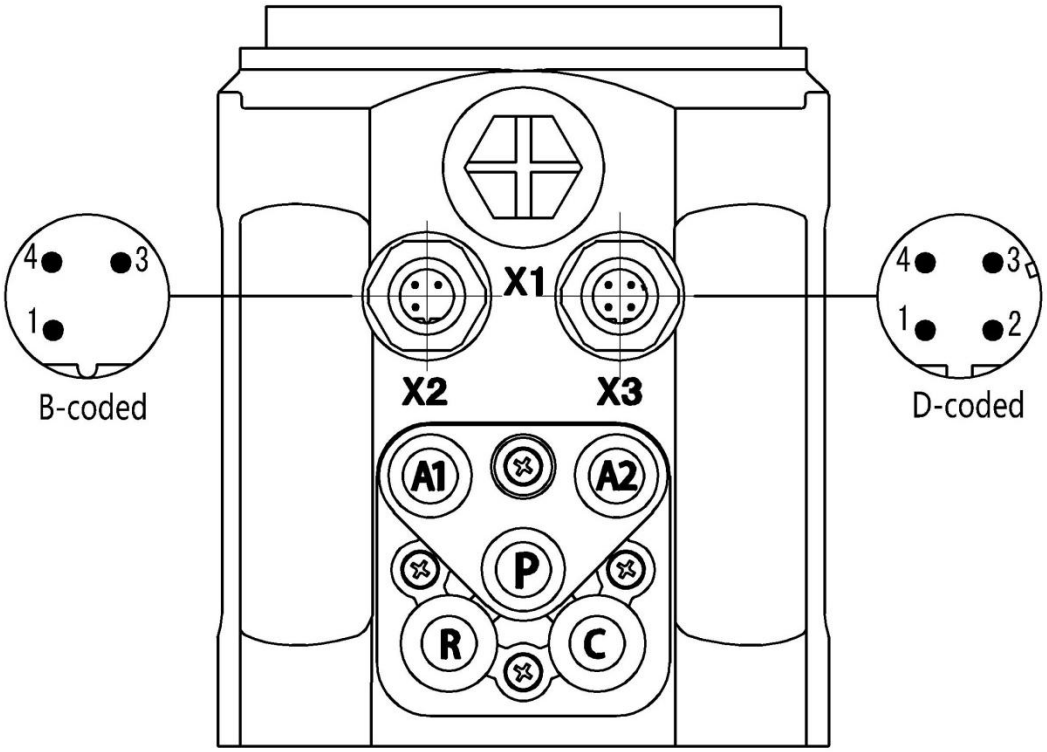

Figure 8. Connection

Connection	Pin	Description	Signal Type
X2	1	Analogue signal output +	4 – 20 mA
	3	Analogue signal output GND	GND
	4	NC	NULL

Table 2. Electrical connection description – X2（optional）

Connection	Pin	Description	Signal Type
X3	1	Power supply +	+24 V
	2	Power supply GND	GND
	3	Set signal input +	4 – 20 mA
	4	Set signal input GND	GND

Table 3. Electrical connection description – X3

NOTE!

Error connection of the electrical pin may cause the positioner damage.

Connection	Description
P	Air supply enter (built-in filter, filter size 5 μm)
R	Air exhaust
C	Check valve
A1	Pilot air outlet

Table 4. Pneumatic connection description

NOTE!

The air source pressure bigger than 7 bar may cause positioner damage.

4. Technical data

4.1. Working data

Ambient temperature: 0~55℃
Protection class: IP65

4.2. Electrical data

Connections: cable gland
Supply voltage:
24 V DC ± 10 %, ≥1A. Recommend switching-mode power supply.
Power input: <5W
Input resistance for set-point signal: 140Ω

4.3. Mechanical data

Cover material: Polycarbonate (PC)
Sealing material: Silicone rubber (SI)
Main body material: Polyamide Resin (PA6-GF30)
Control stroke range: 5-50 mm

4.4. Pneumatic data

Air pressure range: 3~7 bar, specific values depending on the actuator
Connections: Plug-in hose connector G1/4
Air quality:
Clean dry air, according to ISO 8573-1;
maximum particle density 10 mg/ m^3,
maximum particle size 40 μm;
maximum oil content 25 mg/m^3;
maximum pressure dew point -20 °C or minimum 10 degrees below the lowest operating temperature.

5. Operation

5.1. Interface description

The positioner has a 4-key and 12-led control panel. User can set parameters and functions by pressing the four keys. 10 blue led lights are used to indicate the position percent zone of the displacement sensor or the position percent zone of the valve. They indicate the percent zones of 0-10%, 10-20%, 20-30%, 30-40%, 40-50%, 50-60%, 60-70%, 70-80%, 80-90%, 90-100%. The "MANUAL" led is used to indicate the operating mode. Led off indicates automatic mode. Led on indicates manual mode. Led flash indicates initial mode. "STATUS" led is used to indicate some system running states, such as system error alarms.

Figure 9. Operating interface

5.2. Operating mode

5.2.1. Initial mode

The positioner is default in the initial mode when it starts up after leaving factory. In the initial mode, the "MANUAL" led is flash, 10 blue led lights indicate the position percent zone of the displacement sensor effective stroke. User can operate ▲ ▼ keys to open and close the valve. Press ▲ key continuously, the actuator is aerated. Press ▼ key continuously, the actuator is deaerated. Check out and make sure that valve position can move in the range of the displacement sensor and the whole valve stroke range is in the effective range of the displacement sensor.

If the whole valve stroke range is out of the effective range of the displacement sensor, the actuator is fully deaerated. If the minimum value of the whole valve stroke range is smaller than the minimum value of the effective range of the displacement sensor, the "STATUS" led is flash quickly. If the maximum value of the whole valve stroke range is larger than the maximum value of the effective range of the displacement sensor, the "STATUS" led is flash slowly. After system reporting the error, user can't operate keys. User must power off the positioner and then separate it from the actuator and adjust the adjusting nut of the displacement sensor again. After the adjustment, combine with the

actuator, power up and check again. It is need to repeat the above operation until the whole valve stroke range is in the effective range of the displacement sensor.

5.2.2. Automatic mode

After finishing the automatic adjustment function, system is in the automatic mode by pressing key to exit. And if the positioner restarts up, system is default in the automatic mode. In this mode, the positioner accepts the input signal for set-point value and adjusts the valve stroke automatically, "MANUAL" led is turned off, 10 blue led lights are used to indicate the valve position percent zone. The valve is fully close when the percent of set-point value ≤ 1%, and is fully open when the percent of set-point value ≥ 99%.

5.2.3. Manual mode

Press key to switch between the automatic mode and the manual mode. In the manual mode, "MANUAL" led is turned on, 10 blue led lights are used to indicate the valve position percent zone. User can operate keys to open and close the valve manually. User also can operate combination keys to increase the adjustment speed. If after pressing key continuously first, press key continuously, the valve is quickly open. If after pressing key continuously first, press key continuously, the valve is quickly close. When system switches from automatic mode to manual mode or user finishes adjusting the valve position manually, the percent of current position value is as the percent of set-point value in the manual mode. The valve is fully close when the percent of set-point value ≤ 1%, and is fully open when the percent of set-point value ≥ 99%.

5.3. Function instruction

5.3.1. Automatic adjustment

The automatic adjustment function can test the related control parameters including the direction between the aeration state of the actuator and the actual position, the total valve scale, PWM parameters etc.
Under the any operating mode interface, press key for about 3 seconds to run the function. During the process of the function running, blue led lights are

scrolling to display the step of the automatic adjustment.

After finishing the automatic adjustment, all 10 blue led lights are flash. If error appears during the automatic adjustment, "STATUS" led is turned on, and the actuator is fully deaerated.

System will check whether the whole valve stroke range is in the effective range of the displacement sensor during the automatic adjustment process. If the whole valve stroke range is out of the effective range of the displacement sensor, the actuator is fully deaerated. If the minimum value of the whole valve stroke range is smaller than the minimum value of the effective range of the displacement sensor, the "STATUS" led is flash quickly. If the maximum value of the whole valve stroke range is larger than the maximum value of the effective range of the displacement sensor, the "STATUS" led is flash slowly. After system reporting the error, user must power off the positioner. Then separate it from the actuator and adjust the adjusting nut of the displacement sensor again. After the adjustment, combine with the actuator, power up and check again. It is need to repeat the above operation until the whole valve stroke range is in the effective range of the displacement sensor.

Before finishing the automatic adjustment, user can press  key to exit and go to the previous operating mode.

After finishing the automatic adjustment, press  key to exit and go to the specific operating mode according to the previous operating mode. If the previous operating mode is automatic mode or manual mode, system goes to the previous operating mode. If the previous operating mode is initial mode, system goes to the automatic mode.

NOTE!

- Although the positioner has ran the automatic adjustment function in the factory. In order to get the control parameters of the actual work environment, the positioner must run the function again in the actual work environment.
- Make sure that the air supply pressure is in the working range of the actuator and has no big wave. Otherwise the automatic adjustment may fail or the test parameters may be error.

5.3.2. Dead band setting

The function is used to adjust the valve position control accuracy. The system does not adjust the valve position when the gap between the current position value and the position set-point value is not bigger than the dead band value. The minimum value of the dead band is 1%, and the maximum value of the dead band is 10%. In the automatic mode, press key for about 3 seconds to enter the dead band setting interface. 10 blue led lights separately indicate 1%, 2%...10% from left to right. One of 10 blue led lights is flash in order to display the current dead band value. Press keys to change the dead band value. And the value is displayed by the blue led flashing. Press key to confirm and exit back to automatic mode interface. Press key to exit back to automatic mode interface without change.

NOTE !

The smaller the dead band setting, the higher the control accuracy getting. Please set the dead band value in reason. Because the too small value may cause the solenoid valve in the body to act frequently and lead to long adjustment time and unstable working state.

5.3.3. Factory setting

The function is used to recovery the system to factory state. Under the factory state, the positioner is in the initial mode after starting up, and the dead band value is the default value 2%. In the automatic mode, press key for about 3 seconds to run the function. After finishing the function, System is in the initial mode.

5.3.4. Input signal error detection

The function is used to detect the error of 4-20mA input signal. The error condition is the value of 4-20mA input signal ≤ 3.5mA. Once detecting the error signal, "STATUS" led is flash, and the actuator is fully deaerated.

5.3.5. Analogue signal output(optional)

The positioner outputs 4-20mA analogue signal in the automatic mode and the manual mode, and dose not output in the initial mode and the running state of the automatic adjustment.

6. Trouble shooting

1. **LED does not light after the positioner starting up.**
   Make sure that the 24V DC power supply is normal.
   Make sure that the power cables are connected correctly.
2. **The positioner is unable to locate position. The valve can not be fully opened or fully closed for a long time.**
   Make sure that the pressure of air supply meets the requirement.
   Make sure that the dead band value meets the situation that the valve position adjustment is stable and has no fluctuation.
   Make sure that the pneumatic connections of the positioner and actuator are not leaking.

7. Warranty terms

1. If the product is found to have quality problems which are confirmed by our company staff, customers have after-sale services for product maintenance or free replacement in the warranty period. Service response time is 24 hours (excluding non-working days).
2. The product warranty period is 18 months from the date of sale.
3. The following situations for repaired product do not belong to the warranty range:
   (1) The date is after the warranty period.
   (2) The product is disassembled without authorization and permit by the product company.
   (3) The damage causes from the operation which is not according to the product instruction manual or other human factors. Such as the product surface has the traces of collision, the error wiring or error power supply makes components damaged, parts and accessories are

lost, etc.

(4) Force majeure (natural disasters) causes product failure or damage.

4. According to the actual situation, the product company offers the free or fee-based maintenance services outside the warranty range.
5. The terms become effective since the two sides signed a supply contract.

8. Contact

USKON AKISKAN KONTROL SISTEMLERI SAN. VE TIC. LTD. STI.

Address: Kemankes Kara Mustafapaşa Mah. Agac Tulumba Sok. No: 4/A
34425 - Karakoy/ISTANBUL - TURKIYE

Tel: +90 212 251 05 05

Fax: +90 212 251 05 79

Web: www.duravis.com