Product overview

◎ Rated torque: 20N.m
◎ Install below 15N.m valves: 2way,3way ball valve and butterfly valve
◎ Rated voltage: AC230V,AC/DC24V
◎ Control signal: 4-20mA 、0-20mA、0-5V、1-5V、0-10V、2-10V
◎ Position feedback: 4-20mA
◎ Position accuracy: ±1%(set by software)
◎ High performance brushless motor,Overload protection of internal motor
◎ It can be used 20,000 times*1

Product features

△ 1.3” OLED screen,no visual dead angle,highly bright,energy saving and eco-friendly,real time to show valve opening angle and external control command.Enter sleeping state automatically after about 5 minutes,while it could prompt location state and its control command at sleeping time.

△ Original valve adjustment mode--free cover-opening and interactive:

step1:saving “anticlockwise full open position ” by using the button to control valve;
step2:saving “clockwise full open position ” by using the button to control valve;
step3:saving “clockwise full close position ” by using the button to control valve;it makes valve adjustment easier.
Thoroughly eliminate the complex and inconvenience caused by mechanical positioning.

△ Adopt 16 High-performance microcontrollers,12 high-precision AD conversion,built-in unique algorithm, thoroughly eliminate mechanical hysteresis,greatly reduce valve position control error.

△ ※SP-01/02 total series and other DC24Vseries:built-in motor control module,motor frequency speed control can realize accurate positioning.

△ Adopt non contact positioning,control unit module design and potting processing,guarantee components reliability and greatly improve product service life;Interface use standard connectors,convenient for installment, adjustment and replacement.

△ Menu can report real-time failure,including stuck or other reasons which lead actuator fail to realize valve on/off integrally,and output failure warning signal.

△ Menu can realize valve control command exchange.

△ Menu can switch freely between remote control and local setting,by pressing the button to adjust valve position locally,built in position limit and show limit status.

△ Menu can set valve close position deviation to on or off direction,thoroughly eliminate the complex and inconvenience bring by “Normal On/Off mechanical positioning” to local valve adjustment.

△ Menu can restore factory default setting.

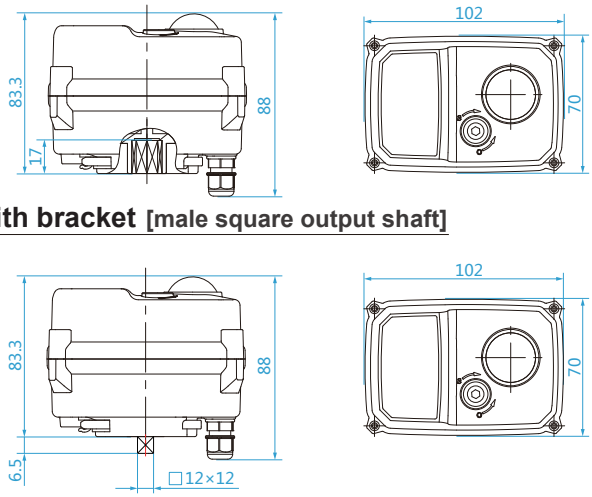
*1 Rated load 15Nm, temperature 25℃, testing switching time is 15s in factory where humidity is 50%, test results will be influenced by different load and working environment.

Technical data

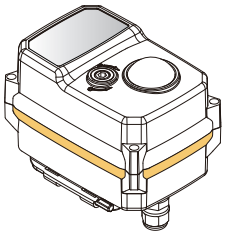
Electrical data	Rated voltage	AC230V50/60HZ)	AC/DC24V
	Rated voltage range	AC95–265V/DC100–300V	AC18–26V/DC22–32V
	Power consumption	9.6W@running 0.12W@holding	9.6W@running 0.85W@holding
	Peak current	35mA@5ms@AC230V	350mA@5ms@DC24V
		75mA@5ms@AC110V	
	Fuse	1A	2A
	Connecting cable	7*0.2mm2 cable, voltage withstand AC300V	
Functional data	Rated torque	20N.m@rated voltage	
	Angle of rotation	90±2°	
	Max angle of rotation	330±5°	
	Manual operation	※ Matching hexagon wrench, using at no power	
	Running time	About 10S (per 90°)	
	Operating frequency	Continuous running	
	Sound power level	Max50dB(A)	
	Position indicator	Mechanical and screen	
Working conditions	Electricity safety level	I Type (ground protection)	III Type (ground protection)
	Inflaming retarding level	V0 UL94 test method	
	Enclosure	IP67 As Per En60529/GB4208-2008 (all directions)	
		F type can add dehumidifying heater	
	Insulation resistance	100MΩ/1000VDC	100MΩ/1000VDC
	Withstand voltage	1500VAC@1Min	1500VAC@1Min
	Medium temperature	≤80°can install with actuator directly	
		※＞80° need to install bracket or heat radiation stand	
	Working environment	Indoor or outdoor; if exposed to the rain or sunshine,	
		need to install protective device for the actuator	
	Explosion-proof level	⚠Not explosion proof products, do not use in flammable	
		and explosive environment.	
	Ambient temp	-20℃— 60℃	
	Non-operation temp	≤-40℃ or ≥80℃	
	Humidity	5-95%RH non-condensing	
	Shock resistance	≤300m/S2	
	Vibration	※10 to 55 Hz, 1.5 mm double amplitude	
	Installation notes	360°any angle, The need for manual operation	
		or the wiring space	
	Maintenance	Free maintenance	
	Certification	CE / MA / AL	
Dimensions / weight	Dimensions (LXWXH)	See “Dimensions”	
	Connection standard	ISO5211 F03、F04、F05	
	Output axis specification	Female octagonal / male square	
	Hole deepness	≤17mm(Female octagonal)/6.5mm(Male square)	
	Weight	ABS material 0.62kg,Casting alumimum 0.82kg	

Dimension 【TCN-02X-ABS (Cable from buttom)】 unit：mm

Direct mount [female octagonal output shaft]

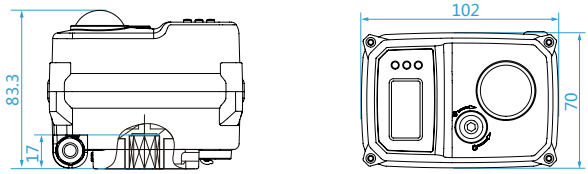


With bracket [male square output shaft]

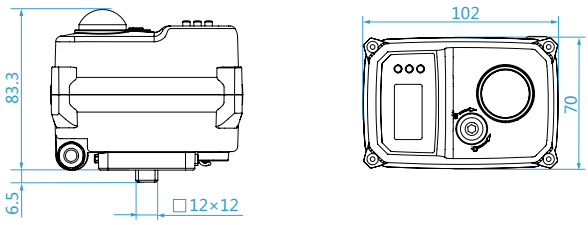


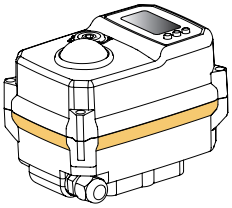
Dimension 【SPV-02X-ABS (Cable from side)】 unit：mm

Direct mount [female octagonal output shaft]



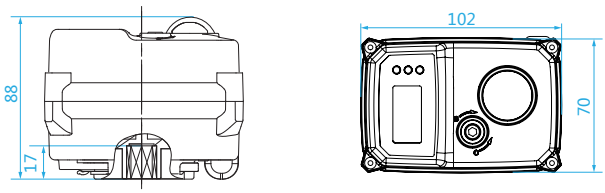
With bracket [male square output shaft]



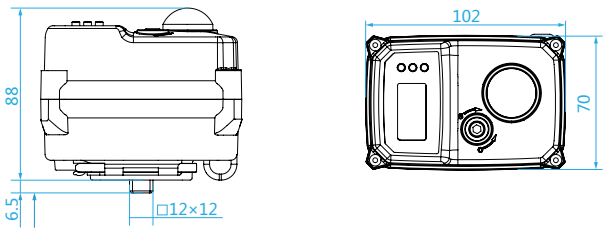


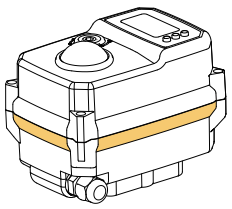
Dimension 【SPV-02X-Die–casting Alumimum】 unit：mm

Direct mount [female octagonal output shaft]



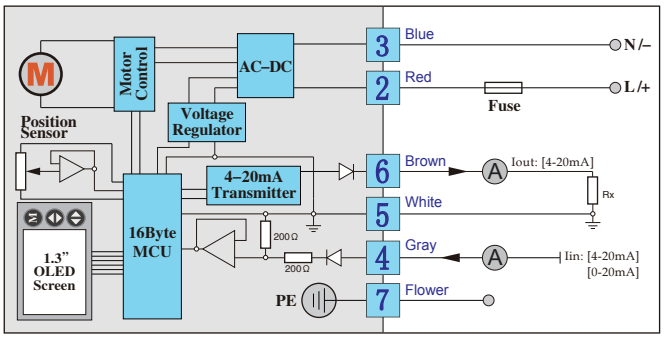
With bracket [male square output shaft]



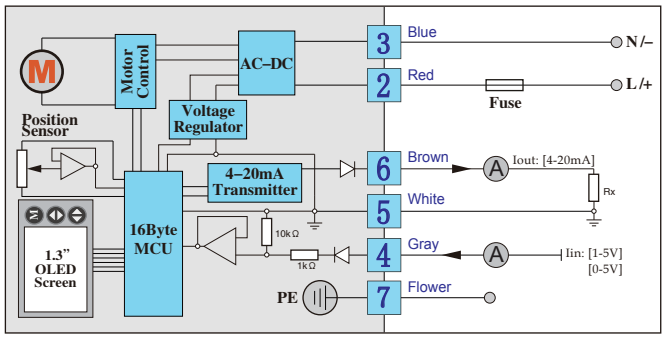


Wiring diagrams

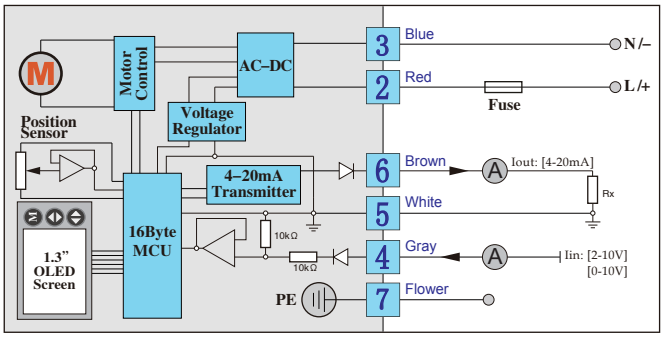
4–20mA/0–20mA



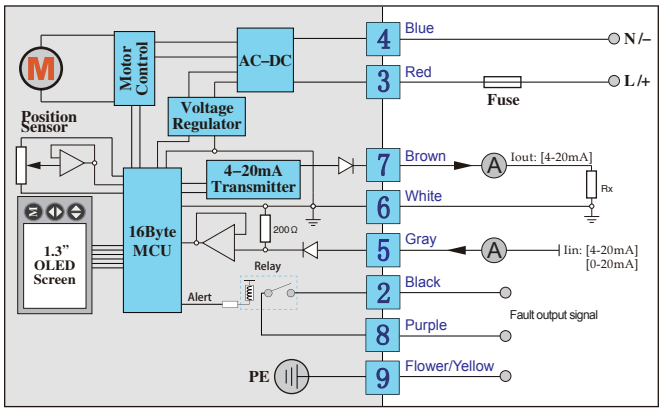
0–5V/1–5V



0–10V/2–10V



4–20mA–A/0–20mA–A [Alert]



※ **[0–20mA 0–5V 0–10V 2–10V could all select fault signal output function]**

Control instructions - [No Alert] :

- ☐ 1 [2] [3] are power supply.
- ☐ 2 [4] [5] [6] are control input and feedback output .
  ※They are forbidden to connect the power supply,otherwise it will damage the control module.
- ☐ 3 Make sure voltage practicable range, ※otherwise it will damage the control module.
- ☐ 4 [4] is feedback current input: 4-20mA,0-20mA,0-5V,0-10V,2-10V,input impedance refers to relevant wiring diagram.
- ☐ 5 [6] is control current output:4-20mA.
- ☐ 6 Vout=Iout·Rx,
  △Rx is recommended to use low TCR resistor.
  △VOUT≤8V,so Rx≤400Ω（recommended Vout=5V,Rx=250Ω/0.25W）.
- ☐ 7 ※For "4-20mA/1-5V/2-10V" control,from "user setting",user can set no control signal valve to full-open. full-close or keep.For other control(0-20mA,0-10V,0-5V),such setting is invalid.
- ☐ 8 When actuator is stuck or other working failures,output failure signal.
  Contactor loading capacity:0.1A/DC24V,50mA/230V.

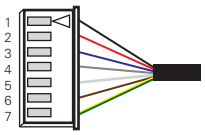


Figure 1 (7wiring diagram)

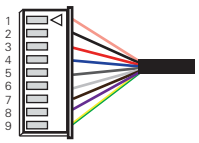


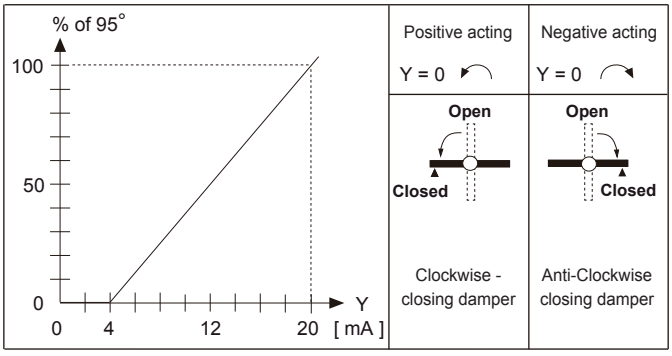
Figure2 (9 wiring diagram)

* Notice: Numeral order of wiring diagram is in accord with its terminal block number .

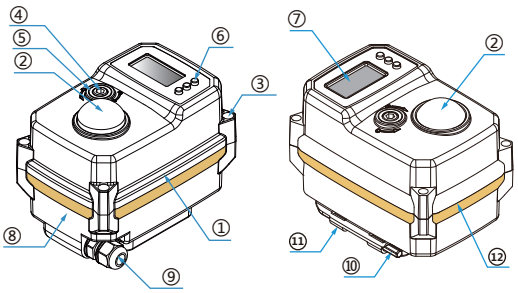
Control instructions - [Alert] :

- ☐ 1 [3] [4] are power supply.
- ☐ 2 [5] [6] [7] are control input and feedback output .
  ※They are forbidden to connect the power supply,otherwise it will damage the control module.
- ☐ 3 Make sure voltage practicable range, ※otherwise it will damage the control module.
- ☐ 4 [5] is control current input: 4-20mA,0-20mA,0-5V,0-10V,2-10V,input impedance refers to relevant wiring diagram.
- ☐ 5 [7] is feedback current output: 4-20mA.
- ☐ 6 Vout=Iout·Rx,
  △Rx is recommended to use low TCR resistor.
  △VOUT≤8V,so Rx≤400Ω（recommended Vout=5V,Rx=250Ω/0.25W）.
- ☐ 7 ※For "4-20mA/1-5V/2-10V" control, from "user setting", user can set no control signal valve to full-open. full-close or keep.For other control(0-20mA,0-10V,0-5V),such setting is invalid.
- ☐ 8 When actuator is stuck or other working failures,output failure signal.
  Contactor loading capacity:0.1A/DC24V,50mA/230V.

Position – Control Signal



Main parts



	Parts	Material		Parts	Material
1	Actuator	Heatproof ABS or Casting aluminum	7	1.3" LCD Screen	OLED
2	Indicator	Transparent AS	8	Label	PVC
3	Screw X 4	304	9	Wrench fixed	Heatproof_ABS
4	Manual shaft	304	10	Hexagon wrench	Tool steel
5	Oil seal	NBR	11	Waterproof cable connector	NiLon
6	KEY	Rubber	12	Lid seal	NBR

Mounting instructions

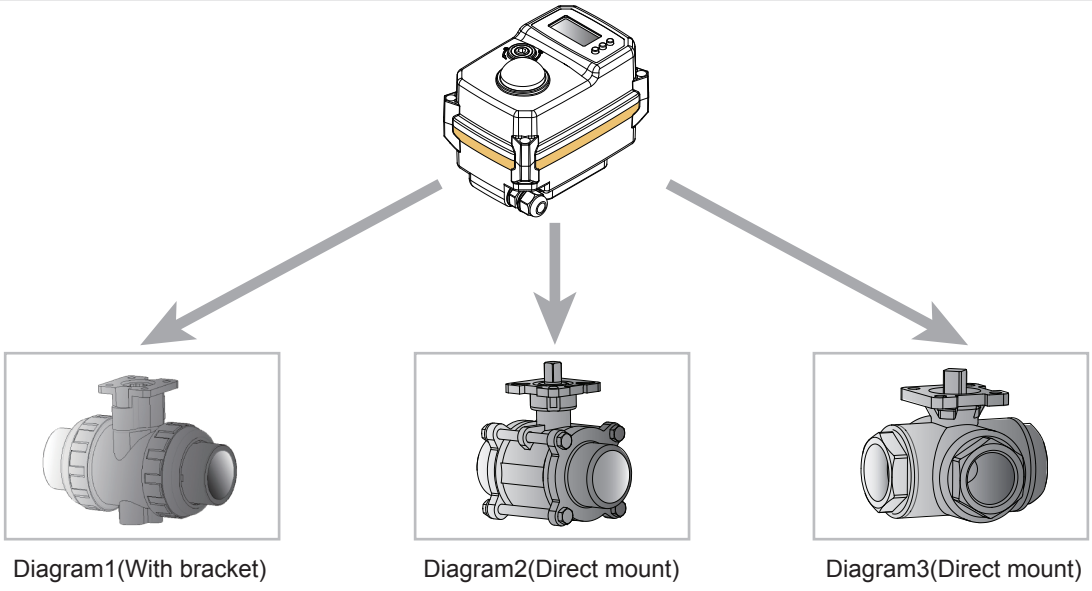


Diagram1(With bracket) Diagram2(Direct mount) Diagram3(Direct mount)

Diagram1 UPVC plastic ball valve+bracket assembly
Diagram2 3piece stainless steel ball valve assembly
Diagram3 3piece stainless steel 3way ball valve assembly

Installed valve technical requirements

☐1 When installing ball valve, the max torque ≤15NM. If the ball valve is out of operation for a long time, and the torque value of first on or off is the max torque. Or you can choose ball valve with elastic sealing.

☐2 When installing butterfly valve, the max torque≤13NM, because the torque value will increased by 10-20% after installing.

☐3 When installing direct mount model valve, the hole deep ≤17mm. It requires cutting if the output shaft is longer than 17mm.

☐4 Pls pay attention to the following items if you install the bracket and coupling by yourself:

※ The intensity of bracket should meet the using requirements: the bracket twisting extent ≤0.2mm in the process of on or off.

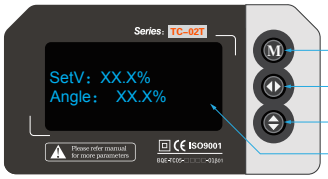
※ The parallelism of bracket ≤0.5mm.

※ When processing the shaft hole at both end of the coupling, it is necessary to ensure the accuracy and concentricity. The purpose is to make sure the mechanical hysteresis ≤10°, otherwise it will cause the actuator unable to work.

☐5 Screw should be installed spring washer、flat washer, and we suggest you daub some glue cement around the screw in case of screw loosening.

☐6 After the valve assembly, handle actuating device should be used to test on/off function ,if all items are qualified, user can wire according to the wiring diagram. After confirming wiring is correct, then power on and do the testing according to the voltage shown on the label. Before leaving factory, the actuator has gone through"factory default setting", thus the valve action will work according to the external command. If valve on/off is inaccurate, user can reset from "factory default setting mode".

Menus operations ---- Factory default setting



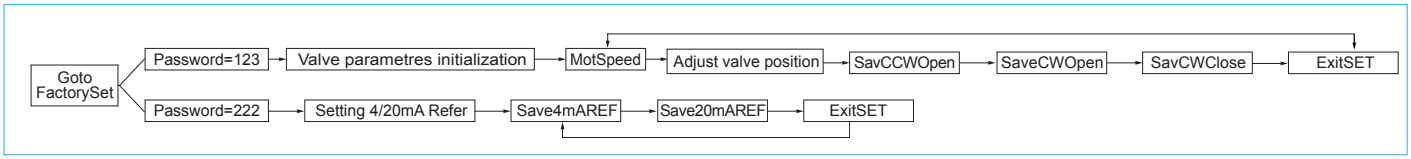
M Key: to switch menus

K2 Key: to switch Flash Item or adjust values

K3 Key: to modulate numerical value

Screen 1.3"OLED,Blue word against black background， 128X64

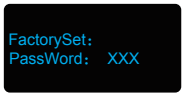
Setting steps:
1. Press the button to enter "factory default setting" mode
2. Input password 123 to enter "valve parameters initialization"
3. Input password 222 to enter "☐ 4/20mA reference"



☐1 Enters to factory default setting mode:

Press M +K3 simultaneously until "MK3" is flicking on top right corner. After 3s, enter default setting mode and meanwhile enter "☐2 input password".

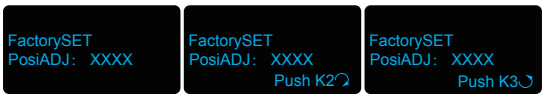
☐2 Input password: password=123



Press K2 button to switch single digit/tens digit/hundreds digit, press K3 button once, it will plus 1. when "xxx=123"， press M button to enter "☐3 MotSpeed". when "xxx=222"， press M button to enter "☐7 Save4mA reference".

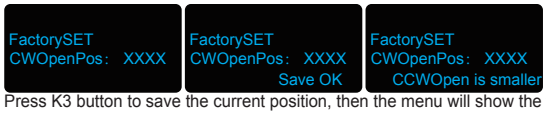
☐3 Valve position adjustment:

Anticlockwise full open: means the actuator will drive valve to rotate anticlockwise to full open position. That is to say, the process from 10°before the full open position to the full open position is always in anti -clockwise direction.



"xxxx" means the current position (0-4096).Press K2 button, the motor will rotate in clockwise direction, and "xxxx" will be smaller and smaller.Press K3 button, the motor will rotate in anticlockwise direction, and "xxxx"will be larger and larger. The motor will brake as soon as K2 or K3 button is released.
By K2 and K3, adjusting to the proper position, then by K3, drive valve to rotate anticlockwise to reach full open. Then press M button to enter "☐5 Saving anticlockwise full open position".

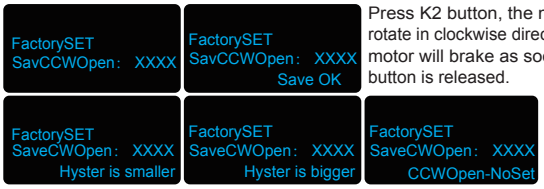
☐4 Saving anticlockwise full open position:



Press K3 button to save the current position, then the menu will show the following:
△"Save OK" ： means saving is successful, and shows the current data. After 1s, actuator will rotate anticlockwise about 10° sequentially to prepare for next item" ☐6 saving clockwise full open position",ang then enter next item ",☐6 saving clockwise full open position" automatically.
△"CCWOpen is smaller"： means the current data is too small to realize90°rotation . The menu will show the hint for 1s, and then dynamically show the current data. Press M button switch to "☐4 Valve position djustment" to readjust the valve position, or press K2 button to rotate the position anticlockwise.

☐5 Saving clockwise full open position:

Clockwise full open: means the actuator will drive valve to rotate clockwise to full open position. That is to say, the process from 10°before the full open position to the full open position is always in clockwise direction.



Press K2 button, the motor will rotate in clockwise direction, The motor will brake as soon as K2 button is released.

After valve is at clockwise full open position through K2 button, press K3 button to save the current position then the menu will show the following:
△"Save OK": means saving is successful and shows the current data.
△"Hyster is smaller": means the D-value between "clockwise full open" and "anticlockwise full open" is too small.
△"Hyster is bigger": means the D-value between "clockwise full open" and "anticlockwise full open" is too big.
The hint will last for 1s and the menu will show the current data dynamically. Press M button to enter "☐7 Saving clockwise full close position".

☐7 Saving clockwise full close position:

Clockwise full close: means the actuator will drive valve to rotate clockwise to full close position. That is to say, the process from 10°before the full open position to the full open position is always in clockwise direction.

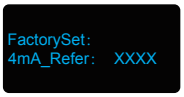
Press K2 button, the actuator will drive valve in clockwise.The actuator will brake as soon as K2 button is released.

By K2 button, after valve is at "clockwise full open position", and press K3 button to save the current position data, and the menu will show the following:
△"Save OK": means saving is successful and shows the current data.
△"Ang_rotat smaller": means the D-value between "clockwise full open"and "clockwise full close" is too small.
△"Ang_rotat bigger"： means the D-value between "clockwise full open"and "clockwise full close" is too big.Press M button to enter "☐A Exit setting ".

Menus operations ---- Factory default setting

☐7 Saving 4mA reference :

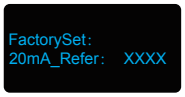
4mA reference: means input 4mA from control end and save the current numerical value as 4mA reference. This numerical value has already been calibrated in factory.



"XXXX"means real time input numerical value from control end.
If the current input is 4mA, press K3 button and the system will save it as 4mA reference, the screen will show "Save OK" for 1s, then dynamically shows the current input numerical value from control end. Press M button to enter the next setting item" ☐9 Saving 20mA reference ".

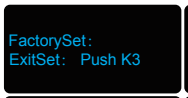
☐8 Saving 20mA reference :

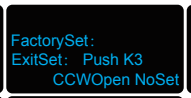
20mA reference: means input 20m A from control end and save the current numerical value as 20m A reference. This numerical value has already been calibrated in factory. Press M button to enter next setting item "Exit setting" if there is no special demand.

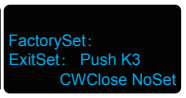


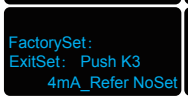
"XXXX"means the real time input numerical value from control end.
If the current input is 20m A, press K3 button and the system will save it as 20m A reference, the screen will show "Save OK" for 1s, then dynamically shows the current input numerical value from control end.PressM button to enter next setting item"☐A Exit setting".

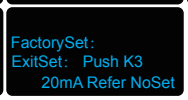
☐A Exit setting:











Press K3 button to exit the current system setting and enter "automatical control mode" If "Saving anticlockwise full open position" unset, the screen will show "CCWOpen NoSet", If "Saving clockwise full open position" unset, the screen will show "CWClose-NoSet", If "Saving 4mA reference" unset, the screen will show"4mA_Refer_Noset", If "Saving 20mA reference" unset, the screen will show"20mA_Refer_Noset". System exit is not allowed if any parameter is unset, pressing K3 button can restore to setting interface.

Menus operations ----Manual operation mode

☐1 Manual operation mode

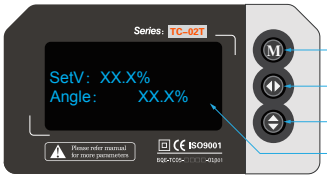
After factory default setting ,actuator could be manual operated by the button. Press K3 button simultaneously, until K3 is flicking on top right corner. After 3s, enter "Manual operation mode".

☐2 Manual operation:

Under "User setting"and "Manual setting"mode, if there is no button pressing for about 10s,system will enter "Auto control mode" automatically.

Press K3 button, actuator will rotate in anticlockwise direction, and the screen will show the current angle . The actuator will stop as soon as the button is released.
If the angle is bigger than 90°, the bottom of the screen will show "Limit"and the actuator will not operate.
Press K2 button, actuator will rotate in clockwise direction, and the screen will show the current angle . The actuator will stop as soon as the button is released.
If the angle is less than 0°, the bottom of the screen will show "Limit"and the actuator will not operate.
Press M button or without pressing any button for 10s means to exit the current mode, and enter auto control mode.

Menus operations ---- User setting mode



M Key: to switch menus
K2 Key: to switch Flash item or adjust values
K3 Key: to modulate numerical value
Screen: 1.3"OLED,Blue word against black background, 128X64

☐1 User setting mode:

Hold M button, until "M" is flicking on top right corner. After 3s, enter "user setting mode" and get into "☐2 Control direction settings" at the same time.

☐2 Control direction setting:

Control direction: Direct acting, Reverse acting. Positive acting: 4mA means valve is totally off, 20mA means valveis totally on.
Negative acting: 4mA means valve is totally on, 20mA means valve is totally off.

Instructions: press K3 button to switch positive acting and negative acting.Press M button to enter the next setting item: "☐3 No control command"

☐3 No control command:

When external control signal is missing, valve can be designed to perform on/off/ keep on.

Instructions: Press K3 button to switch these 3 choices in cycle. Press M button to enter the next setting item: " ☐4 Dead zone setting"

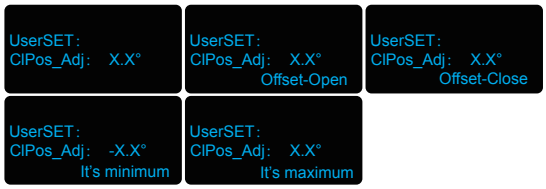
☐4 Dead zone setting:

Dead zone setting: main task is to adjust the accuracy and sensitivity, the unit is deviation degree.The bigger the dead zone is, the less accurate and sensitive the valve is. The smaller the dead zone is, the more accurate and sensitive the valve is. But it tends to cause the system oscillation. The range:0.5-3.9°, the system default is 1.0.

Instructions: Press K3 button to increase 0.1, K2 button to decrease 0.1. Press M button to enter the next setting item: "☐5 Slight adjustment to valve-off position"

☐5 Slight adjustment to valve-off position:

Slight adjustment to valve-off position: You can adjust the value to change "valve-off" position if there is lax close problem which leads to water leakage.Valve-off position will move anticlockwise(valve-on direction) when the value is increasing.Valve-off position will move clockwise(valve-off direction) when the value is decreasing.



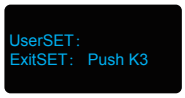
△ Press K3 button to increase 0.1° , and the menu will show "Offset-Open" which indicates valve-off position is moving towards valve-onposition. If the menu shows "It's minimum", it means the set value is out of range of valve-off limits.
△ Press K2 button to increase 0.1°, and menu will show "Offset-Close" which indicates valve is moving towards valve-off position. If the menu shows "It's is maximum", it means the set value is out of range of valve-off limits.
△ Press M button to enter next setting item: "☐6 PWM_4mA modifying".

☐6 PWM_4mA modifying:

if 4mA deviation value of output current is big, user can adjust it by this item. if the number increases, output current will be bigger, if the number decreases, the output current will be smaller.

Instructions: Press K3 button to increase the figure one by one, K2 button to decrease the figure one by one.Press M button to enter the next setting item: "Exit setting "

☐7 Exit Setting:



Instructions: Press K3 button to exit setting, press M button to loop the beginning menu. After exiting setting, the system will enter auto control mode.

Common failures and processing methods

	Fault phenomenon	Fault cause	Processing methods
□1	Actuator no action	△1 power not connected	Connect power
		△2 voltage below level or incorrect	Check whether voltage is within the normal range
		△3 overload protection of motor after 3s	Check whether valve gets stuck or torque value is too big
		△4 terminal loose or poor contact	Check and correctly connect terminal
		△5 starting capacitance poor run	Contact the manufacturer to get repair
□2	No feedback signal	△1 line barrier of user acquisition signal	Connect user acquisition signal
		△2 4-20mA deviation is too big	Adjust the reference value of PWM-4mA by the menu
		△3 4-20mA transducing circuit damage	Contact the manufacturer to get repair
□3	Actuator not fully closed	△1 use feedback signal to control actuator	Receive feedback signal doesn't mean actuator is fully closed, so don't cut power off
		△2 return difference increases due to abrasion between actuator and valve rod	1 Adjust valve–off position to realize deviation by the menu 2 Contact the manufacturer to get repair
□4	Actuator interior water ingress	△1 OD of incoming line cablenon-standard	Contact the manufacturer to get repair
		△2 waterproof treatment of incomingline incomplete	
		△3 actuator lens wearout	
		△4 screws on connection cover/head cover /slide cover loose	

Working environment

- ☐ Indoor and outdoor are both optional.
- ☐ Not explosion proof products, ⚠ do not use them in flammable and explosive environment.
- ☐ You need to install protective device for the actuator if it is expossed to the rain or sunshine.
- ☐ Please pay attention to the ambient temp.
- ☐ When installing, you need to consider the reserved space for wiring and repairing.
- ☐ When power on, ⚠ it is not allowed to dismantle actuator and valve.
- ☐ When power on, ⚠ it is not allowed to do wiring.
- ☐ ※Absolutely no falling down the ground, which will hit the device and lead to improper operation.
- ☐ ※Absolutely no standing on the device, which will cause device malfunction or personal accident.
- ☐ ※It is forbidden to do wiring project in rainy day or when there is water splash.

Safety notice

- ☐ In order to use the device safely for a long term, please pre-read the manual carefully to ensure correct use.
- ☐ Notice item: Please understand the product specification and using method clearly to prevent personal safety danger or device damage.
- ☐ In order to indicate damage and danger, here we classify them as “warning ⚠ ” and “notice ※ ”.
- ☐ Both of contents are very important, which should be obeyed strictly.
- ☐ “Warning ⚠ ”: It will cause death or serious injury if not obeyed.
- ☐ “Notice ※ ”: It will cause slight injury or device damage if not obeyed.
- ☐ Subject to technical changes.