CONVALVE

SPECIALIST IN VALVE AUTOMATION

MODULATING ELECTRIC ACTUATOR USER MANUAL

PUBLISH DATE: 22.07.2023
REVISION NO: 01

INTRODUCTION

Thank you for purchasing Convalve products. Each product has been thoroughly inspected after its production to offer you the highest quality and reliable performance. Please read the product manual carefully prior to installing and commissioning the product.

- Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly.
- The manual should be provided to the end-user.
- The manual can be altered or revised without any prior notice. Any changes in product's specification, design, and/or any components may not be printed immediately but until the following revision of the manual.
- The manual should not be duplicated or reproduced for any purpose without prior approval from Convalve.
- In case of any other problems that are not stated in this manual, please make immediate contact with Convalve for assistance.

TRANSPORTATION AND STORAGE

- Convalve recommends storing modulating electric actuator valves in a clean and dry environment. For optimal storage conditions, it is recommended to store the modulating electric actuator indoors, safeguarding them against adverse weather conditions and other potentially harmful elements. At Convalve, we prioritize the longevity and performance of our products, and these storage guidelines are meant to preserve the modulating electric actuator's functionality and reliability throughout their lifecycle.
- Handling the modulating electric actuator with care is of utmost importance to prevent any scratches, damage, or harm to the environment during transportation. Adequate protection should be provided to ensure the modulating electric actuator remains intact throughout the transportation process.

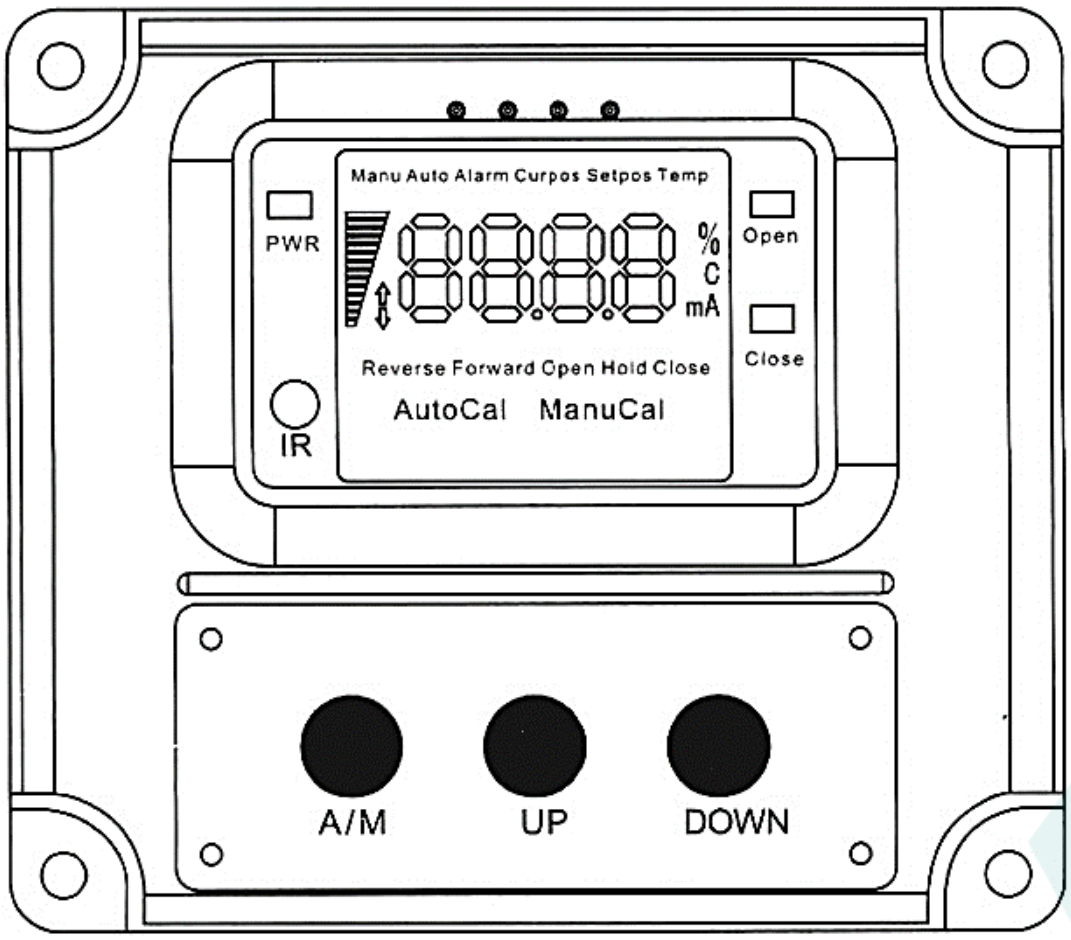
PRODUCT DESCRIPTION

- LCD multifunction display window, content is very rich, user can grasp the basic equipment parameters and monitor the running status, can easily known the fault alarm information.
- Equipped with infrared remote control, achieve non-contact site control and parameter setting, and get free-open maintenance.
- Actuator real-time monitoring function. After detecting the fault, the controller will stop the motor and protect the equipment, it will show the alarm information, can alert the control system through passive contact
- With lack phase automatic protection function and the phase sequence automatic phase, auto corrective function, local no need concern phase sequence.
- Use advanced originality PID control algorithm, to improve the success rate of once location. Improved PID control algorithm according to the inertia of the brake actuator mechanism, wear and tear, the change of load torque automatically adjust the PID parameters. According to the PID parameters to calculate the forward and reverse best downtime, to ensure once location success.
- Have over-torque protection function, when the fault occurs, can disconnect actuators.
- Waterproof design, waterproof level grade IP65.
- Combine the adjusting type and switch type, user can make free choice.
- With an integrated design, looks elegant.

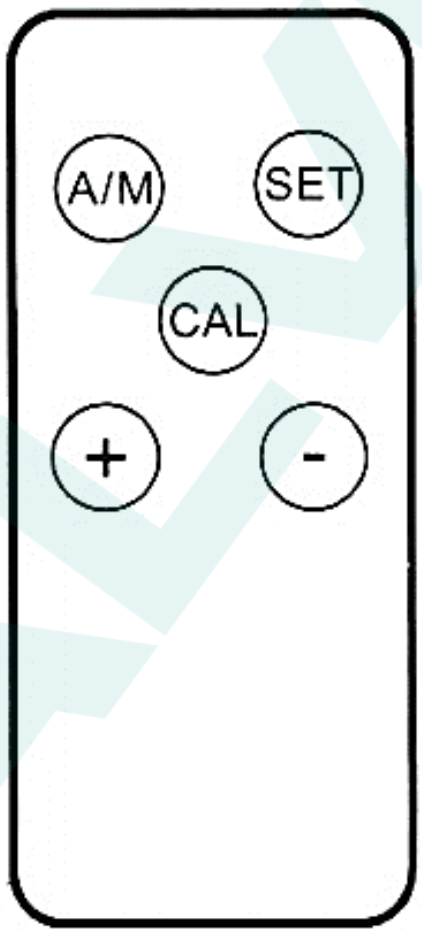
MAIN TECHNICAL SPECIFICATIONS

- Input voltage range: three-phase: 342V-418V, single phase: 85V-248V
- Environment temperature: -40,°C~85°C, relative humidity: 90RH%,can setting over temperature alarm function.
- Control accuracy: 0.1%~3.0% (can be adjusted by parameter d)
- Actuator feedback signals: potentiometer 500Ω~10KΩ (can customized before out of the factory)
- Output of the driver motor: output of the silicon-controlled (1200V AC, 25A)
- Input of the analog signal: Control opening signal DC, 4~20mA, 0~5V, 0~10V, the default value can customized before out factory, input resistance: 250Ω
- Feedback of the valve current opening signal : 4~20mA DC (0~5V, 0~10V, default value can customized before out factory), the maximum load capacity<=500Ω（2000V surge voltage)
- Input of switching signal : 3 channels input signal of photoelectric isolated control (remote on. off, keep) with built-in 24V control voltage.
- Feedback of switching signal: feedback of the relay, including trouble, remote status, on position, off position output, load ability 60V/500mA.
- Signal isolation: signals are isolated by the relays and optoelectronic couplers, the isolation can be up to 2000V.
- Chassis size:
  10=10 actuator rear cover Size: 104mm*92mm*35mm
  20=20 actuator rear cover Size: 115mm*97mm*35mm
  30=30 actuator rear cover Size: 114mm* 100mm*35mm

BRIEF INTRODUCTION OF DISPLAY PANEL



PICTURE 1 : PANEL



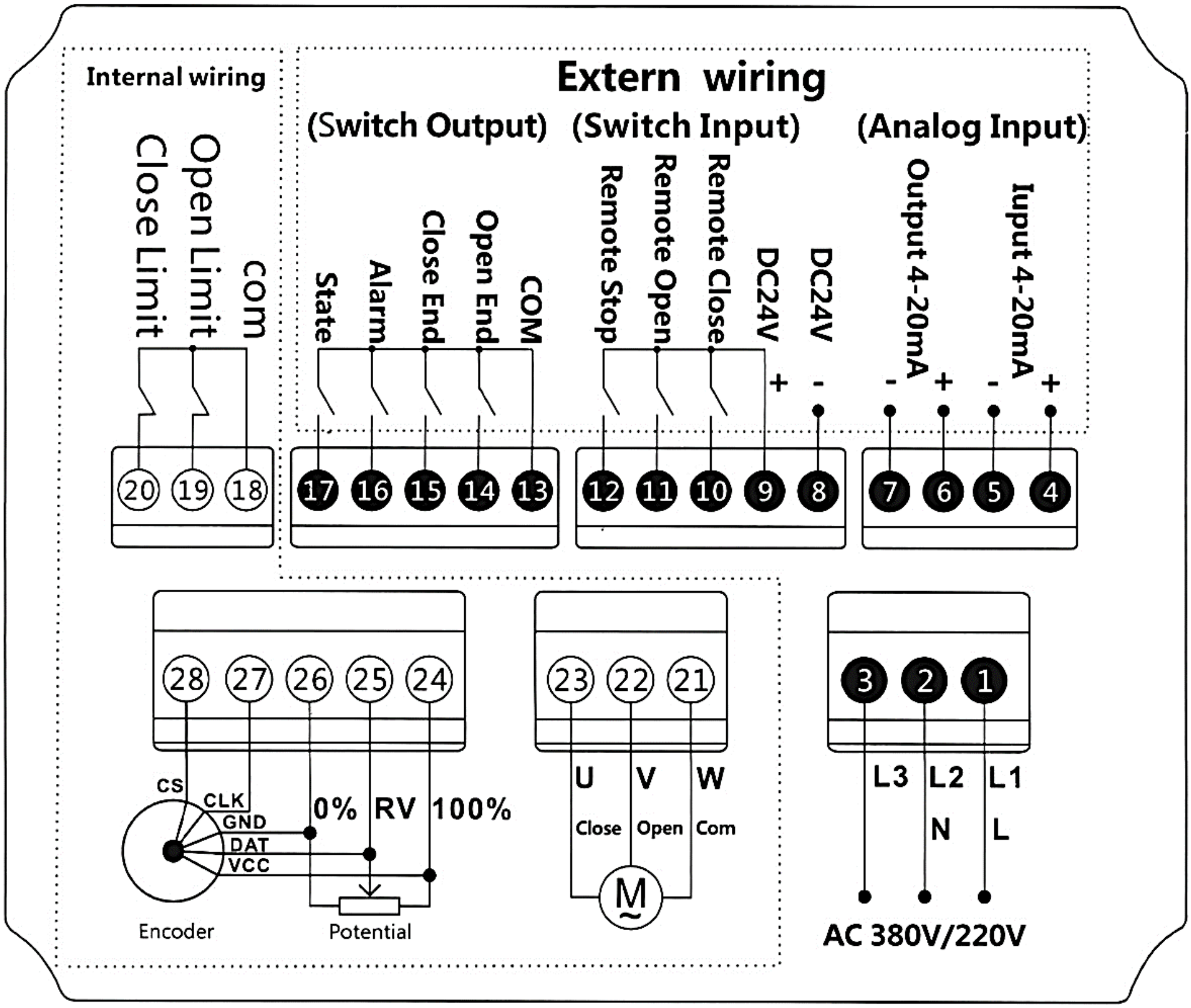
PICTURE 2 : REMOTE CONTROLLER

TYPE	DISPLAY ITEM	DESCRIPTION
PARAMETER	Number display area	Valve opening, set the opening, error code , set parameters
	Valve position	The value displayed is the actual value of the actuator‘s opening valve position
	Given	The value displayed is the setting value of the actuator’s opening valve position
	Temperature	The value displayed is the internal temperature of the actuator
WORKING MODE	Local	Local manual control
	Remote	Remote control
OPERATE MODE	Forward direction	Reverse action mode, input signal output as below:
		4mA-full position (general calibrate to full open) 20mA-zero position (general calibrate to full close)
	Reverse direction	Reverse action mode, input signal output as below:
		4mA-full position (general calibrate to full open) 20mA~zero position (general calibrate to full close)
	Full open	When the input signal interrupt, open the actuator valve to the maximum position
	Keep	When the input signal interrupt, open the actuator valve to the current position
	Full close	When the input signal interrupt, open the actuator valve to the minimum position
	Alarm	Failure alarm, electric machinery, potentiometer, valve, mechanical part and the upper machine abnormal
CALIBRATION METHOD	Auto calibration	The control mode in auto calibration status
	Manual calibration	The control mode in manual calibration status
UNIT INSTRUCTIONS	%	The actuator opening percentage
	°C	The temperature of the unit
	mA	The current unit of mA
KEY	A/M	Remote local switch
	UP	Remote mode: press this key to show the setting parameter, local mode: press this key to let the electric al machine open the valve.
	DOWN	Remote mode: press this key to show the temperature parameter, local mode: press this key to let the electric al machine close the valve.
	Setting (SET)	Enter the parameter setting interface, the parameter setting can refer to < setting parameter table •>
	Calibration (CAL)	Long press 3 seconds, enter auto calibration.

WIRING METHOD

- Wiring the terminals and the meter case refer to the diagram. Connect the electric actuator and the power supply; Pay attention to the polarity. Three-phase motor wiring, no need care phase sequence issue local.

- To reduce the motor interference, need to separate the electric actuator's motor control line and signal line; the current control signal line connected to the front input instrument should as short as possible, if need use long line, need to use shielding signal lines, the shield controller shell should ground connected.

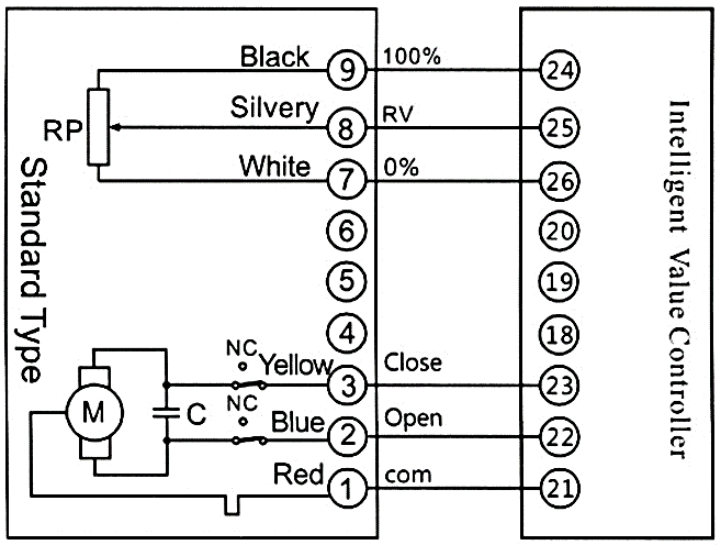


PICTURE 3 : SINGLE-PHASE / THREE-PHASE DIAGRAM

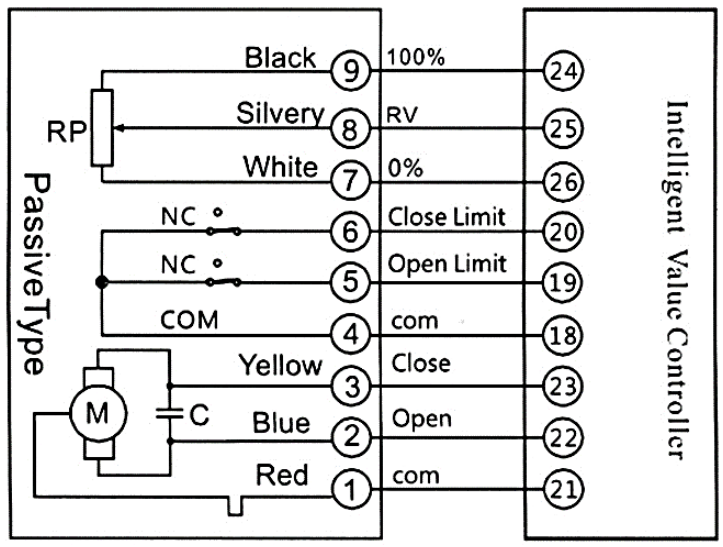
NOTES :

- Can set P=9. 1 to enter working type selection to choose work under adjust type or switch type, but can not use adjust and switch type simultaneously (5 switching value control type), the factory default value is iP=0 (adjust type) or iP=1 (switch type), the other control way please refer to (remote control signal settings)
- On, off over torque port need connect to the normal close switching type limit switch, the factory default value is Md=2, If no need for this function, can set P=9. 5 and change Md to 1to shield this port function, please refer to (actuator wiring typesetting)
- The public port control by switching value is DC 24V+, and the voltage supply by module, no need external power. When need DC 24V power supply, connect the negative pole of the power to DC24-port.
- The product can connect to potentiometer or encoder, please refer to (Selection of the valve sampling)

ACTATOR WIRING TYPE SETTING



PICTURE 4 : WIRING OF THE STANDART ADJUST TYPE MOTOR (SETMD=1)



PICTURE 5 : WIRING OF THE PASSIVE CONTACT TYPE MOTOR (SETMD=2)

By change P to 9. 5, and press “A/M” key to enter Md parameter setting, set the motor type refer to below table.

MOTOR TYPE	MD VALUE	CONTROL DESCRIPTION	FACTORY DEFAULT
Standard Adjust Type	Md=1	Port 18. 19. 20 not receive any signal	Md=2
Passive Contact Type	Md=2	Port 18. 19,20 need connect motor limit switch, the limit switch type is normal close point.	

NOTES :

- When setting to passive contact type motor (Md to 2), Port 18, 19, 20 need connect motor limit switch or the torque switch, if the port dangling, will lock the motor anc make it works abnormal.
- If using an external temperature protector, the protector should concatenation at public port 18.

SETTING OF THE REMOTE CONTROL SIGNAL

By change P to 9.1, Press “A/M” key into parameter iP setting, set the remote control signal refer to the table below.

REMOTE CONTROL MODE	PARAMETER IP VALUE	DESCRIPTION	DEFAULT VALUE
Remote Adjust Type	iP=0	Adjust type, control the motor run through the analog signal 4~20mA rate, other control signal can customized	iP=0 Remote Adjust Type.
Remote Electric Control	iP=l	Switch type, the valve open when remote open signal closing, the valve close when the signal opening. The close valve action similar. The remote keep signal invalid.	
Remote Keep On	iP=2	Switch type2, the valve close when remote keep signal closing, the valve open when the keep signal opening. After open signal closing 3 seconds, opening the open signal, the valve will keep open, until the keep signal closing. The close valve action similar.	
Remote Keep Of	iP=3	Switch type3, the valve close when remote keep signal opening, the valve open when the keep signal closing. After open signal closing 3 seconds, opening the open signal, the valve will keep open, until the keep signal closing. The close valve action similar.	
On Signal Open, No Signal Close	iP=4	Switch type4, only the remote open signal valid, the valve keep close when remote open signal opening, the valve keep open when remote open signal closing	
On Signal Close, Off Signal Open	iP=5	Switch type5, only the remote close signal valid, the valve keep open when remote close signal opening, the valve keep close when remote close signal closing	

The table above list 6 common control signal according to the PLC output control signal type. If there Is any other specific control signal, please contact us consult customizing.

SELECTION OF VALVE SAMPLING (POTENTIOMETER OR ENCODER)

The valve sampling of the module support potentiometer and encoder, user can choose the potentiometer or encoder through below steps:

- First step: change the 'hardware, can use the mini jumper setting the TP2, TP3, TP4 on the display board.
- Second step: Change the P to 4. 4, press “A/M”key to enter PM parameter setting, set as the table below.

VALVE SAMPLING MODE	PM VALUE	TP2	TP3	TP4	CONTROL DESCRIPTION	DEFAULT VALUE
Potentiometer	PM=0	SHORT	OPEN	SHORT	Port 24=100%, port 25=RV, port 26=0%	PM=0
Encoder	PM=1	OPEN	SHORT	OPEN	Port24=VCC, Port25=DAT, Port26=GND, Port27=CLK, Port28=CS	

ZERO POSITION AND FULL POSITION CALIBRATION METHOD

METHOD ONE : MANUAL CALIBRATION METHOD

Manual calibration can enter through two mode:

- Under manual or auto measure and control status, press “A/M” and “DOWN” key for 3 seconds simultaneously to enter zero position parameter setting, then can set the zero position parameter “uL”. After finish setting, press “Swtich” key to save and exit. Or press “A/M” and “UP” key for 3 seconds simultaneously to enter full position parameter “uH” setting, after finish setting, press “A/M” key to save and exit.
- By set P to 3. 1, press “A/M”key to enter zero position parameter “uL” setting, after setting the zero position, press “A/M”, display “uH=xxx” to demarcate the full position, after finish setting, press “A/M” again, then set P to 5. 0, press “A/M”to save and exit, return to automatic measurement and control state.

METHOD TWO : AUTO CALIBRATION METHOD

Under the manual or auto measurement and control state, press key “UP” and “DOWN” key for 3 second simultaneously will start the auto calibration program. The positioner will automatically calibrate the zero and full position, the calibration no need manual operations. After the calibration finish, the positioner will back to the initial state.

NOTES :

1. Adjust the touch open potion of the normal limit switch or the torque limit switch.
2. Adjust the rotation range of the potentiometer of absolute value encoder.
3. When the normal limit switch or the torque limit switch touch, the auto calibration not work.

SETTING OF THE DEAD ZONE

During the positioner measurement process, the feedback potentiometer quality, the input signal strength or the environment electromagnetic interference may cause the actuator to oscillate and become hot, to avoid the actuator keep oscillating, the user can increase the value of parameter "d", or take some other measures.

THE CALIBRATION ON THE INPUT CURRENT

- Modify parameter “P” to 11. 1, then press A/M key to set the parameter “iL”
- Calibrate zero position input current: display the “iL”, input zero position electric current 4mA, After the value display stable, press “A/M” to confirm and enter parameter “iH”
- Calibrate full position input current: display the “iH”, input full position electric current 20mA, After the value display stable, press “A/M” to confirm, the set P to 5. 0, press “A/M” again to save and exit, return to automatic measurement and control state.

NOTES :

1. Normally no need do this step, if need please operate under the engineer’s guidance
2. Only the adjust type have this setting.
3. When do the input current calibration, need a signal source have 4~20mA output current ability

THE CALIBRATION OF THE OUTPUT CURRENT

- Modify parameter “P” to 1.1, then press A/M key to enter parameter “oL” setting;
- Calibrate zero position output current : Display the “oL” parameter, press “UP” or “DOWN” key to modify the “oL” value, change the output current to 4mA, press “A/M” to confirm, continue to parameter “oH” setting.
- Calibrate full position output current: Display parameter “oH”, Press “UP” or “DOWN” key to modify value of “oH”, to change output current to 20mA, press “A/M”to confirm. Then continue to the setting of internal temperature alarm parameter “t”.
- Setting the motor temperature alert : enter parameter “t”(internal temperature alarm threshold) : press “UP” or “DOWN” to modify the “t” value, usually set between 70 and 80 degree, press “A/M” key to confirm , then set P to 5. 0, press “A/M” again to save and exit, return to automatic measurement and control state.

NOTES :

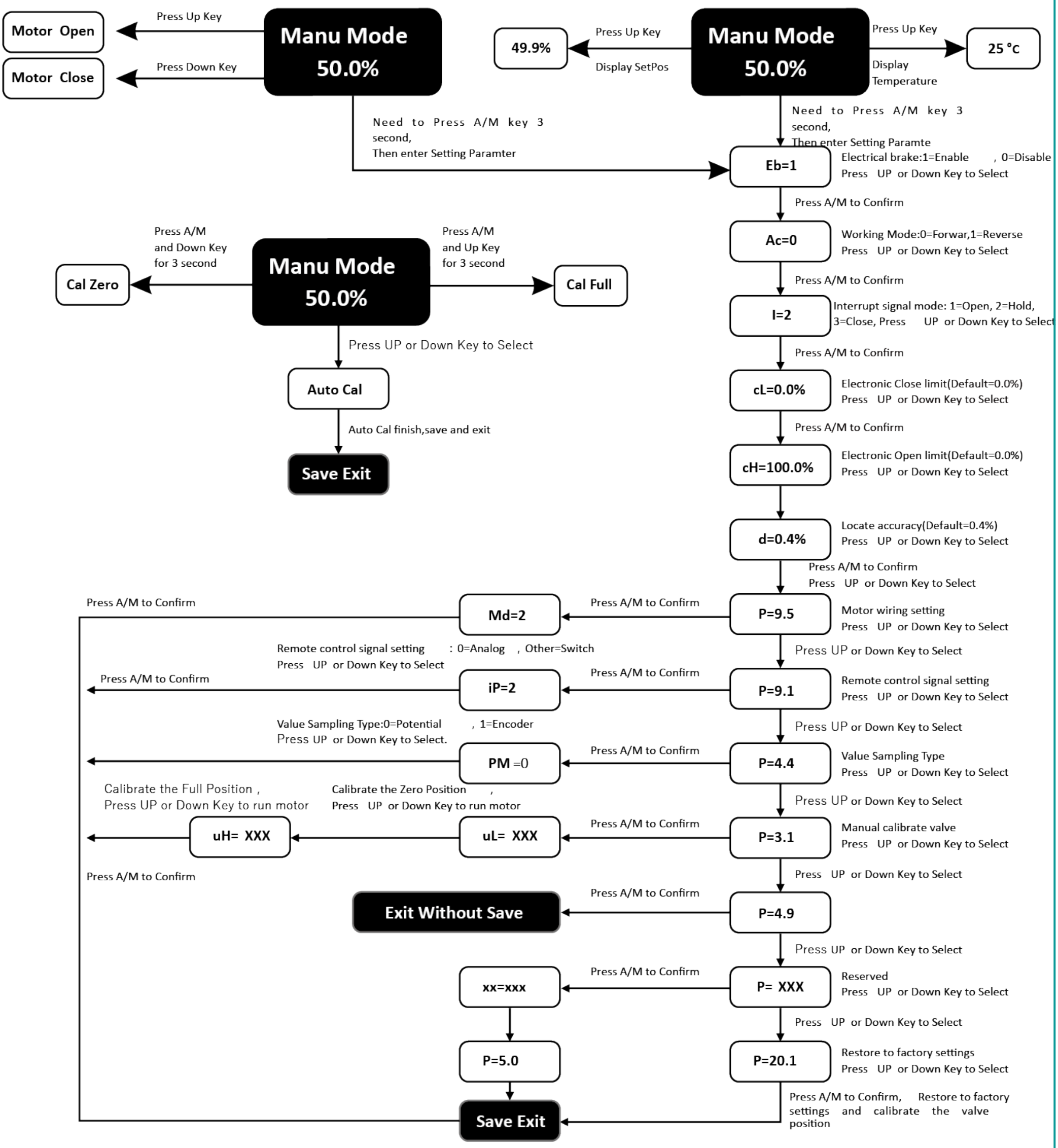
1. Normally no need do this step, if need please operate under the engineer’s guidance
2. When do the output current calibration, need an ampere meter input range cover 4~20mA

EXIT METHOD

Save and exit : After calibration need change “P”to 5. 0 by press “UP” or “DOWN”, then press “A/M” to confirm, the positioner automatically save the parameter set and exit the setting state.

Exit without saving : After calibration need change “P” to 4.9 by press UP or DOWN, then press “A/M” to confirm, the positioner automatically exit without saving the parameter set. Or during the setting process above, no key press wait time can not exceed 30 seconds, otherwise the positioner will automatically exit without saving the parameter set.

THE CALIBRATION OF THE OUTPUT CURRENT



ERROR CODE AND RESOLUTIONS

EROR CODE	DESCRIPTION	RESOLUTION
ER 0	Actuactor phase-lack	Check if 380VAC three-phase control phase-lack
ER 1	Parameter store error	Product not calibrate, recalibrate
ER 2	Internal temperature too high alarm	Internal temperature of the device too high, take action to cool.
ER 3	Forward action motor blocked	Check the mechanical part of the valve and actuator
ER 4	Reverse action motor blocked	Check the mechanical part of the valve and actuator
ER 6	Input current not enough	<”iL” value, need increase the signal to 4mA
ER 7	Input current too much	>”iH” value, decrease to 20mA
ER 8	Threshold smaller than low limit	Check ” cL”value until 0. 00%
ER 9	Threshold more than upper limit	Check ” cL’value until 100.00%
ER 10	Zero full stroke too small	Running schedule difference is too small, zero recalibration valve full again
ER 11	External temperature detecting head over temperature	Take action to cooling
ER 12	Potentiometer not connect or overrun	Check wiring or adjust potentiometer
ER 13	Open; a moment	With a direction of torque, check the mechanical parts of the valve or actuator
ER 14	Clearance of torque	Zero direction of torque, check the mechanical parts of the valve or actuator
ER 15	Three-phase motor wire inversely connect	Adjust motor wire phase sequence

PARAMETER SETTING DESCRIPTION TABLE

NAME	PARAMETER	DEFAULT VALUE	DESCRIPTION
ENTER SETTING MENU			Enter parameter setting menu, need to press A/M key over 3 second, then enter Eb paramter
ELECTRICAL BRAKE	Eb	Eb=l	Eb=1 allow, press UP or DOWN to select, press A/M to confirm, continue to set parameter Ac.
			Eb=0 forbid, press UP or DOWN to select, press A/M to confirm, continue to set parameter Ac.
WORKING MODE	Ac	Ac=0	Ac=0 forward action : input current change from 4mA to 20mA, mapping the valve open wider, press UP or DOWN key to select, press A/M to confirm, continue to parameter I settings, Forward” Led light up
			Ac=l reverse action: input current change from 4mA to 20mA, mapping the valve openwider, press UP or DOWN key to select, press A/M to confirm, continue to parameter I settings, Reverse” Led light up
INTERRUPT SIGNAL MODE	I	I=2	I=2 no action (keep the valve open level), press UP or DOWN to select, press A/M key to confirm, continue to parameter cL setting, “Keep” Led light up.
			I=3 close action (till the valve full close), press UP or DOWN to select, press A/M key to confirm, continue to parameter cL setting, “Close” Led light up.
VALVE CLOSE LOW LIMIT	cL	ct. 0	Restrict the minimum low limit of close valve (in percentage), press UP or DOWN to select, press A/M to confirm, enter parameter cH
VALVE CLOSE LOW LIMIT	cH	cH=100	Restrict the maximum low limit of close valve (in percentage), press UP or DOWN to select, press A/M to confirm, enter parameter cH.
LOCATE ACCURACY	d	d=0. 4	d=0. 1~3. 0 press UP or DOWN to modify the value (in percentage), continue to parameter P
SAVE AND EXIT	P=5.0		Press A/M key to confirm, save setting parameter, exit the setting state, return to the control state
EXIT WITHOUT SAVING	P=4.9		Press A/M key to confirm, not save setting parameter, exit the setting state, return to the control state
RESTORE TO FACTORY SETTINGS	P=20.1		Press A/M key to confirm, restore to factory default settings and automatically calibrate the valve.position.
CALIBRATE INPUT CURRENT	P=11.1	iL=XXX	Press UP or DOWN key to set P to 1. 1, press A/M to confirm, continue to parameter iL. (Note: calibrate the min input current first, then calibrate the maxinput current)
			Calibrate min input current iL, adjust external input current to 4mA, after the display on the LED stable, press A/M key to confirm, continue to parameter iH.
		iH=XXX	Calibrate the max input current iH, adjust external input current to 20mA, after the display on the LED stable, press A/M key to confirm, continue to parameter P=5. 0.

PARAMETER SETTING DESCRIPTION TABLE

NAME	PARAMETER	DEFAULT VALUE	DESCRIPTION
CALIBRATE OUTPUT CURRENT	P=1.1	oL=XXX	Press UP or DOWN till P=1.1, press A/M key to confirm, continue to parameter oL. (Note: calibrate the min input current first, then calibrate the max input current)
			Calibrate the minimum output current oL, press UP or DOWN key to modify the value, after external amperemeter stable show 4mA, press A/M key to confirm, continue parameter oH settting.
		oH=XXX	Calibrate maximum output current oH, press UP or DOWN key to modify the value, after external amperemeter stable show 20mA, press A/M key to confirm, continue to parameter t setting.
		oCXXX	Internal temperature warning parameter t, press UP or DOWN key to modify value to setting the warning temperature, continue to parameter P=5.0.
MANUAL CALIBRATE VALVE	P=3.1	uL=XXX	Press UP or DOWN kev until P=3.1, press A/M to confirm, continue to parameter uL setting. (Note: neecf calibrate small then big)
		uH=XXX	Calibrate full position uH. First press UP or DOWN key to expected full position, press A/M key to confirm, return P^S. 0
VA	P=4.4	PM=0	PM=(): choose potentiometer, press “UP” or “DOWN” until P=4. 4, press “A/M” to confirm, enter PM setting to change PM=0
			PM=1: choose encoder press “UP” or “DOWN” until P-4. 4, press “A/M” to confirm, enter PM setting to change PM=1
MOTOR WIRING SETTING	P=9.5	Md=2	Md= 1: standard adjust type motor, press “UP” or “DOWN” until P=9. 5, press “A/M” to confirm, enter Md setting to change Md=l
			Md=2: passive contact type motor, press “UP” or “DOWN” until P-9. 5, press “A/M” to confirm, enter Md setting to change Md=2
LOCAL CONTROL METHOD SELECTION	P=9.3	MM=2	MM=1: local pointing control, press “UP” or “DWON” key until P=9. 3, press “A/M”to confirm, enter MM parameter setting change MM to 1
			MM=2: local keep control, press “UP” or “DWON" key until P=9.3, press “A/M” to confirm, enter MM parameter setting change MM to 1
REMOTE CONTROL SIGNAL SETTING	P=9.1	iP=0	iP=0: adjust type, control motor running through analog 4~20 mA rate, other control signal can customized
			iP = 1 : remote pointing control: remote open signal close, the valve open, signal off, valve stop! Close valve similar, remote keep signal invalid.
			iP=2: remote keep open: remote keep signal close, the valve stop, keep signal open, open signal close last for T seconds (T=3), the valve keep open, until the keep signal close. Close valve similar.
			iP 3: remote keep close: remote keep signal open, the valve stop, keep signal close , open signal close last for T seconds (T=3), the valve keep open, until the keep signal open. Close valve similar.
			iP=4:on signal on and off signal off: only remote open signal valid, remote open signal open the valve keep close, remote open signal close, the valve keep open.
			iP-5:on signal off and off signal on: only remote open signal valid, remote open signal open the valve keep close, remote open signal close, the valve keep open.
KEEP TIME	P=6.2	T=3	Time parameter “T” modified, when iP=2 or 3, open signal close last for T seconds, can keep running, T can modify to 0~20 seconds.