IAT/IMT series intelligence angle traveling electric actuator

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Ⅰ. Summary

IAT/IMT series intelligence angle traveling electric actuator is designed on the basis of the reliable traditional mechanical transmission, using the super large scale integrated circuit, Created its advanced digital control technology, mechatronics design of the formation of a new generation of intelligent, refined small-scale, high-performance, multi-function, remote control operation, the Chinese showed that self-diagnosis fault alarm angle traveling electric actuator.

IAT/IMT series products have excellent performance, perfect functions, light and nice contour, debugs simply, operation conveniently, breakdown self-diagnosis, all Chinese display, menu style operation. To combine with all kinds of ball valve, butterfly valve, throttle valves, etc. become the unit of electric actuator. It is widely used for such automatic control systems as power plants, oil, steel work, chemical factory, food, medicine, oil pipeline and waste treatment, specially desulfurization devices and so on automatic control system. Able to meet the requirements of intermittent control.

The products have been built in accordance with the standard: Q/ZTK01-2006 <<Intelligent Actuator>>

IAT/IMT series products main features:

1. Using the super large scale digital integrated chips and the system function integration chips, so formidable function, fast response, high precision.
2. Designing with mechanotronics, nice contour, light weight.
3. The rich information content display and user-friendly interface for man-machine dialogue.
4. By using the non-intrusive infra-red setting tool set up the functions and parameters, adjusting and operating the actuator in local.
5. All Chinese, numbers and character display, menu-style operation.
6. Powerful self-diagnostic function.
7. May modify the parameter settings and may configuration multiple signal output.
8. With the power phase lose protection and phase sequence auto-correct feature.
9. Non-invasive isolation seal, no run through shaft design.
10. Electrical control wiring using pluggable architecture design, convenient, saving time, saving effort.
11. Fieldbus control technology is optional.

Ⅱ. Types and Specifications

IAT series electric actuator is suitable in reversiable, intermittent operation work system, S2 working system, connected to sustained rate 25%, on-off frequency less than 630 starts per hour

IMT series electric actuator is suitable in the frequent adjustment situation, S4 working system, connected to sustained rate 25%, on-off frequency up to 1200 starts per hour.

Ⅲ. Main Technical Paraments

*Input Signal: (1) Analog signal 4-20mA · DC
(2) Switching Control of the contact
(3) Optional fieldbus control technology
*Output Signal: Valve position feedback signal 4-20mA · DC Load Resistance ⩽750Ω
Output shaft torque shown in Table 1
Actuator consume power and current shown in Table 1
*Error: ±1%
*Dead area: 0.1~9.9% adjustable The default setting is ⩽0.5%
*Gap: ⩽0.9°
*Half-way limit: Open limit range set 40%~100%
Closed limit range set 0%~60%
*Enclosure: IP68
*Explosion Proof: 1)Setting tool ExdⅡCT4 2)Electric actuator ExdⅡBT4
*Contact Capacity: 250V AC, 5A; 30V DC, 5A
*Power Supply: Single phase, 110/220 V AC 50/60HZ
Three phase, 380/440V AC 50/60HZ
*Ambient: 1)Ambient temperature: -25℃~+70℃ (Explosion proof -20℃~+60℃)
2)RH: 5%~98%
3)Atmosphere pressure: 86~106kpa
4)Air medium: non-caustic gases

*Interference Performance:
1) Magnetic field immunity: ⩽400A/M, 50Hz
2)Commom mode interference: 250V, 50Hz
3)Differential mode interference: 1V, 50Hz, 0~360°
4)Electrostatic discharge: 4KV
5)Electrical fast transient burst: power supply terminal 1000V;
input signal terminal 500V
6)Radio-frequency electro magnetic field immunity: frequency 80~1000MHz
field intensity 3V/M distance 1m
7)Surge immunity: 1KV

Ⅳ. Principle

IAT/IMT series electric actuator is drived by single phase or three phase motor, decelerated by two stage worm gearbox, change the high-speed small torque power into low-speed large torque power. Drive output shaft, driving the valve device.

Table 1

Type	Max Torque (N.M)	Rated Torque (N.M)	Torque Adjustment		Travel Time 60/50HZ	Max Stem dia	Motor Power (P)	Rated Current (A)			Handwheel Rotation	Weight
								1-Phase 110/220V		3-Phase 380/440V		
			1-Phase	3-Phase	S	mm	W	Switching	Modulating	Switch /regulation	n	Kg
IAT/AMT 60	60	50	25	30	14/17	22	15	1.00/0.53	1.00/0.45	0.25/0.14	8.5	12
IAT/IMT 90	90	75	40	45	14/17	22	25	1.30/0.60	1.30/0.58	0.28/0.20	8.5	12
IAT/IMT 150	150	125	70	75	17/20	22	40	1.60/0.80	1.60/0.95	0.39/0.33	10	13
IAT/IMT 190	190	160	85	95	17/20	22	45	1.70/1.10	1.70/0.95	0.50/0.36	10	14
IAT/IMT 280	280	235	130	140	20/25	32	50	2.00/1.20	2.00/0.95	0.40/0.34	12.5	18
IAT/IMT 380	380	320	175	190	20/25	32	60	2.80/1.40	2.80/1.30	0.45/0.35	12.5	19
IAT/IMT 500	500	420	230	250	20/25	32	90	3.60/1.70	3.60/1.50	0.73/0.60	12.5	20
IAT/IMT 600	600	500	270	300	24/29	42	90	3.60/1.70	3.60/1.50	0.73/0.60	14.5	23
IAT/IMT 800	800	670	360	400	24/29	42	140	4.00/2.00	4.00/2.15	0.80/0.72	14.5	24
IAT/IMT 1000	1000	840	450	500	24/29	42	180	4.80/2.40	4.80/2.45	0.98/0.80	14.5	26
IAT/IMT 1500	1500	1250	720	750	72/87	75	90	3.60/1.70	3.60/1.50	0.73/0.60	43.5	69
IAT/IMT 2000	2000	1670	950	1000	72/87	75	140	4.00/2.00	4.00/2.15	0.80/0.72	43.5	71
IAT/IMT 2500	2500	2100	1100	1250	72/87	75	180	4.80/2.40	4.80/2.45	0.98/0.80	43.5	71

The actuator has the hand/auto mechanical devices. Depress the hand/auto lever into hand position, the handwheel engage the second worm shaft through the clutch, torque will be delivered to the output shaft. Once the actuator switch to electric operation, whether it is the remote control or the local electric operation, hand/auto switch mechanical devices will automatically remain in electric operation the first priority. Motor drive first stage worm gear, through the clutch drive second stage worm gear, the torque transmission output shaft, while a torque detection device is equipped on the second stage of the worm gear worm shaft. The position switch is equipped on the output shaft.

IAT/IMT electric actuator receive the standard analog control signal, drive the vavle to complete the positioning control. Actuator can also receive the switch signal. Event signals located in a pre-set position of control system

Table 2

Type	D MAX	E	F	G	H	I	J	K1	K2	K3	L	M	N	O
IAT/IMT 60/90	22	55	102	43	2	387	212	108	130	50	260	60	235	102
IAT/IMT 150/190	22	57	120	43	2	417	233	233	130	50	272	60	265	102
IAT/IMT 280/380/500	32	75	145	52	2	440	238	238	130	50	342	70	288	125
IAT/IMT 600/800/1000	42	85	175	59	2	480	254	254	130	50	353	78	328	170
IAT/IMT 1500/2000/2500	75	120	236	109	7	480	254	254	130	50	530	78	375	170

The actuator's base plates and flange based on standard ISO5210.

The corresponding flange No.

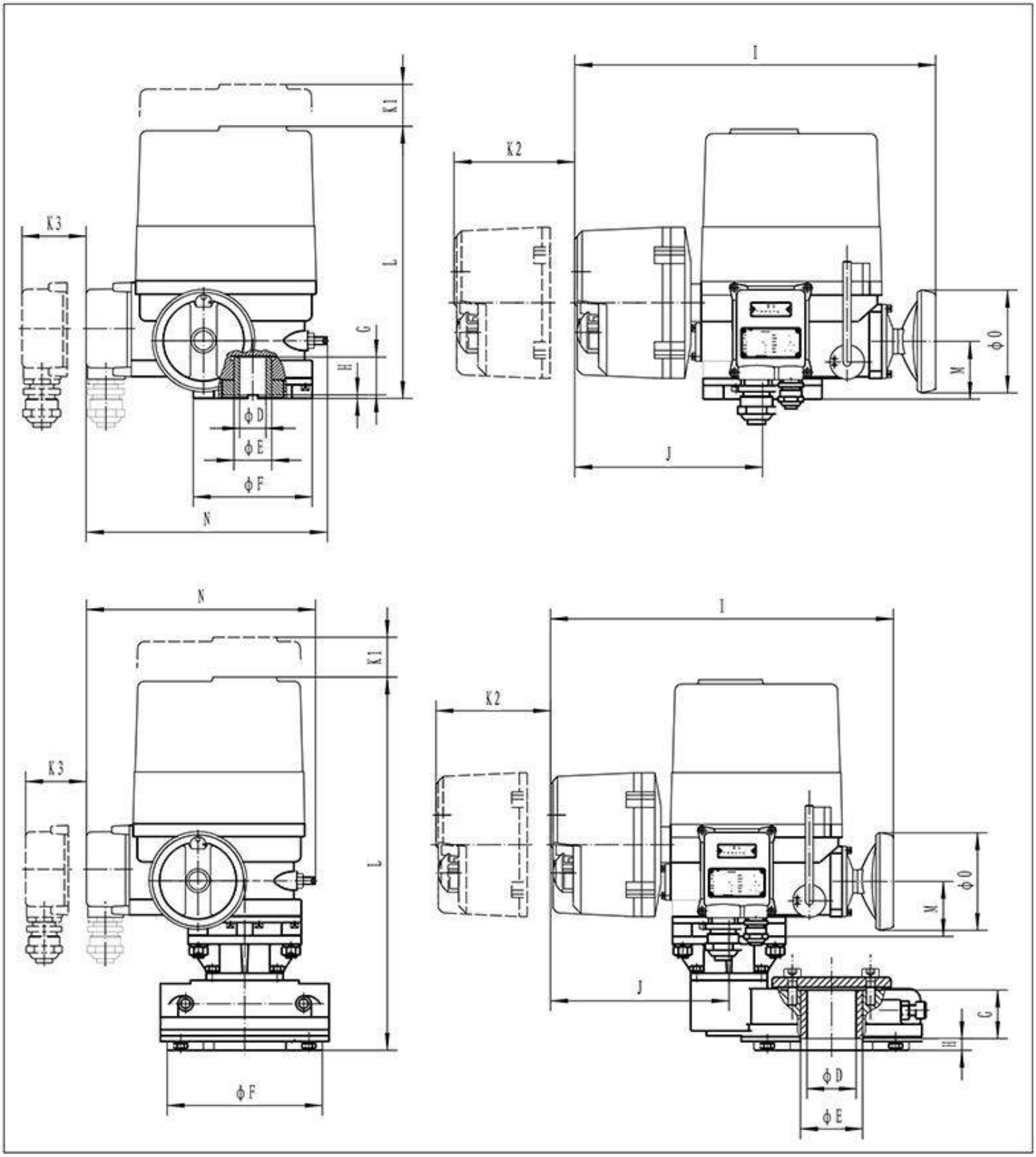
Table 3

Type	Flange Type ISO5211	Screw Hole Center Distance mm	Screw Size	Screw depth mm
IAT/IMT 60/90	F07	70	4-M8-6H	12
IAT/IMT 150/190	F07	70	4-M8-6H	15
	F10	102	4-M10-6H	15
IAT/IMT 280/380/500	F10	102	4-M10-6H	18
	F12	125	4-M12-6H	18
IAT/IMT 600/800/1000	F12	125	4-M12-6H	22
	F14	140	4-M16-6H	22
IAT/IMT 1500/2000/2500	F16	165	4-M20-6H	30

V. The Outline And The Dimension

1. IAT/IMT angle traveling electric actuator's outline and dimension

Figure 1, Outline and dimensions of actuator



2. IAT/IMT angle traveling electric actuator's base plates's dimension(see table 3)

VI. The Mounting And Connections

1. The mounting of the actuator

The base plate of actuator based on standard ISO5210(Table 3). The actuator's output flange join with the the valve flange, the sizes of the actuator and the the valve flange's sizes should be consistent. Otherwise, need to add the joining devices such as transition flange and holder etc.. If the valve joining flange does not conform with the IOS5211 or other standards and requirements should be made in the order. Our company can customize the practical requirements of the design of the base flange, in order to meet the site requirements

(A). Drive shaft sleeve join with the valve central shaft

The actuator's torque output is through the drive shaft sleeve which unites with the output shaft transmits for the valve central shaft. Therefore, actuator's drive sleeve of the output shaft should be dismantled and processed into suitable joining valve central shaft's shape and size.

1. The demolition of drive sleeve

IAT/IMT 60-1000 drive sleeve instals in the hole of the base plate, remove the four joining screws, so remove the drive sleeve. IAT/IMT 1500-2500 drive sleeve instals in the gear box. First remove the four joining screws on the gear box's top cover, then remove the cover and set drive sleeve release from the base side of gear box. Demolition is completed, it is best instal screws and associated parts back, so as not to lose.

release from the base side of gear box. Demolition is completed, it is best instal screws and associated parts back, so as not to lose.

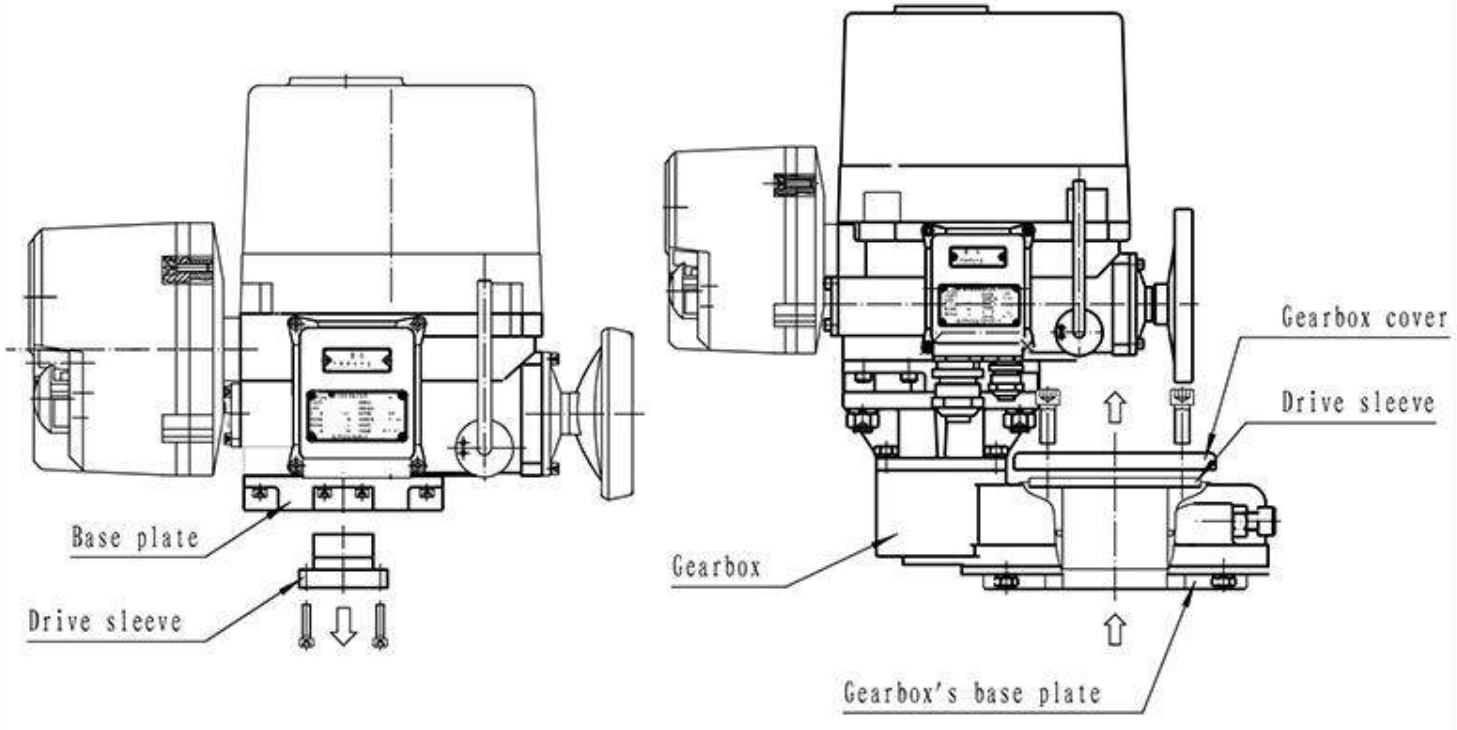


Figure 2, Demolition methods of drive sleeve

2. Processing of drive sleeve

When the actuator in the closed position, the drive sleeve of mounting holes and the screw of the base flange position relationship shown in Figure 3, typically 45° angle between the two is. Therefore, when processing of drive sleeve's hole should be four mounting holes of drive sleeve as the location of the base, and pay attention to ensure drive sleeve's hole and drive sleeve's excircle the concentricity. In addition, the drive sleeve's hole's diameter (ie, the valve shaft diameter) shall not exceed Table 2 (D MAX) value, please pay attention.

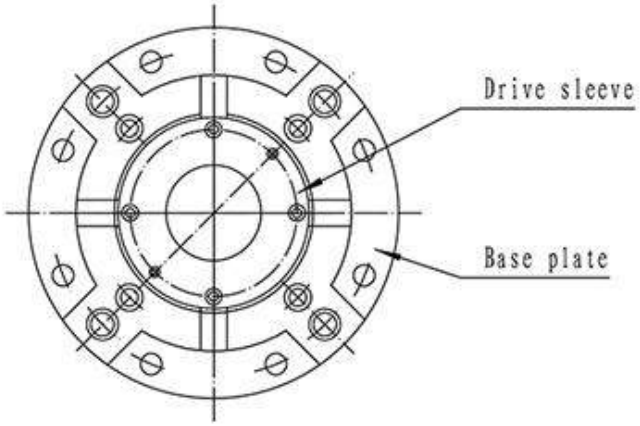


Figure 3, The relative position between the drive sleeve and the valve seat

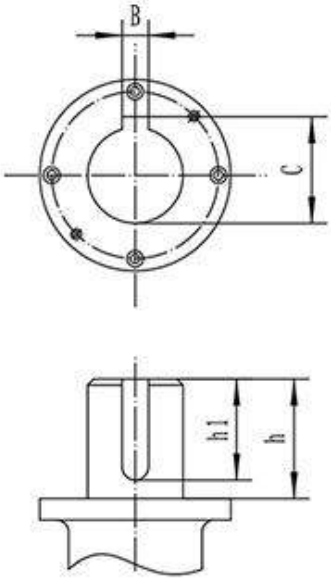


Figure 4, Drive sleeve and valve key joining (recommend form)

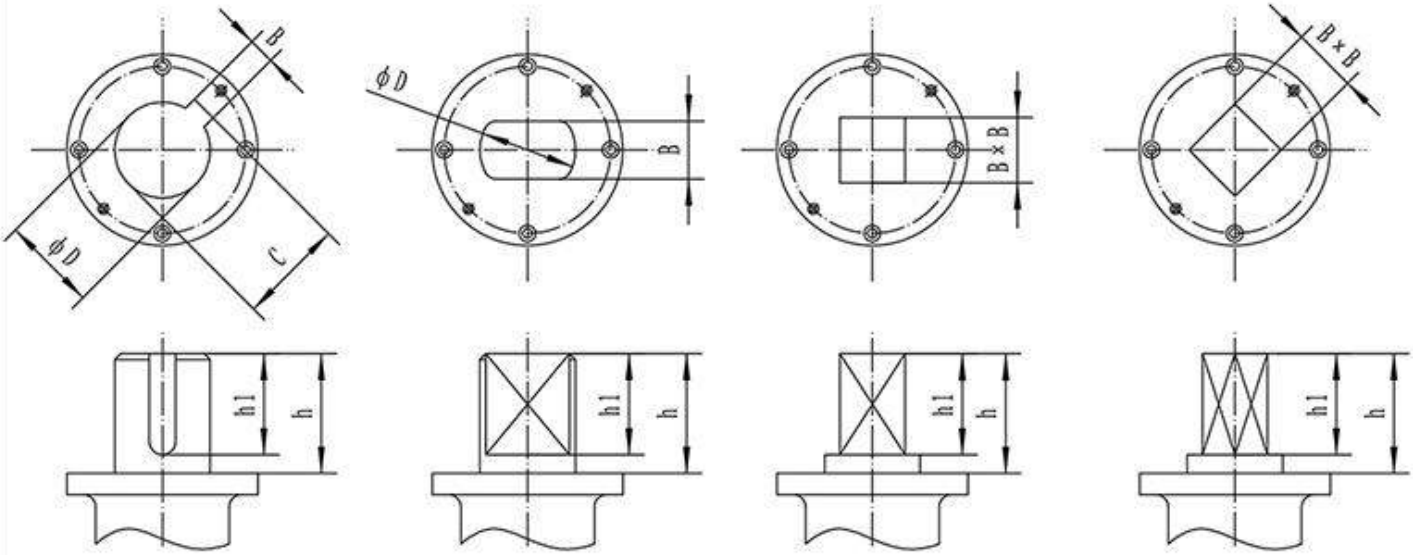


Figure 5,Drive sleeve and valve joining form

The drive sleeve and the valve shaft recommend using the key joining. And recommend that drive sleeve's key gap point to a mounting hole (see Figure 4). In addition, the drive sleeve valve shaft can use a number of other joining mode, as shown in Figure 5.

Our company may according to the user's requirements, when the delivery provides drive sleeve which joins the valve shaft suitably. (Required to charge a processing free). If required, please submit in advance and indicate on the drawing processing of size requirements.

3. Mounting of drive sleeve

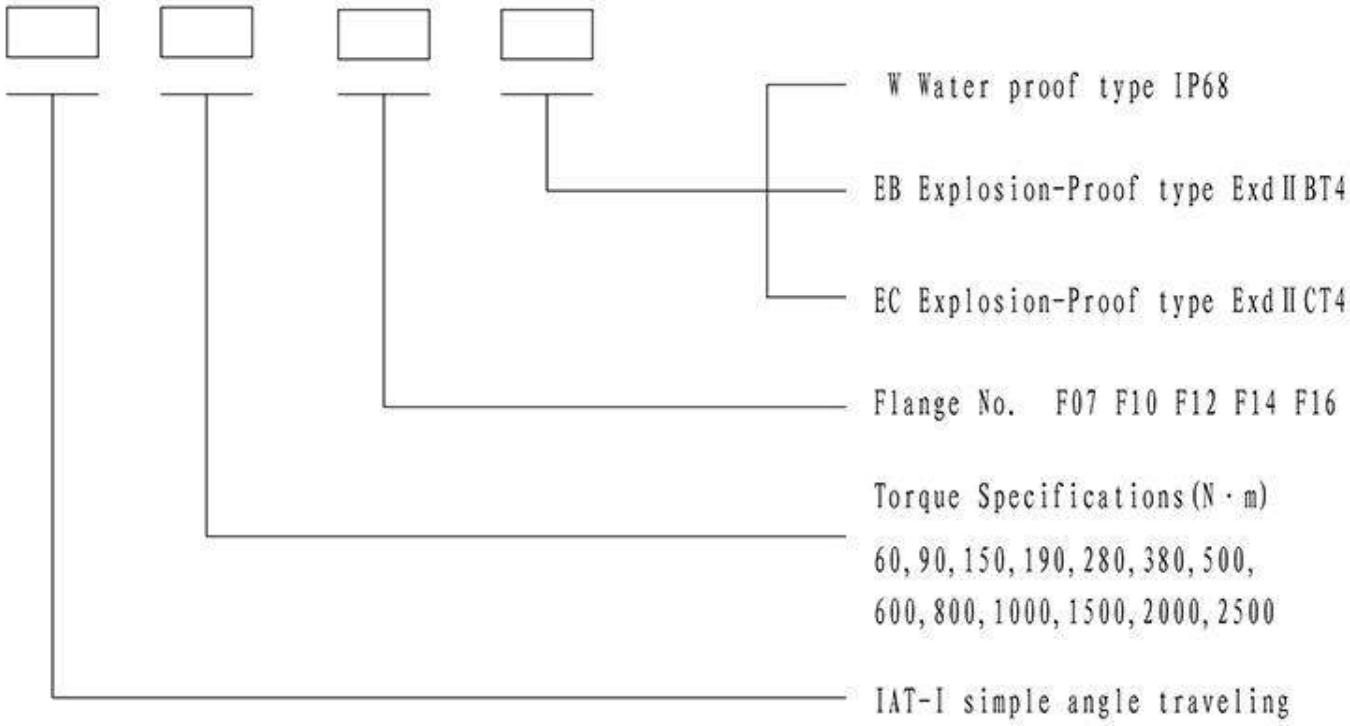
Drive sleeve which have been processed, should be test-assembly with the valve shaft, to test the accuracy of joining size and form. Test correctly, install the drive sleeve to the actuator back, and tighten the joining screws. IAT/IMT 1500-2500 to install the drive sleeve, the gear box top cover's arrows point to be consistent with the demolition of the former in order to avoid wrong direction.

(B). Installation of actuator and valve

Before the installation, the actuator and valves should be placed in full closed or full open position, and then assemble the actuator, valves and joining devices. The relative position of the actuator and the valve, adjust through the drive sleeve's four mounting holes, and then tighten all the fasteners.

2. The connections of the actuator

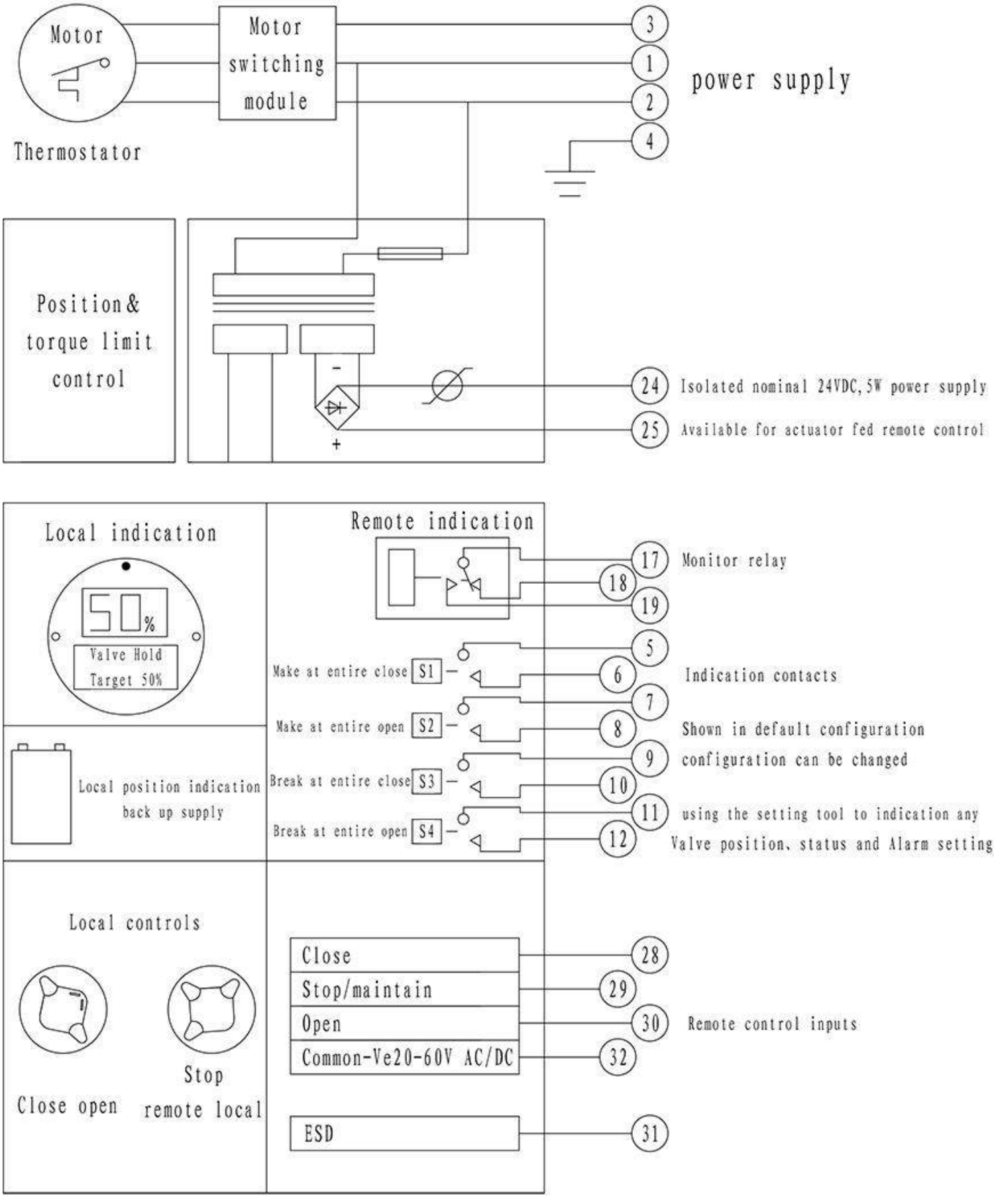
(1). Type of actuator



2. The function of the actuator and the corresponding terminals

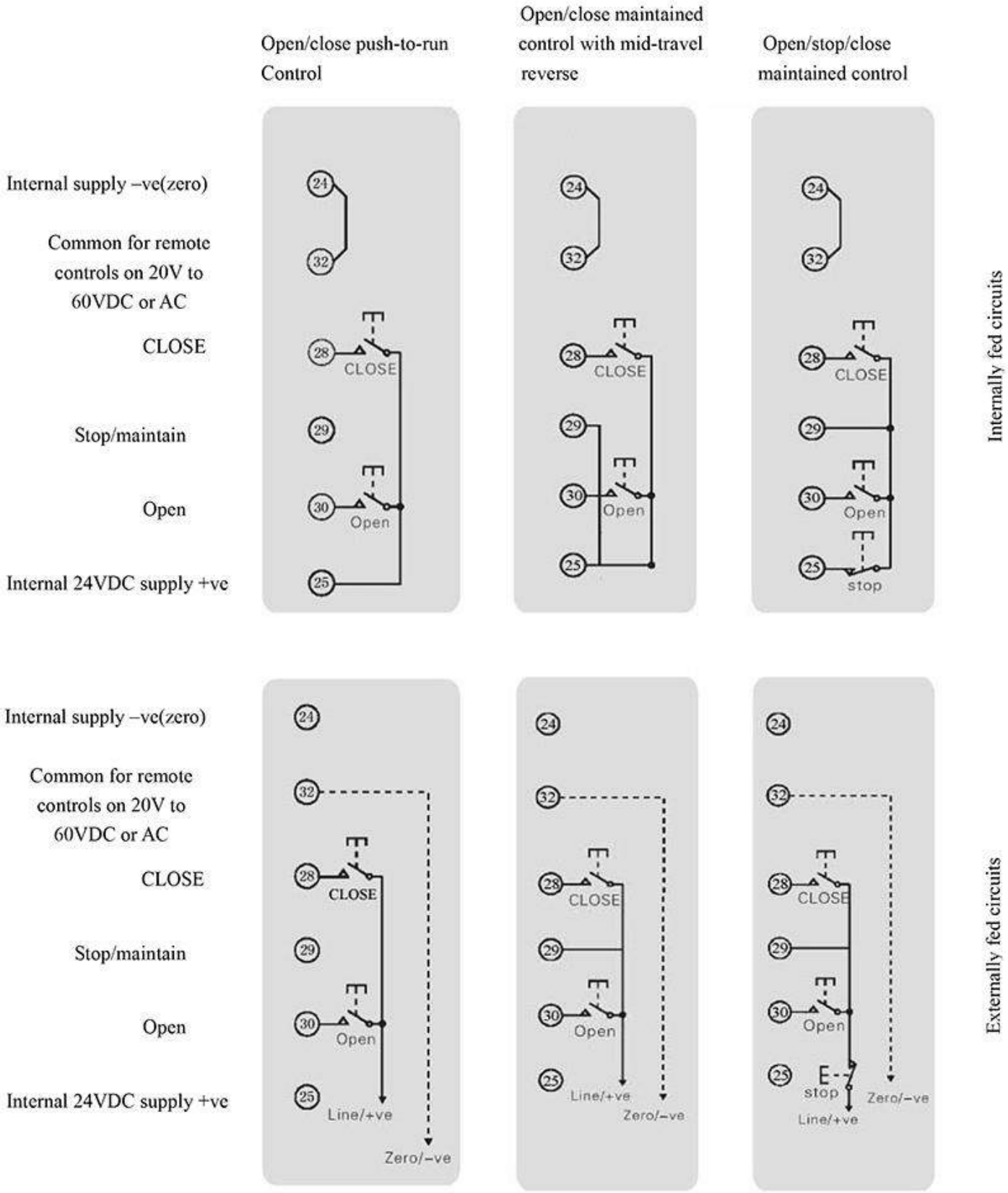
No. terminals		Terminal function
1 2 3	U V W	Three-phase power supply (Single-phase power supply L-1, N-2)
4	PE	Earth wire
5 6		Indication contact S1, default close at valve full closed , normally open
7 8		Indication contact S2, default close at valve full open , normally open
9 10		Indication contact S3, default open at valve full closed , normally closed
11 12		Indication contact S4, default open at valve full open , normally closed
13 14		Close direction torque limit contact CTS, open at close direction torque trip, normally closed
15 16		Open direction torque limit contact OTS, open at open direction torque trip, normally closed
17 18 19		Monitor relay { 3- phase power lost phase The control voltage is lost Red control knob is in stop or local position Motor thermal relay action
20 21		Flomatic, auto control terminal Manual/auto control common-Ve
22 23		Valve position signal output (+) 4-20mA Valve position signal output (+) 4-20mA
24 25		Internal 24VDC supply(-) Internal 24VDC supply(+)
26 27		Analogue signal input (+) Analogue signal input (-)
28		Remote close
29		Remote close/remote open/ maintain/stop control terminal
30		Remote open
31		ESD signal
32		Remote close/ Remote open common

Actuator basic circuit diagram(drawn in mid-travel power off)

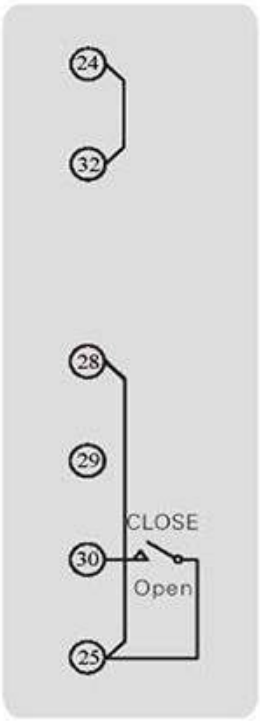


3 Actuator control circuit

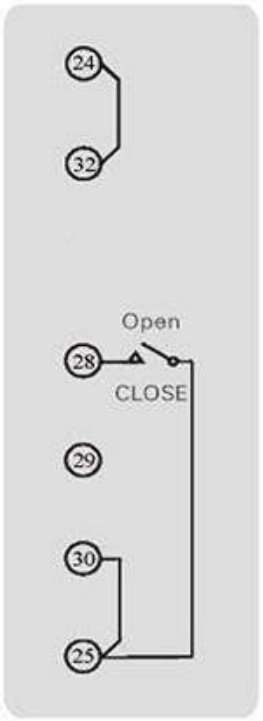
3.1 Remote switch control



Two-wire control:energize to open,de-energize to close (configure for open priority) customer to link25-28

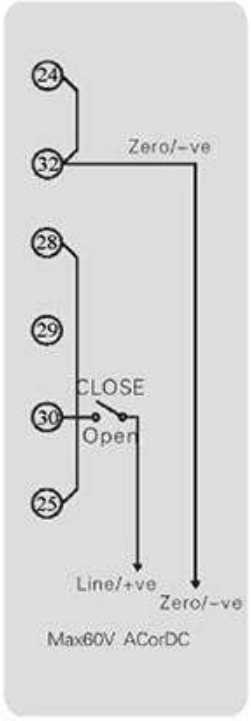


Two-wire control:energize to close,de-energize to open (configure for close priority) customer to link25-30

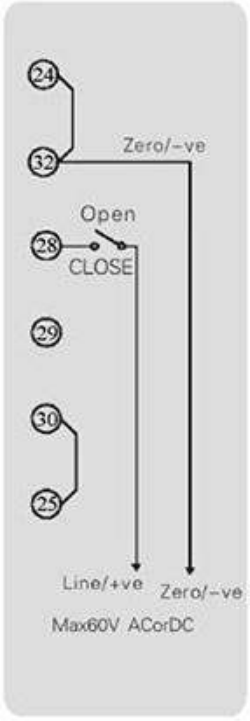


Internally fed circuits

Two-wire control:energize to open,de-energize to close (configure for open priority) customer to link25-28



Two-wire control:energize to close,de-energize to open (configure for close priority) customer to link25-30

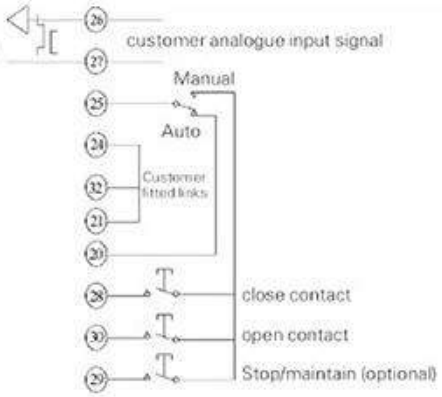


Externally fed circuits

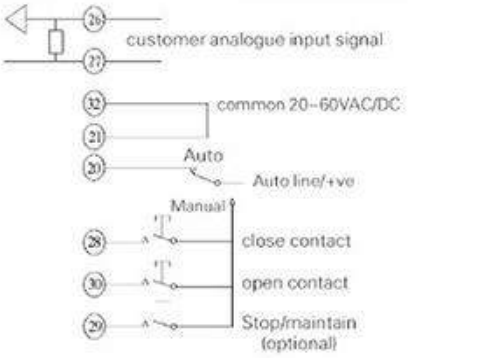
3.2 Remote analogue folomatic control

Analogue folomatic control only

Analogue folomatic control with internally fed remote manual control



Analogue folomatic control with externally fed remote manual control



Ⅶ Checkout

3-phase power supply can be connected to the terminal ① ② ③, the input signal source 4 –20mA DC can be connected to the terminal ㉖ and ㉗. Fitted link the terminal ㉔ and ㉑ ,terminal ㉕ and ⑳. Local operating: with the red selector positioned at"local", if the actuator internal setting is set as"Selfmaintain", operating the adjacent black knock (clockwise), the actuator will be turned to close until entire closed, unless turning the red selector to the"stop". If internal setting of the actuator is set as"Non-selfmaintain", pushing the black knock (clockwise), the actuator will be turn to close, once the black knock is free, the actuator will be stopped.

Turn the red selector to"remote"(clockwise). The actuator receives the input signal from the terminal ㉖ and ㉗. If the input signal value is less than the value of the valve position fedback signal. The actuator will run towards to close direction until the tolerance value of the two signals is less than the control deadband setting. If the input signal value is more than the value of the valve position fedback signal. The actuator will run towards to open direction until the tolerance value of the two signals is less than the control deadband setting.

Turning the red selector to"local"position. You can operate with the setting tool. Press the ◥ button. The actuator will run towards close direction until entire closed. So as the open button.

The default settings have been set selfmaintain and checked.

Ⅸ The setting and operating

(Ⅰ) Operating mode

1. Local operating

A. Electrical operating

There are two knobs under the display window. The red one is the selector. It can be positioned three positions:"remote", "stop"and"local". The black one is the operating knob. Turn it clockwise to close the valve and turn it anticlockwise to open the valve. With the red selector positioned at"local", if the actuator internal setting is set as"Selfmaintain", operating the adjacent black knock (clockwise), the actuator will be turned to close until entire closed, unless turning the red selector to the"stop". If internal setting of the actuator is set as"Non-selfmaintain", pushing the black knock (clockwise), the actuator will be turn to close, once the black knock is free, the actuator will be stopped. So as the open button.

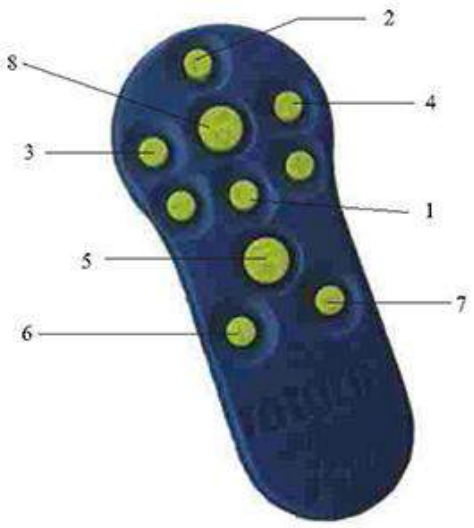
B. Manual operating

Turn the red selector to the local position. Press the hand/auto lever into"hand"position and turn the hand wheel to engage the clutch. If it is difficulty to press the lever, you can press the lever while turning the hand wheel.

2. infrared local operation

the operation functions of the setting tool:

1) key display next function or decrease
2) key display last function or decrease
3) key enter displayed function or valve
4) key return back displayed status
5) key stop actuator
6) key close actuator
7) key open actuator
8) key extended function



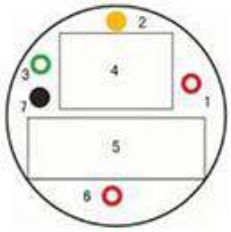
Turn the red selector to the 'local'
Position .You can set the functions and parameters by using the setting tool
3.Remote control: turn the red selector to the'remote'
Position. The actuator will accept the standard controlling signal to open, to close or stop

(II) Setting functions and parameters

Turn the red selector to the"local"position. You can set the limit, torque,functions and parameters by operating the four keys at the functions and parameters area on the setting tool.

1. Display

Display the indication of the actuator position



(Fig.)Display screen

The display screen consist of:

1) Red-indicate"open"position
2) Yellow-indicate"mid-travel"position
3) Green-indicate"closed"position
4) LCD1-indicate valve position
5) LCD2-indicate the operating states
6)Actuator alarm indicator lamp(red)
7)Infrared receiver

On power up, the actuators liquid crystal display screen is back-lit with a "soft amber"light and one of the indicator lamps will be on, according to position. The display screen will show percentage open or an end of travel symbol (see Fig.)

As standard, red lamp signifies valve entire open. Yellow lamp signifies intermediate and green lamp signifies valve closed.

Entire open: red lamp and entire open symbol

Mid-travel: yellow lamp and percentage open

Closed: green lamp and closed symbol

With the main power supply switched off the LCD screen in powered by a battery and continues to display actuator position. However, the battery dose not support screen back-lighting or indicator lamps.

2. Display- Running states indication

This display consists of: (A) Normal indication (B) Alarm indication

A. Normal indication: -----Display the percentages open of the valve position and input signal

----- Display the percentages open of the valve position and the percent of the torque value

While the red selector turned to the"local"or"stop"position. Press the" ⬇"key, the display will be changed from percentages open of the valve position and input signal into display the percentages open of the valve position and the percent of the torque value. The time retained of this display is about 30 seconds.

Display the percentages open of the valve position and input signal:

Stop state

Close state

Open state

Display the percentages open of the valve position and the percent of the torque value:

Stop state

Close state

Open state

B. Alarm indication

Ⅰ Valve alarm :

1) Torque tripped alarm

Torque tripped alarm indication as shown:

The actuator will be "trip off" of the value if torque more than configured torque value. And electrical operation at the same direction is inhibited. The alarm will remain displayed until entering setting state.

2) Valve stalled alarm indication

Valve stalled alarm as shown:

Close stalled

Open stalled

The control circuits are detecting the valve position, while actuator moving. If the control system of the actuator sent an instruction to run , but the hall senor can not detect any change of the valve position in 7 seconds. It will send a valve stalled alarm and jump off the contact signal. The operation in the same direction is inhibited.Note: Entering setting state, the stalled alarm will be release.

Ⅱ Control alarm indication :

1) ESD alarm

The position of the actuator can be presented to open, close or stay put, while an ESD signal applied, once the ESD signal disappear, the control alarm will not be displayed.

2) Signal lost alarm

The position of the actuator can be presented to open, close or stay put. The indication will display the signal lost of the control alarm while the input signal is lost. Once the signal appear, the control alarm will be disappear.

Ⅲ Actuator alarm :

1) Phase lost alarm

The actuator will send an instruction to cut off the power supply of the motor and display the alarm on indicate window, while it check the one of the phase voltage lost. Until power supply is normal. The alarm will be disappear.

2) Inner communication error alarm

The actuator display alarm and disable electric operation, while the control circuit can not receive any signals of the valve position. The alarm indication disappear until the control circuit receive the signals again.

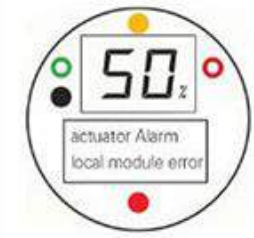
3) Overheating alarm

Once the temperature of the motor raise to the limited value. The alarm display and disable the electric operation. The alarm indication will be disapper the temperature cold down under the limited value.

4) Battery low alarm

The battery alarm is displayed when the actuator detect battery is low, the alarm will be disappear until exchanging battery.

5) Local module error alarm



The local module error alarm is displayed when the connection between the local PCB in the controller box and main PCB or the magnetic steel in the operator knob or in the red selector is out of the question.

6) 24V error alarm

The actuator display the 24V error alarm when the control circuit detected the inner supply is failure.

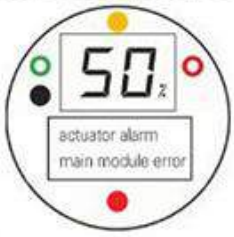
7) PV module error alarm

Once the position circuit is failure. The actuator will display the PV module error alarm.

8) Extension module error alarm

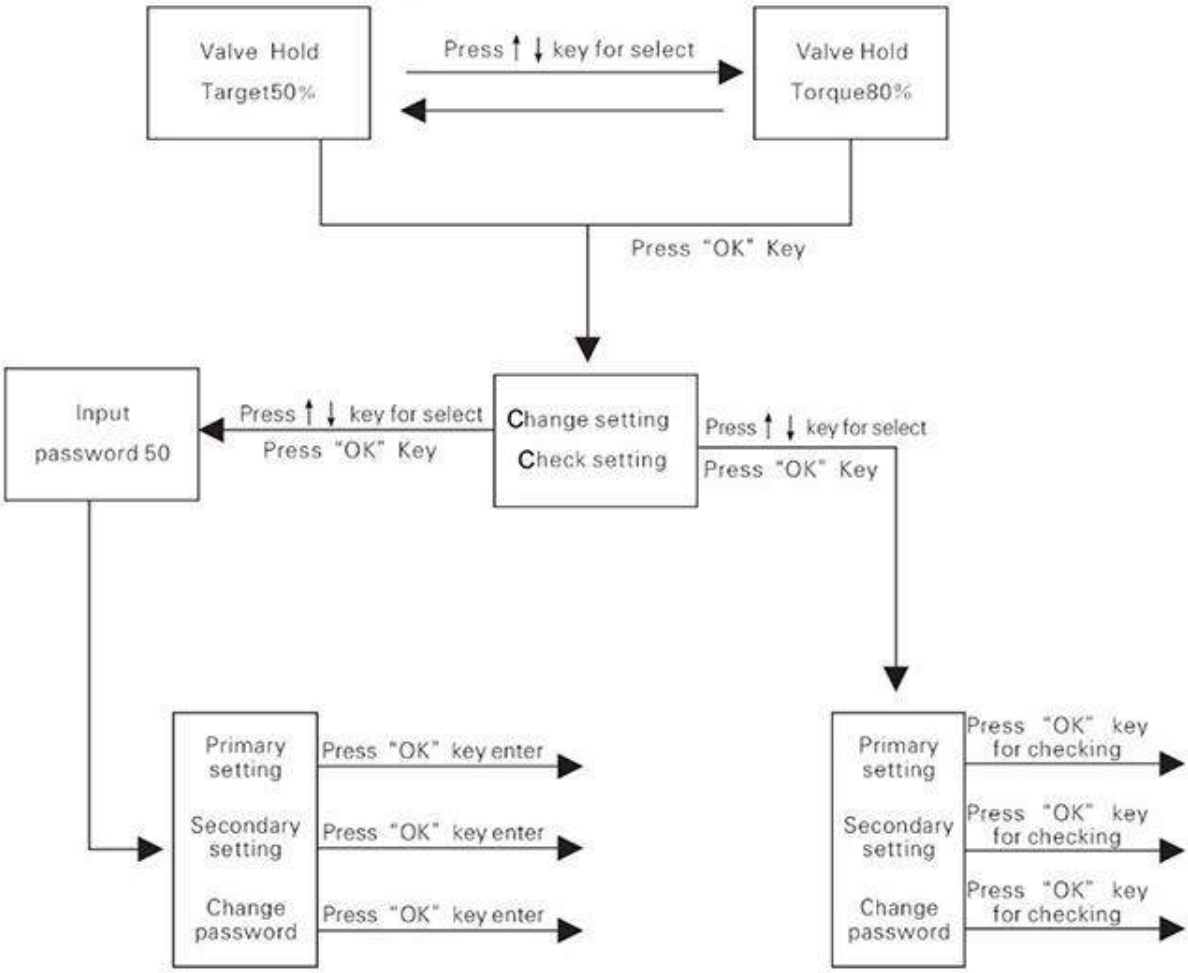
If the communication or connection between the extension module and mian module is failed. The actuator will display the extension module error alarm.

9) Main module error alarm

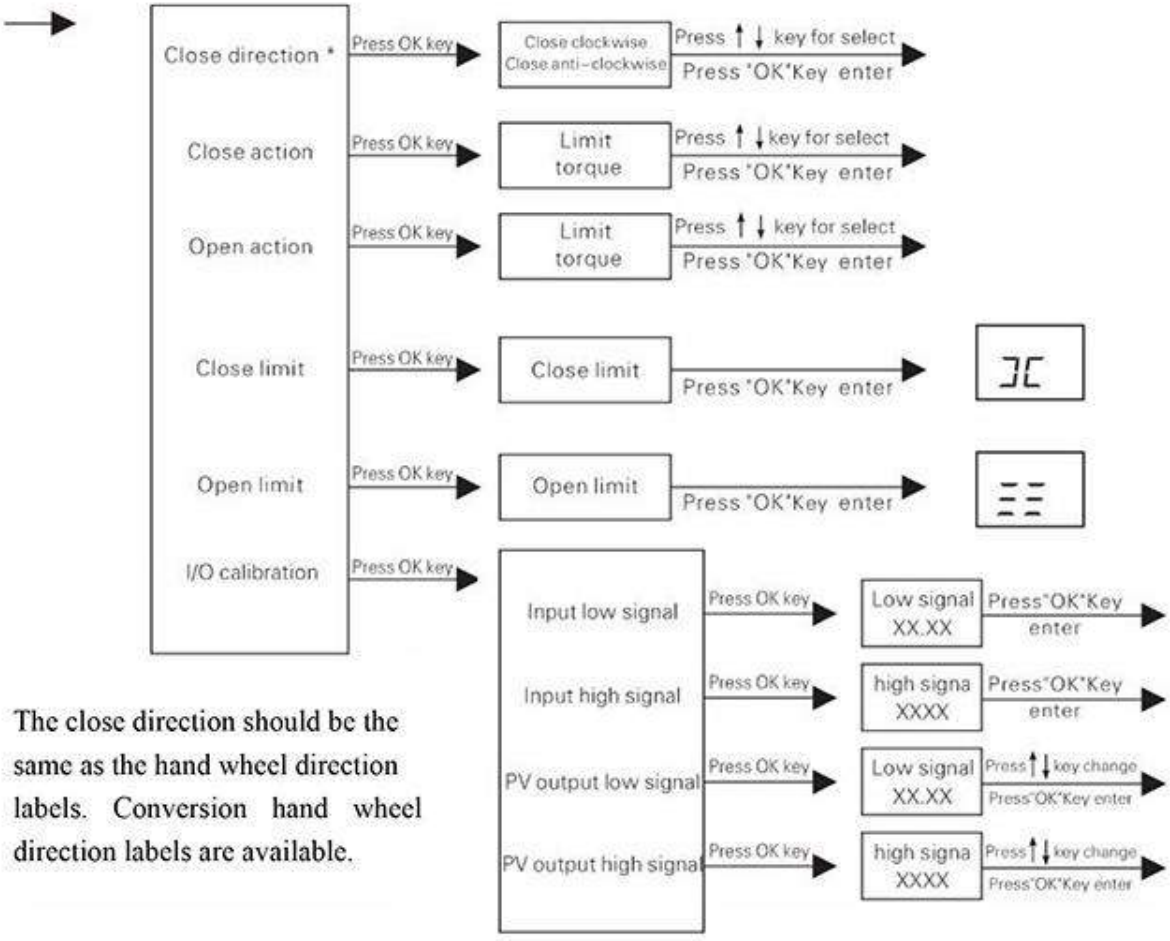


When the communication between the control circuit chip and the memory chip is failed. The actuator will display the main module error alarm.

3. The functions, parameters setting



3.1 Primary functions and parameters setting



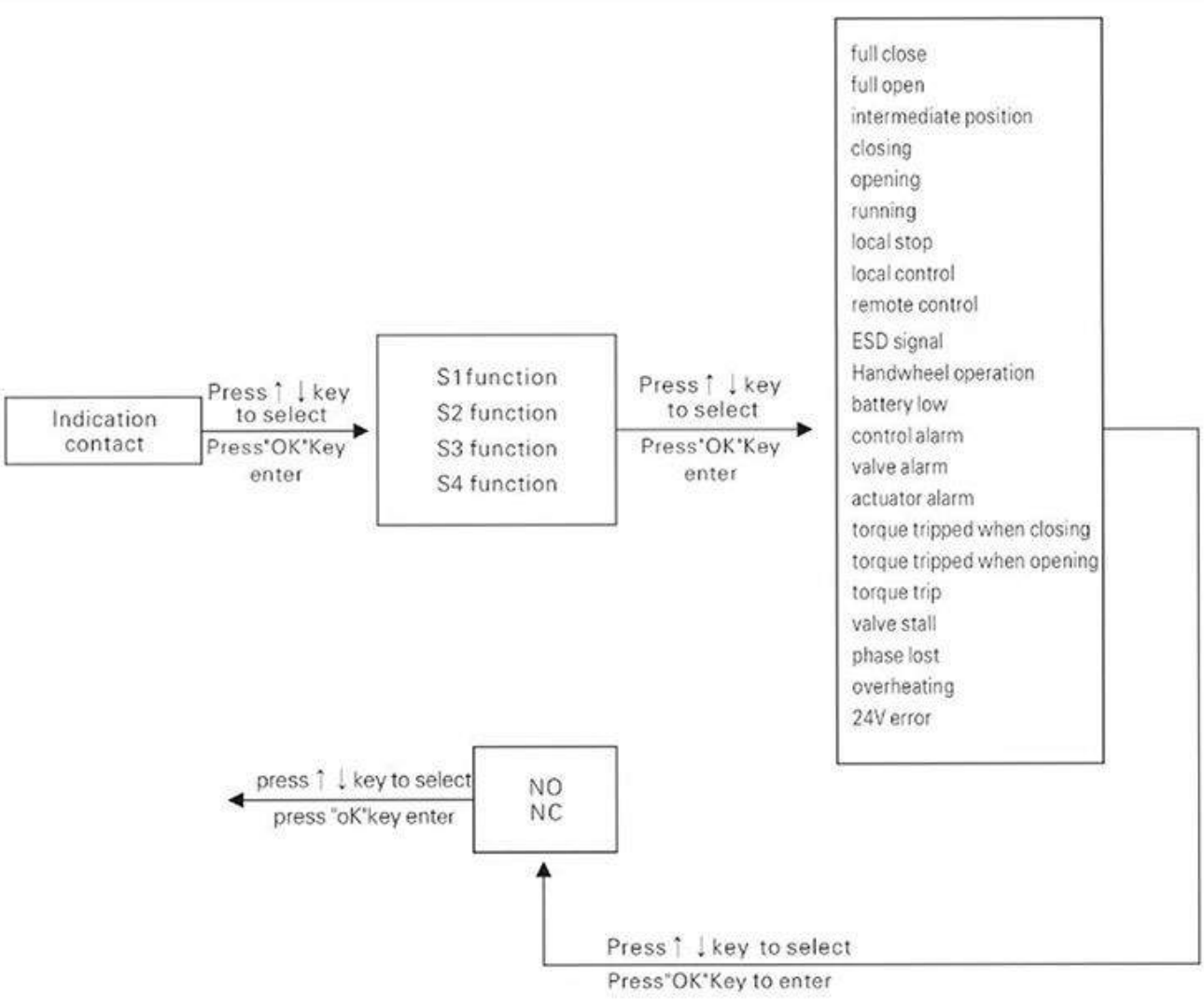
The close direction should be the same as the hand wheel direction labels. Conversion hand wheel direction labels are available.

3.2 Secondary functions and parameters setting

1. Indication contacts
2. Control method
3. CPT
4. Point signal
5. Remote control source
6. Interrupter

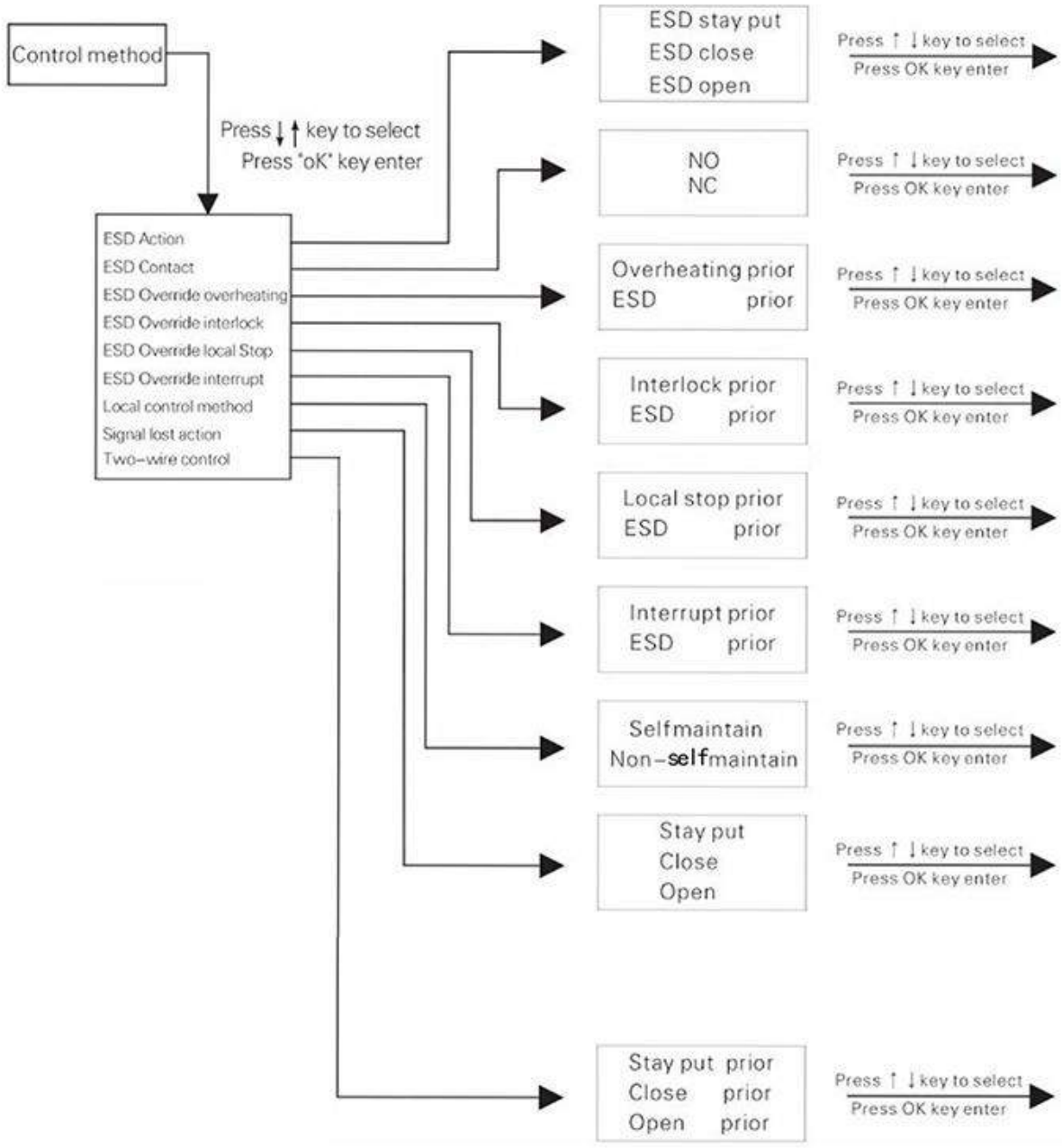
3.2.1 Indication contacts

Every contact of the indication contact S1,S2,S3,S4 can be set as following functions. You can press the ↑ ↓ key to select the function and press the "OK" key to enter.



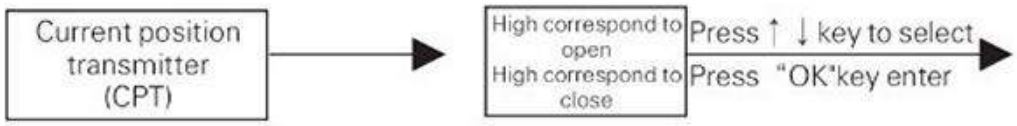
3.2.2 Control method

The setting of control methods are response with the operating for ESD, local control, signal lost action, and two-wire control.

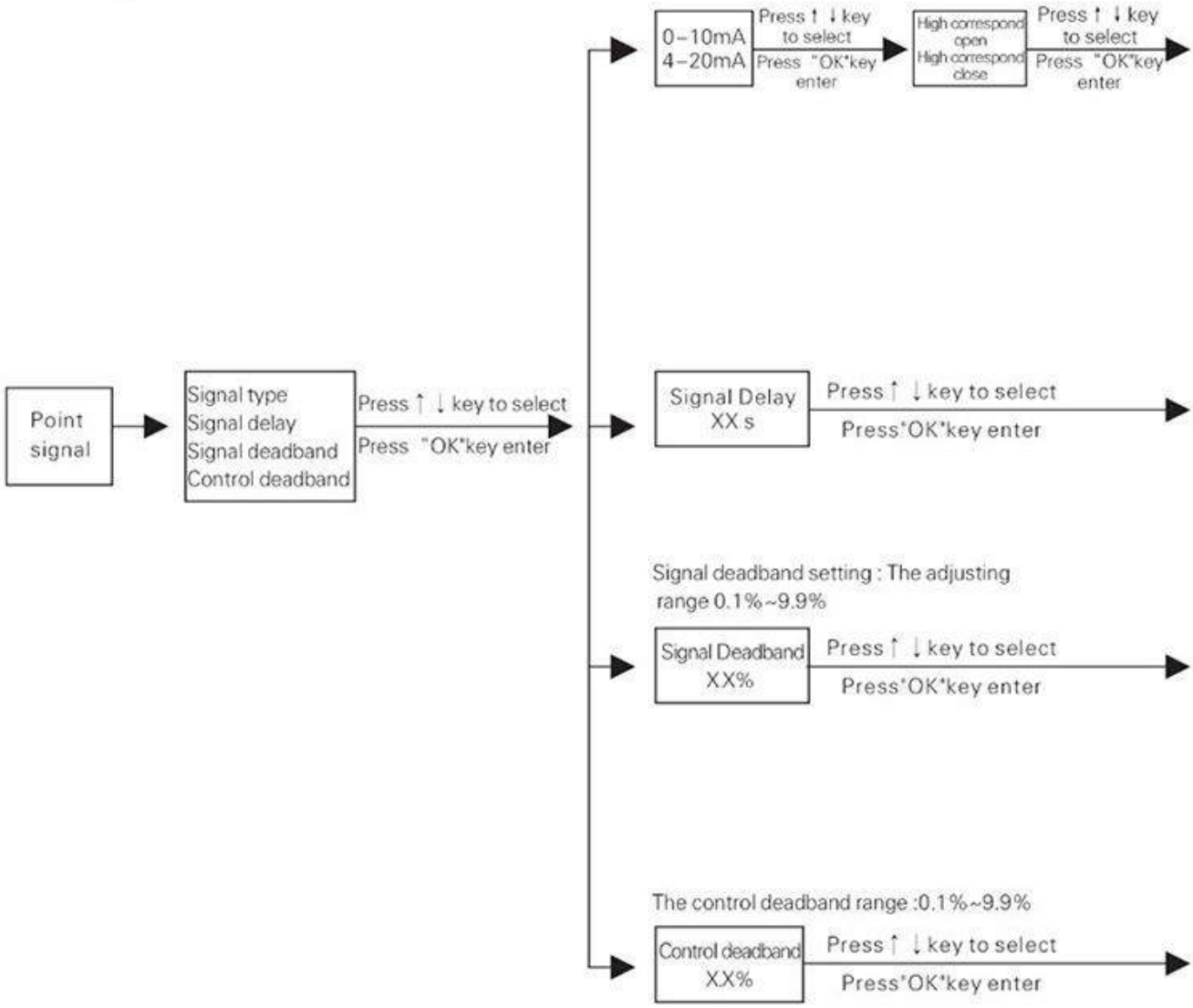


3.2.3 Current position transmitter(CPT)

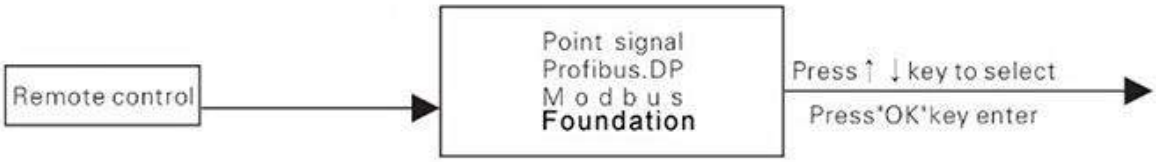
The function of the CPT is to generate an analogue signal 4-20mA. Correspond with valve position. With "High correspond to open". The CPT operates close=4mA, open=20mA. If close=20mA, open=4mA is required to select "High correspond to close".



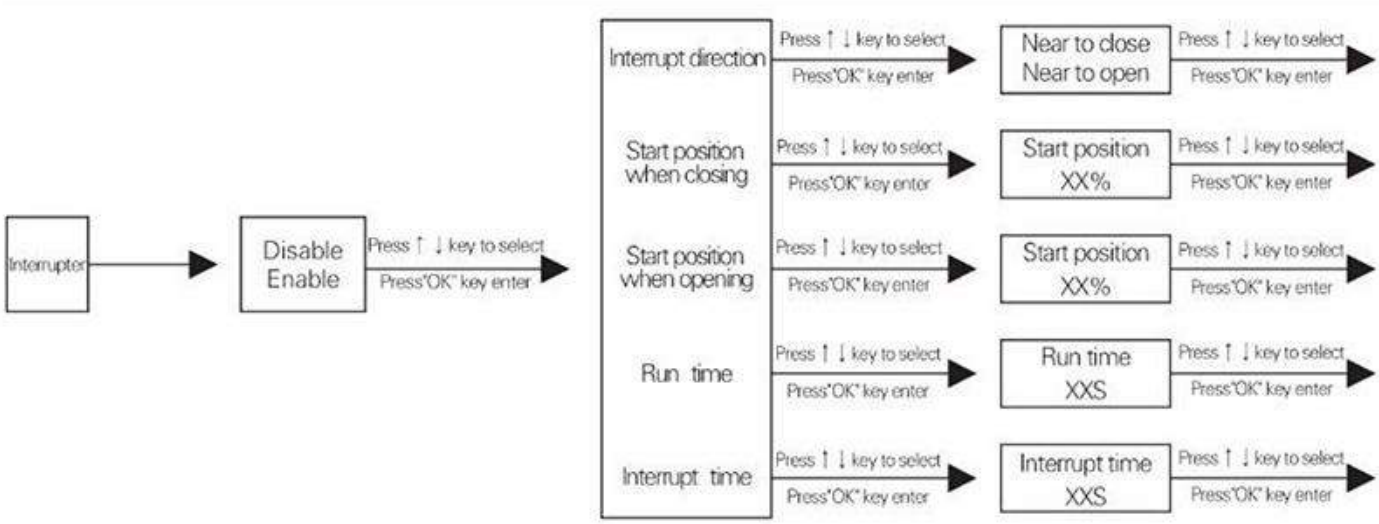
3.2.4 Point signal



3.2.5 Remote control sources



3.2.6 Interrupt setting



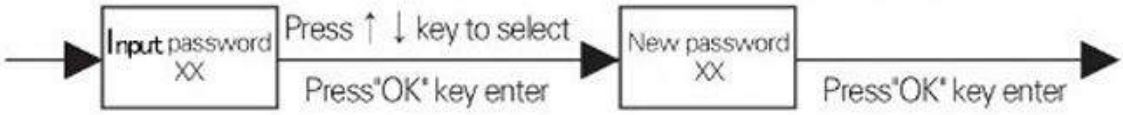
Interrupt direction select Near to close or Near to open.

That will determine the action of Start position when close or Start position when open .

When Interrupt direction is set to Near to close, timer operation will start while closing, the percentage open less than the setting position of timer, as while opening, the percentage open less than the setting position of timer.

When Interrupt direction is set to Near to open, timer operation will start while opening, the percentage open larger than the setting position of timer, as while closeing, the percentage open larger than the setting position of timer.

3.3 Change password



3.4 Default setting

All actuator function and parameters are configured before despatch, to standard default setting. When site commissioning take place entered settings overwrite the default setting and these "current"settings are used for operation:

1) Prmary setting
   - 1.1close direction clockwise
   - 1.2close action close on limit
   - 1.3open action open on limit
   - 1.4close limit to set
   - 1.5open limit to set

2) Secondary setting

2.1 Indication contacts
   - 2.1.1 S1 indication contact Closed NO
   - 2.1.2 S2 indication contact Entire open NO
   - 2.1.3 S3 indication contact Closed NC

2.1.4 S4 indication contact Entire open NC

2.2 Control mode setting

2.2.1 ESD Action	Stay put
2.2.2 Local Control Mode	Self-maintain
2.2.3 Signal Lost Action	Stay put
2.2.4 ESD Contact	NO
2.2.5 ESD Override Overheating	Overheating Prior
2.2.6 ESD Override Local Stop	Local Stop Prior
2.2.7 ESD Override Interrupt	Interrupt Prior
2.2.8 Two-wire Control	Open Prior

2.3 CPT High correspond open

2.4 Point signal

2.4.1 Input signal mode	4-20mA
2.4.2 Signal Deadband	1.0%
2.4.3 Signal Delay	0.2S
2.4.4 Control Deadband	0.5%
2.5 Remote Control Source	Point signal
2.6 Interrupt setting	Disable

Ⅸ Package List

Intelligent actuator are packed by PET plastic jockey and paper carton. Attached datum with the actuator as following:

1. Specification	1
2. Certificate	1
3. Infra-red setting tool	1

Ⅹ Transport and Storage

Transport to place of installation in sturdy packing.

Do not attach ropes or hooks to the handwheel for purpose of lifting by hoist.

If actuator is mounted on valve, attach ropes or hooks for the purpose of lifting by hoist to valve.

Store in well ventilated, dry place.

Protect against floor dampness by storage on a shelf or on a wooden pallet. If actuator be stored for a long time more than 18 month, must be lubricate again.

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