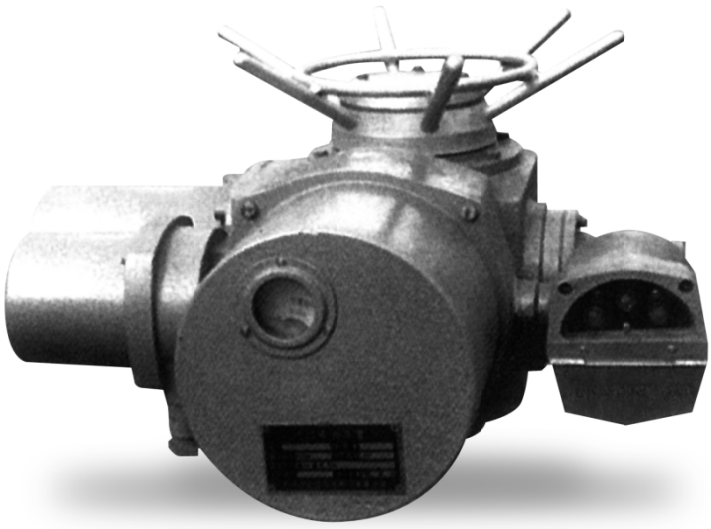
Z—TYPE

Valve's electric actuator. User's Guide



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Ⅰ. Summary

The multi-turn vale electric actuator, generally known as z-type, can be utilized on linear-action valve such as gate valve, diaphragm valve , check valve and water valve. Used to open, close or modulate valves. The actuator is indispensable for the remote control, centralized control or self-control of the valves. This versatile deice features small size, light weight, reliable performance, advanced control system and ease of maintenance; which allows for a wide range of use in many industries like petroleum and chemical industries, power stations , water treatment and paper-making industries. In terms of working environment, the equipment can be classified into four types： DZW (The outdoor type); DZB (The explosion-proof type); DZZ (The integral type); DZT (The integrated-regulating type.

The performance of this product conforms to the stipulation of JB/T8528-1997 "General valve Electric Actuator Technical conditions". Its explosion-proof performance conforms to the stipulations of 6B3836 .1-2000 "Electrical Apparatus for Explosive Gas Atmospheres. Part 1： General Requirements "GB3836.2-2000 "Electrical Apparatus for Explosive Gas Atmosphere's Part 2 : Flameproof Enclosed and JB/T8529-1997" Explosion-proof valve Electric Actuator Technical Conditions"

Ⅱ. Working Conditions and Technical Data

1. Power Source: There is three-phase AC.
   380V (special orders 220V or 660V), 50HZ (special orders 60HZ); the control line is 220v, 50HZ (Special orders 60HZ); Remote control is 24V DC.
2. Ambient Temperature -20℃ +60℃ (special orders-60℃ +80℃).
3. Relative Humidity ≤90% (when 25℃).
4. Surrounding Mediums: The outdoor type is used for environment free of combustible, explosive and corrosive mediums ; The explosion-proof products

include dI and dIIBT4 ; dI is suitable for the wording face of the coal mine where no excavating undertaken; and dIIBT4 can be applied in the factories, where the explosive gases mixture meets the requirements for the Environment (IIA, IIB T1-T4).

5. Protection Class: IP55 - Ip67 for the outdoor type and explosion-proof type.
6. Operation Rule: Only 10 minutes at a stretch (special orders 30 minutes)

Sheet 1: Technical Data of Z-type series.

Model Number	Rated Torque (N.m)	Max Control Torque (N.m)	Min Control Torque (N.m)	Max Stem mm	Max Turn r	Manual Ratio i	Output Torque (r/min)	Motor		Weight Kg
								Power KW	Power Current A	
Z5	50	75	≤25	28	50	1:1	12	0.18	0.9	28
Z10	100	150	≤50	28	50	1:1	24	0.25	1.5	61
							36	0.37	1.6	
Z15	150	225	≤75	28	50	1:1	24	0.37	1.6	63
							36	0.55	2.4	
Z20	200	300	≤100	40	50	1:1	24	0.55	2.4	63
							36	0.75	3	
Z30	300	450	≤150	40	50	1:1	24	0.75	3	65
Z45	450	675	≤225	48	120	1:1	24	1.1	3.4	110
							36	1.5	4.5	
Z60	600	900	≤300	48	120	1:1	24	1.5	4.5	112
							36	2.2	6.5	
Z90	900	1350	≤450	60	120	1:1	24	2.2	6.5	139
							36	3	9	
Z120	1200	1800	≤600	60	120	1:1	24	3	9	142
Z180	1800	2160	≤900	70	150	25:1	24	4	11	261
							36	5.5	14	
Z250	2500	3000	≤1250	70	150	25:1	24	5.5	14	264
Z350	3500	4200	≤1750	75	150	13:1	18	7.5	19	430
Z500	5000	6000	≤2500	75	150	13:1	18	10	26	440

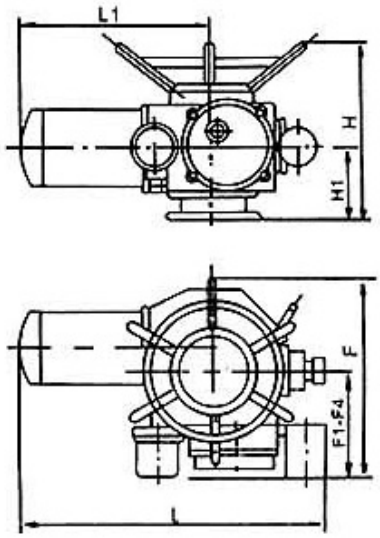
Note: we provide the electric actuators of other rotational speeds according to the use's requirements.

Outline and Connection Dimension

1. Outline dimension see Picture 1 and Sheet 2 .

Sheet 2 Outline Dimension

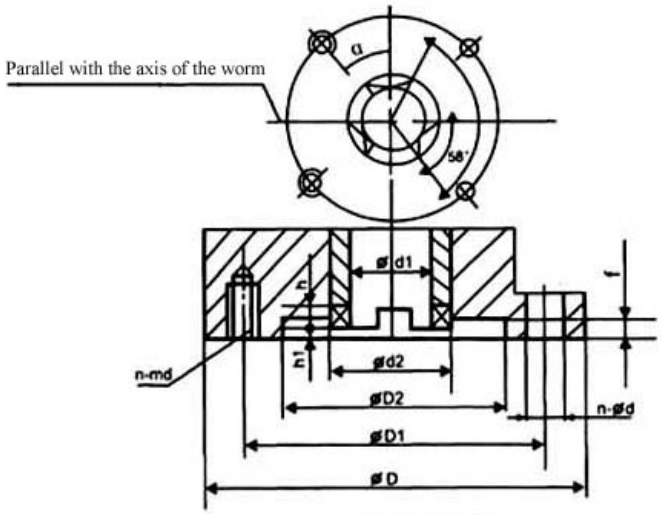
Model Number	H	H1	L	L1	F	F1	F2	F3
Z5	232	96	410	275	261	156	/	290
Z10/15	320	135	565 610	340 385	441	235	286	370
Z20/30	320	135	610	385	441	235	286	370
Z45/60	425	172	755	510	552	270	320	337
Z90/120	456	180	825	535	621	315	350	371
Z180/250	585	250	870	564	710	322	380	415
Z350/500	649	252	1162	764	710	408	456	415



Note: F1 are the outdoor type, F2 are the explosion – proof type, F3 are the integral type.

Picture 1: Outline drawing.

2 types and sizes of connection see picture 2and sheet 3



Pidture 2 : Connection dimension drawing

Sheet 3 : Connection dimension

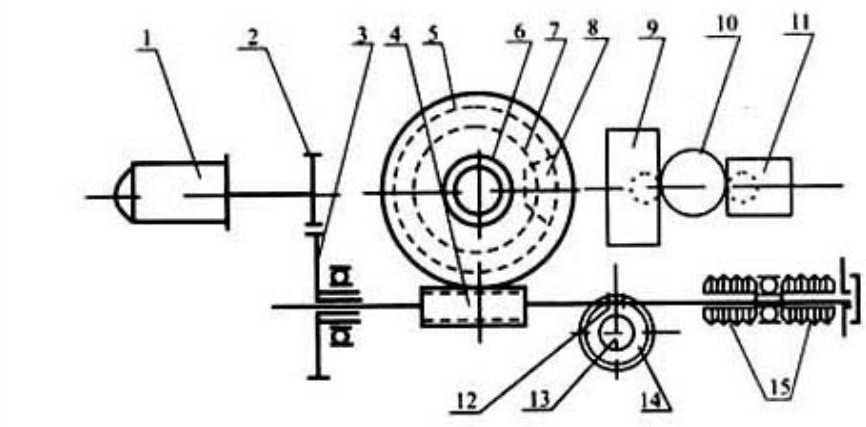
Model Number	Torque Type JB2920											
	Flanged Number	D	D1	D2 (H9)	h1	f	h	d1	d2·	d	n	α
Z5/10 /15	2	145	120	90	2	4	8	30	45	M10	4	45°
	2I	115	95	75			6	26	39	M8		
Z20/30	3	185	160	125			10	42	58	M12		
	3I	145	120	90			8	30	45	M10		
Z45/60	4	225	195	150		5	12	50	72	Φ18		
Z90/120	5	275	235	180			14	62	82	Φ22		
	5I	230	195	150			12	50	72	Φ18		
Z180/250	7	330	285	220			16	72	98	Φ26		
Z350/500	8	380	340	280			20	80	118	Φ22	8	22.5°

Note : (I) show's the connection dimensions of the power stations.

IV. Components.

Z-type electric actuator consists of motor, speed reducer, moment of force control apparatus, traveling control apparatus, opening indicator, manual-electrical changing mechanism ,hand wheel and electrical part. The outdoor type utilizes the incorporate round rim and O-ring to seal; while the seal design of the explosion –proof type is the same as that of the outdoor type but an explosion-proof face is added to the explosion-proof type in addition to the same seal design. The explosion-proof junction box and three –phase motor which specially designed to

the outdoor type, corrosion and explosion-proof the electrical valve of series YBDF. See picture 3 about its transmission principle:

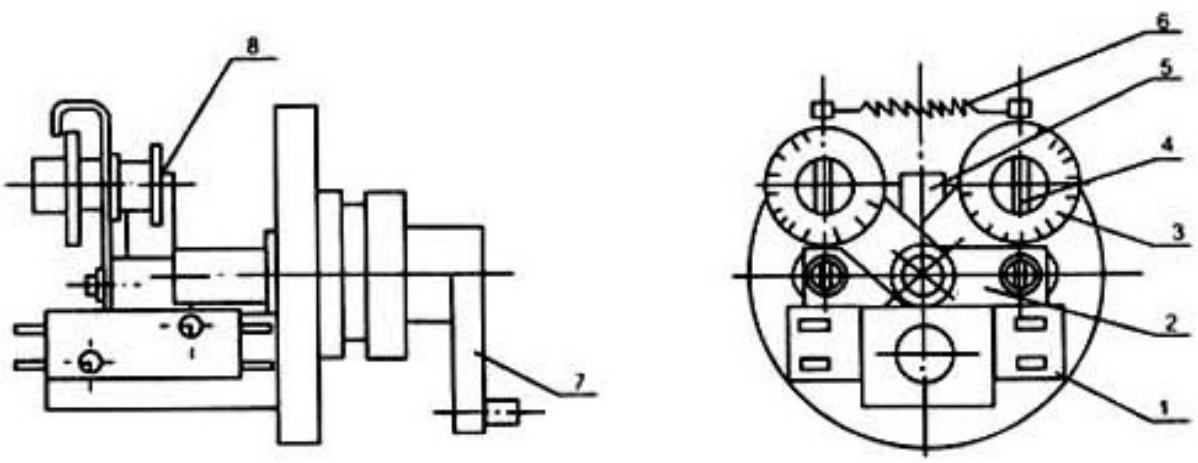


1. Motor 2.3 . Spur Gear. 4. Worm 5 .Worm gear. 6. Output Shaft. 7. 8 Bevel Gear 9. Travelling Control Apparatus. 10 .Middle Gear 11. Opening Indictor 12. Worm Round Grave 13. Crank 14. Torque Control Apparatus. 15 .Butterfly Spring.

1.1 Motor: The outdoor type utilizes the YDF-type motor and the explosion-proof type adopts the YBDF-type three-phase as synchronous motor which specially designed for the valve.

1.2 Speed reducer: Speed reducer is composed of a pair of spur gears and worm gear pairs. The motive force of the motor transfers from speed reducer to the output shaft.

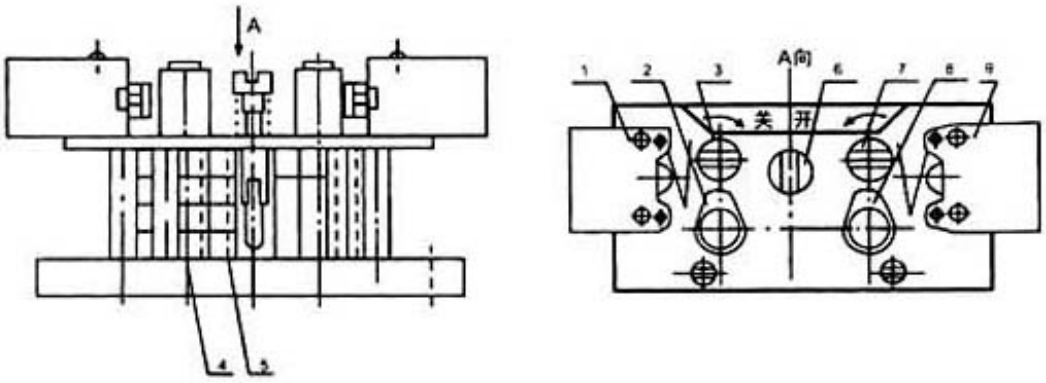
1.3 Torque control apparatus: Torque control apparatus is a commonly used part for the z-series, its components see Picture 4. When a certain amount of torque is applied to the output shaft, the worm will rotate and move to drive the crank which in turn causes the block collision to press the cam and raise the support will lift until the microswitch disconnects the power source and stops the motor so as to control the output and protect the valve.



1. Microswitch 2. Support 3. Calibrated Dial 4. Adjustment Shaft 5. Block Collision
6. Extension Spring 7. Crank 8. Cam

Picture 4: Torque control apparatus

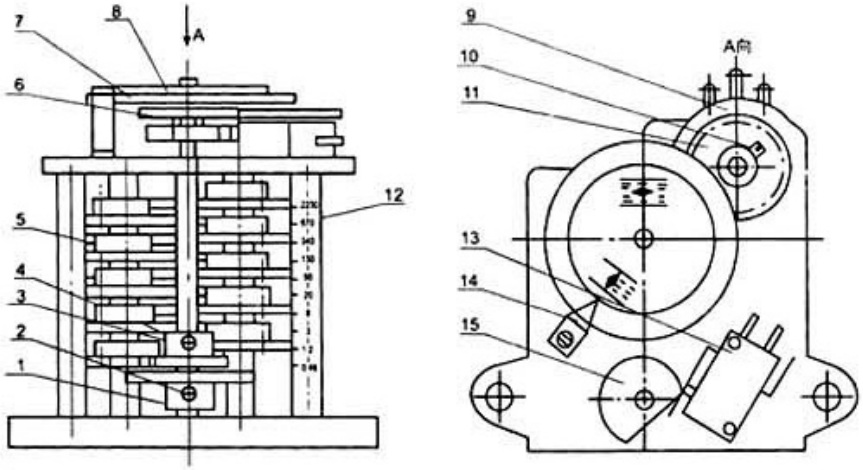
1.4 travelling control apparatus: traveling control apparatus utilizes the same principle as the decimal counter with a high precision. It is also the commonly used part for the Z-series (see picture 5). Its working principle is as follows: A pair of big and small bevel gears in the speed reducer box drive the active small gear (z=8), and drive the counter to work. If the counter has been adjusted according to the closed /opening position of the valve, then when the counter reaches the preset point , the cam will turn 1/4-turn and force the microswitch to cut off th**e** power source and stop the at this time, thereby controlling the revolutions number



1. Close Microswitch 2. Close Cam 3. Closed Adjustment Shaft 4. Idle Wheel 5. Counting Gear
6. Roof Bar 7.Opening Adjustment Shaft 8. Opening Cam 9.Knife Microswitch

Picture 5 : Travelling Control Apparatus

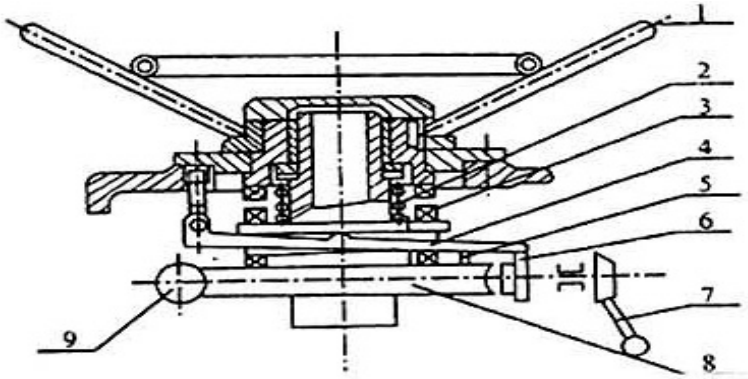
1.5. Opening indicator: opening indicator is also a commonly used part for z-series. See picture 6. Started by the unit gear of the counter, input gear slow down and turn the indictor dial to indicate the close/opening of the valve. The potentiometer rotor turns as the indicator dial rotates, which enables the opening indication of remote transmission, the opening indicator is equipped with a microswitch and cam. The rotational cam periodically causes the microswith to act during the operation of the actuator, its frequency being one 1 tow actions for one turn of the output shaft, which provides the flash signal .



1. Input Gear 2. Fixing Screw 3. Fixing Screw 4. Revolutions Adjustment Gear 5. Step Gear
6. Opening Gear 7.Closed Indicator Dial 8.Opening Indicator Dial 9. Potentiometer 10. Fixing Screw
11. Potentiometer Gear 12. Revolutions Signal 13. Flash Switch 14. Pointer 15. Flash Cam

Picture 6 : Machinery-type Opening Indicator

1.6 manual – electrical changing mechanism: manual – electrical changing mechanism is a semi-automatic system, which consists of handle ,cam, frame work ,vertical bar, middle clutch, pressed spring and so on, see picture7,when the hand wheel is used for operation, first push the transfer handle in the manual direction and cause the cam to turn with the handle shaft, lift the framework the idle clutch and in turn so to press the pressed spring. The idle clutch disengages from the worm gear and meshes with the hand wheel when the handle is pushed to a certain position, then the acting force of the hand wheel transfers to the output shaft to reach the manual state. When the frame work rises to a certain height, the vertical bar will erect on the surface of worm gear by the torsion spring force, which supports the framework so as to keep the idle clutch from falling down, release the handle when it is pushed to the manual position and the use the hand wheel to operate. The vertical bar falls down as the motor drives the rotation of the worm gear, the idle clutch moves to the worm gear by the pressed spring force and meshes with the worm gear, there by reaching the electrical state



1、Handwheel
2、Pressed Spring
3、Idle Clutch
4、Frame work
5、Vertical Bar
6、Cam
7、Transfer Handle
8、Worm Gear
9、Worm

Picture 7 Manual-electrical Changing Mechanism

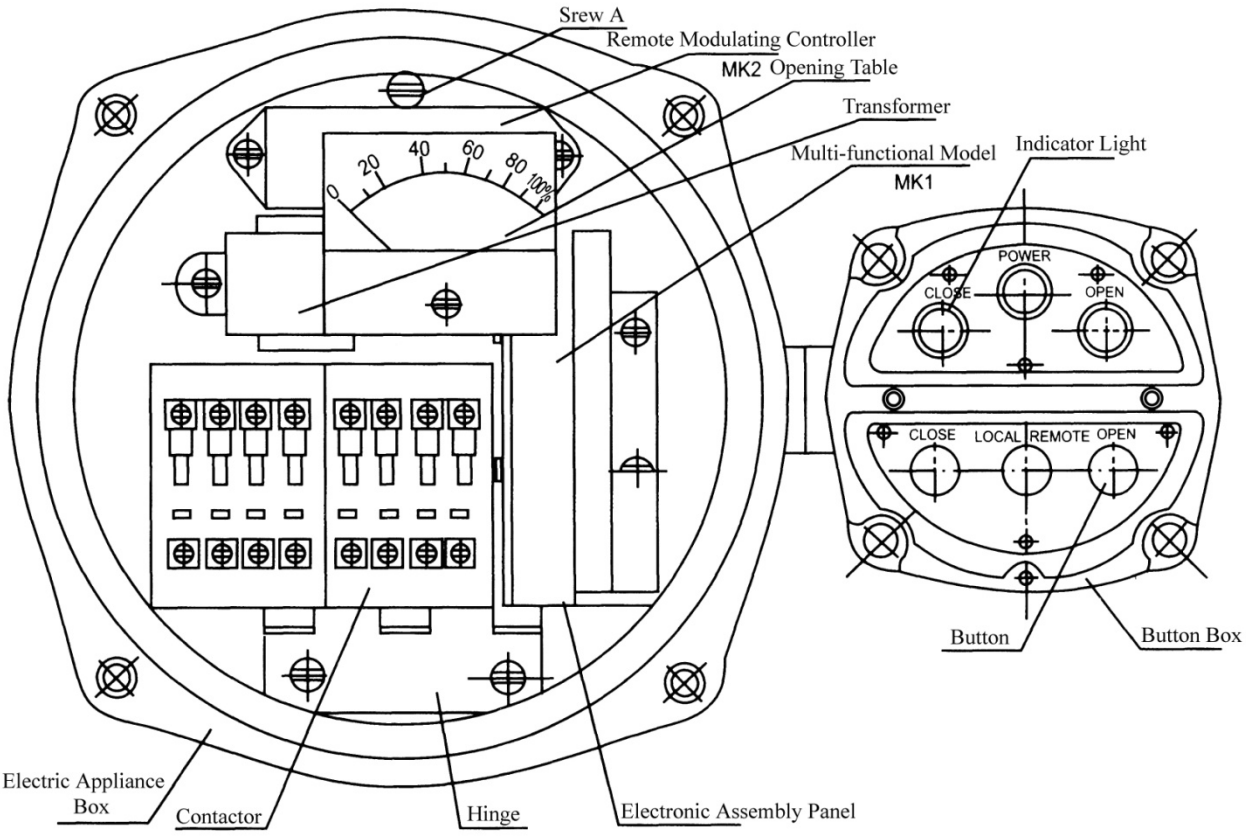
1.7 The electrical parts of the integral and regulating types:

The integral type, which derives from the outdoor type, contains many added electrical components. The electrical part of the integrated – outdoor type consists of multi – functional module MK1 remote modulating controller MK2, indicator light of the button box, opening table, contactor and so on .

The multi-functional module MK1 is composed of phase position identification XS,

interlock protection HB of the contactor and direct curren DC. Four solid-state relays and three switches comprise the remote modulating controller MK2. The electrical part of the integrated-regulating type consists of adjustment module TMK, contactor, and thermal relay and so on. The adjustment module can relieve and send out standard signal 4-20MA. The electrical components are equipped on a reversible panel so as to adjust the moment of force controller, traveling controller and opening apparatus. The button box has three buttons, the middle one being local / remote change-over button, the left one being the local closed valve and the right one being remote control button, remote control is performed with the box closed and on the contrary, local control is performed.

See picture about the electrical control part.



Picture 8 Electrical Components drawing of the integrated-general type

2. The schematic drawing and wiring of the electrical control

2.1 The principle of the outdoor type

The electrical control drawing of the DZW-Type is the same as the DZB-Type, see picture 9(a), which is explained as follows;

(1) This picture is designed in accordance with "'95' typically Designed lines", which was enacted by the general department of the power planning. It can meet the needs of various control lines picture 9(a) is the schematic drawing of the opening table, wiring which is for reference only, because the actuator does not have this kind of line.

(2) If the closed torque TSC is used to control the closed valve the self-maintained line of the closed button SC1 should be connected with A41; but if the closed torque LSC l is used to control the closed valve, and the closed TSC used as a protection, the self-maintained line should be connected with A42.

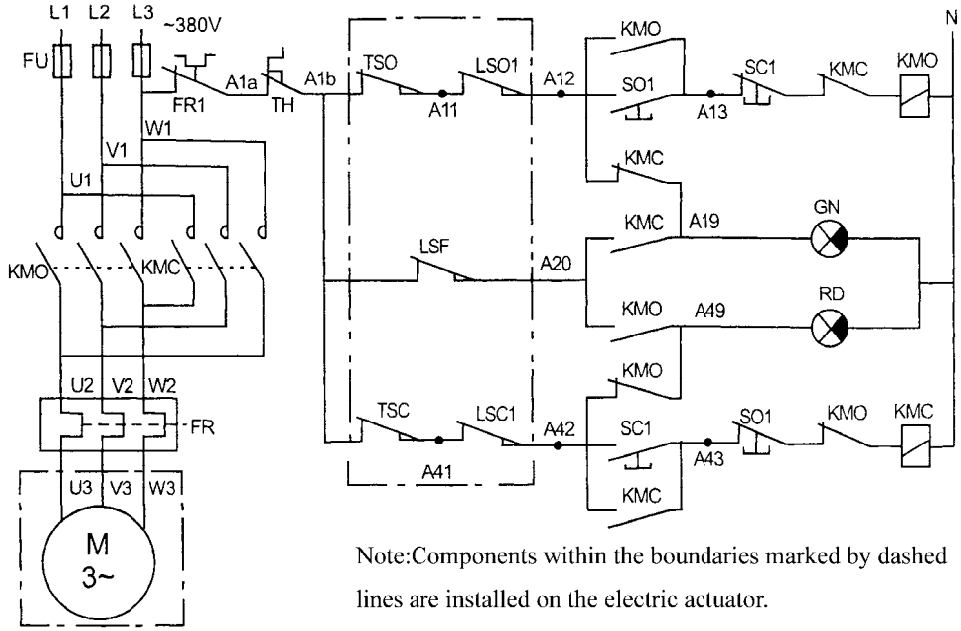
(3) Remote Opening indication utilizes the potentiometer to provide the user with a resistance value which varies with the action of the valve. The user can see picture 9(b) as reference.

(4) Remote Opening indication cannot be equipped together with the indicator light type opening indication simultaneously, but it can be used with the indicator light which inside of the control cabinet.

(5) The indicator light can be paralleled with A19, N, A49 directly to transmit the signals to the remote place.

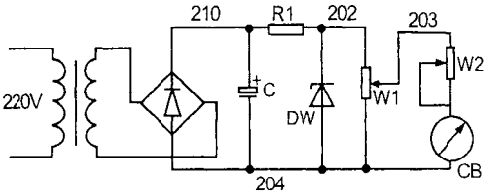
In order to provide the user with enough control points the traveling control apparatus can be equipped with four groups of microswitches at most, and use the connection terminal of 51 fuses (provided for special orders).Two opening and two closed microswitches are namely provided.

The sequence of the electrical components is as picture 9(d).

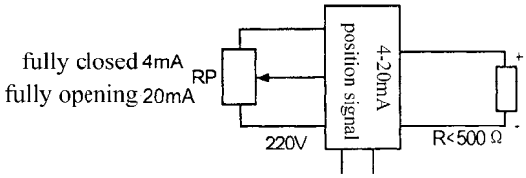


Note:Components within the boundaries marked by dashed lines are installed on the electric actuator.

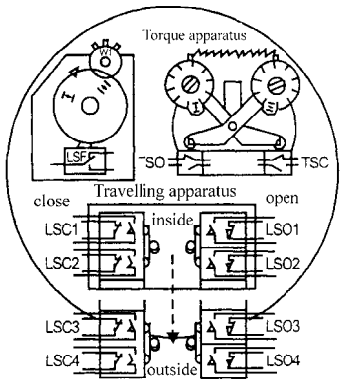
(a) Electrical Schematic diagraw



(b)The wiring diagram of the opening table



(c)The square drawing of the standard sihnal

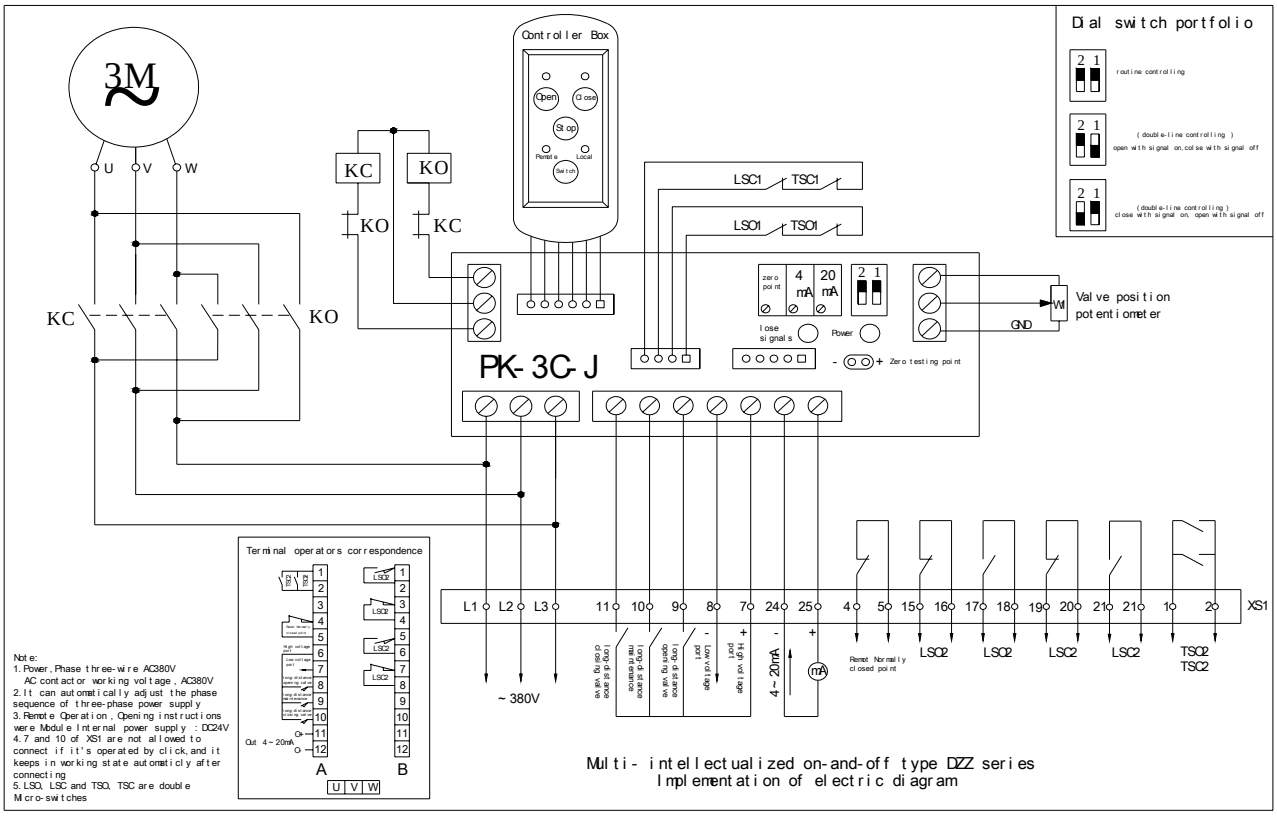


(d) The position diagram of '95'typically designed electrical.

Picture 9: The electrical schematic diagram of DZW, DZ Boutdoor type.

3, the electrical schematic diagram of the integral type

3.1 The electrical schematic diagram of The integral type DZZ, The integral explosion-proof type DZZB, see picture 10, which is explained as follows.



Picture 10: The electrical schematic diagram of the integral type DZZ, the integral explosion-proof type DZZB

Sheet 4: Electrical Components Table

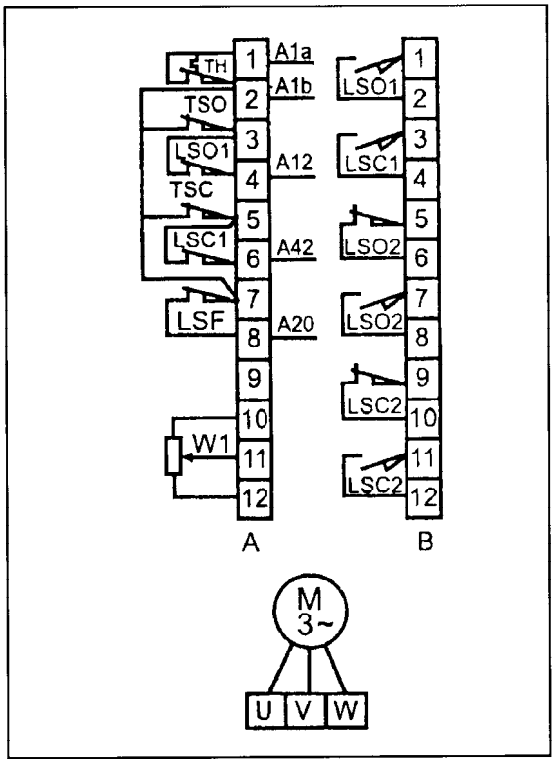
Code	Name	Model Spcifications	Quantity	Used in Outdoor Type	Used in Integral Type	Used in Regulating Type
KO,KC	AC Cont actor	CJx8-9 or CJ10	2	√	√	√
FR	Thermal Relay	JR16B	1	√		√
LSF	Flashlight Switch	V-157	1	√		
LSD,LSC	Travel switch	Wk1-1 or WK3-1	4	√	√	√
TSO,TSC	Torque Switch	KN1-203	2	√	√	√
SA	In patients Switch	KN1-203	1	√		
SBD,SBC	Button	MK1-1	2		√	√
QC2	Local/Remote TorqueSwitch	MK1-1	2		√	√
SO,SC,SS	Buttcn	LA11-A11D	3	√		
TH	Thermal Switch	T11	1	√	√	
FU	Fuse	BLx-1	1	√	√	√
CB	Opening Table	1-10mA	1	√	√	
W1	Potentiometer	WX10-330n	1	√	√	
RPC	Precision Potentiometer	Wx701-5K				√
W2	Potentiometer	WX10-2.2K	1	√	√	
RH	Heating Resistor	RX20-25	1		√	√
M	Motor	YDF/YBDF	1	√	√	√
B	Transformer	220V/9V/6V	1	√		

C	Electrolytic Capacitor	220/uF,1V	1	√		
V	Diode	2CP10	4	√	√	
YD,RD,GD	Indicator Light	ND3 or NDL3	3	√	√	√
TMK	Automatical Modulating controller	Homemade Pieces controller	1			√
MK1	Phase Sequence Identification and protection	Homemade Pieces	1		√	√
DC	DC Power	DC 24V	1		√	
MK2	Remote Modulating Controller	Homemade Pieces	1		√	
HS	Interlock Protection	Homemade Pieces	1		√	

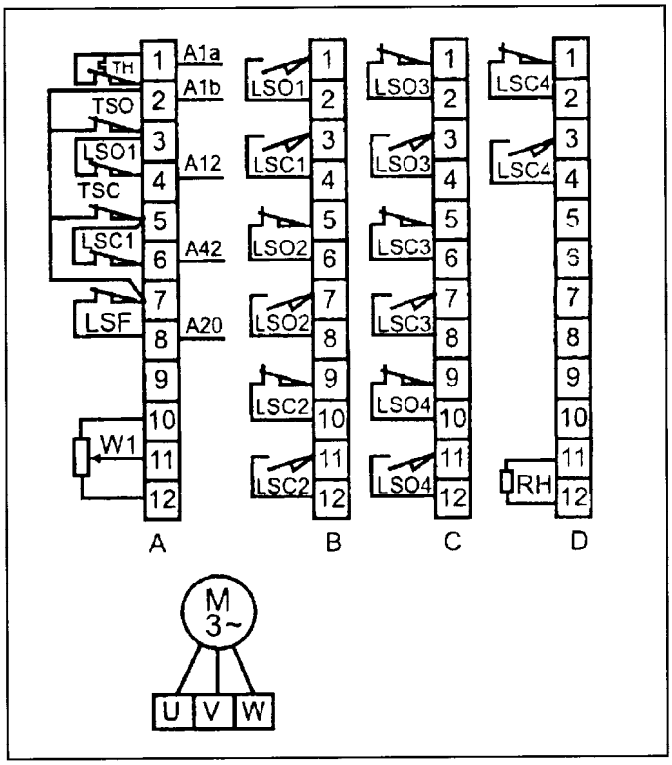
4. The wiring of the outdoor type

a) Non-typically designed terminal wiring diagram (See Picture 10);

b) '95' typically designed 51-fuses terminal wiring diagram (See Picture 11) (Non-typically designed terminal wiring diagram doesn't have C, D terminals)



Picture 10: Non-typically designed terminal wiring diagram.



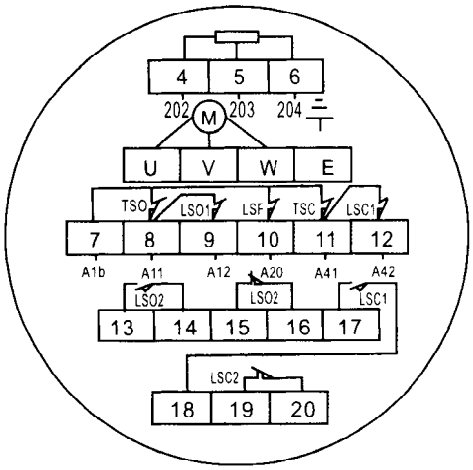
Picture 11 '95'typically designed 51-fuses terminal wiring diagram.

Note: TH is thermal switch in the motor; RH is space heater in the electric actuator .We provide TH and RH according to the user's requirements.

5. The wiring of the explosion-proof type (DZB), see picture 12. The terminal wiring should be strong by griping the wires with bend, see picture 13as a reference. The electrical gap between different potential conductive parts, which in the junction box must meet the following requirements:

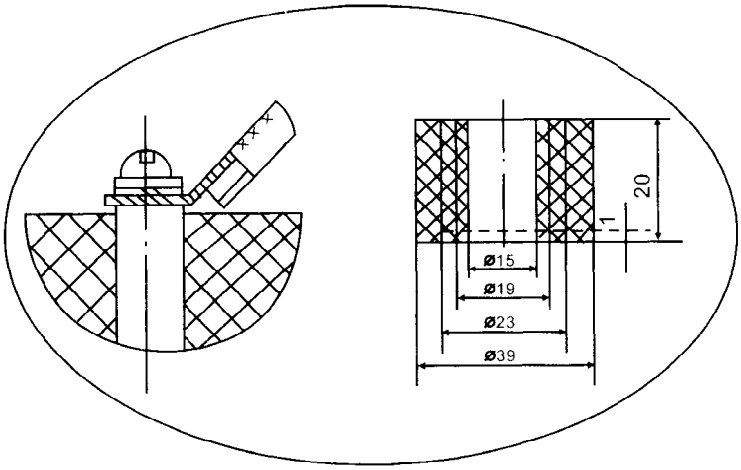
The gap should be not less than 6mm when the voltage is 220v, and not less than 8mm when 380v.

There are two entry devices in the junction box, one leads into the power cable of the motor and the other leads into the control cable, but the power cable must have earth wire which connects with the earth terminal .The diameter specifications of the entrance cable see picture 14and sheet 5.Pack and press the sealing ring tightly after the connection. The shore hardness of the sealing ring ranges from 45 degree to 55 degree and it must be changed immediately when damaged and worn.



Picture 12 The terminal wiring diagram of the explosion-proof type (DZB).

Note: Please specify if the terminal is not enough.



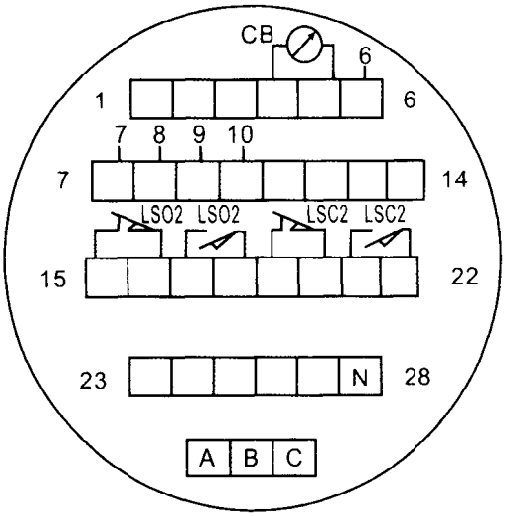
Picture 13: The method of the terminal wiring.

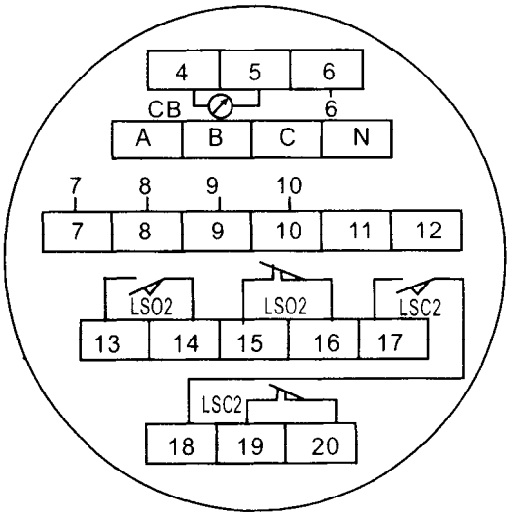
Picture 14: Sealing ring.

Sheet 5 Cable Diameter

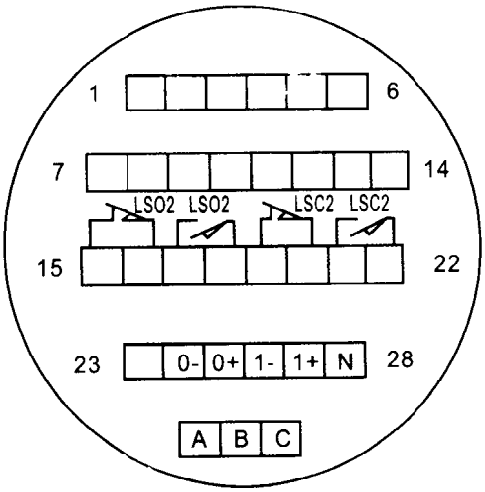
The inner diameter in the concentric groove of the sealing ring (mm)	15	19	23
The nominal diameter of the entrance cable permitted (mm)	15±1	19±1	23±1

7. The terminal connection diagram of the integrated outdoor type , integrated explosion-proof type, integrated regulating type and integrated regulating explosion-proof type(See Picture 15 16,17and18)

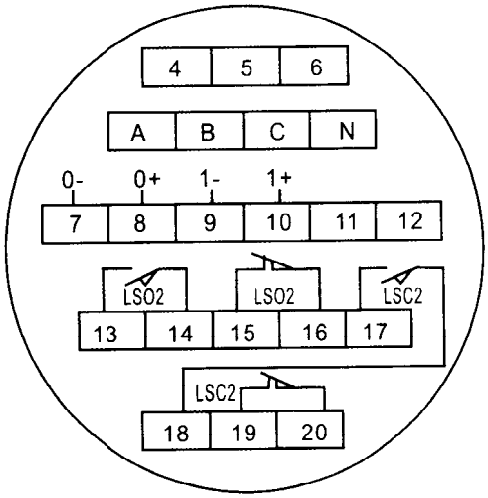




Picture 15: The terminal wiring diagram of the Integrated outdoor type (DZZ).



Picture16: The terminal connection diagram of the integrated explosion-proof type(DZBZ)



Picture17: The terminal connection diagram of the integrated regulating type(DZT)

Picture18: The terminal connection diagram of the integrated regulating explosion-proof type (DZBT) .

Adjustment

After the electric actuators and valves are installed, you must adjust the torque controller, traveling controller and opening indicator separately before putting the valves into use; prior to the adjustment, you must make sure that the potentiometer on the opening indicator is withdrawn (By loosening the fixing screw of the gear which on the potentiometer shaft) to prevent damage; Finally check the rotational direction of motor and the control lines in case that the motor may get out of control.

The adjustment procedure applies to the torque, traveling controllers and opening indicators of the DZW, DZZ, and DZT.

1. The adjustment of the torque control apparatus (See Picture 4)

   We already adjusted according to the user's requirements prior to the delivery. To reset the setting valve, you can turn the adjustment shaft of the cams to the corresponding scale, first the close direction, then the opening direction.

2. The adjustment of the traveling control apparatus (See Picture 5).

3. The adjustment of the fully closed position.

a) Tightly close the valves manually ;

b) Press the roof bar with the screw driver and make a 1/4 turn to wedge ;

c) Revolve the closed adjustment shaft according to the arrow until the cam acts;

d) Rotate the roof bar to its original position.

4. The adjustment of the fully opening position.

a). Manually start the valves to the necessary position;

b) Press the roof bar and make a 1/4 turn to wedge;

c) Revolve the opening adjustment shaft according to the arrow until the cam alts;

d) Turn the roof bar to its original position.

5. The adjustment of the indicator (See Picture 6)

Adjust the local indicator and remote transmission potentiometer after the adjustment of the torque and travel; Prior to adjustment , you must loosen the potentiometer gear .

The method of adjustment is as follows:

a) Move the revolutions adjustment gear to the necessary position;

b) Close the valves manually or electrically;

c) Revolve the closed indicator dial so that the closed mark can aim at the pointer;

d) Grip the revolution shaft of the potentiometer and face to approach the terminal position in the counter-clockwise direction , then tighten up the fixing screw of the potentiometer;

e) Electrically or manually operate the valves to the fully opening position and keep the calibrated dial of the closed direction motionless, then revolve the opening indicator dial so that the opening mark can aim at the pointer ;

f) electrically operate the valves to check the flash light.

A flashing red light will illuminate during the process of starting valve, then a

steady red light indicates a fully opened valve condition ; a flashing green light will illuminate during the process of closing valve, then a steady green light indicates a fully closed valve condition.

6. The adjustments of the integral type and modulating type.

7. Check the power source

If the yellow light fails to illuminate after the power cords are plugged in , which means that the mistake of the numbers of the power cords or lack of phase, you should exchange randomly two phase until the yellow light is on.

8. The adjustments of the moment of force controller, travelling controller and opening apparatus.

Open the cover of the electrical box and loosen the screw A on the electronic assembly panel (See Picture 8) and reverse the panel 1/4 turn prior to the adjustments of the moment of force controller, traveling controller and opening apparatus.

9. Local / Remote control operation

Integral actuator is equipped with button boxes, which provides the user with two control modes, that is , local control and remote control.

1) Local control. Open the cover of the button box and use the buttons to open and close.

Green light is on while the valve id fully closed; red light is on while the valve is fully opened. Local operation ends with the lid closed.

2) Remote control. Remote control may begin with the button box closed.

The integrated—outdoor type and the integrated explosion-proof type are equipped with modulating controller, which provides the users with 5 modes of remote of remote control , we will provide the second control mode unless the user specifies.

Assembly and Disassembly

1. There is no special request about the installment of this equipment. Provided that the motor and the electrical box are recommended to be placed at the horizontal or vertical position to facilitate, which is better for the lubrication , testing and maintenance and manual operation.
2. While installing the equipment, ensure enough room for maintenance personnel to disassemble the parts.
3. The axial clearance of the installment and jaw linkage is not less than 1-2㎜.
4. Check whether the extension of the stem equals to the length of the guard shield when the actuator is used for the rising stem valve.
5. Cause no damage to the sealing face; sealing pieces and explosion-proof face of the explosion-proof actuator during the process of assembly, testing and disassembly, moreover you should spread some rust – resistant oil on the explosion –proof face.
6. The disassembly proceeds under the condition that the valve is slightly opened by turning the hand wheel several turns.

Words of caution

1. The power source should be cut off prior to opening the cover of electrical box under the explosive condition (or don't remove and test the equipment with the power under the explosive condition);
2. The window of the opening apparatus cannot collide with hard objects;
3. Don't open any sealing parts such as the cover of electrical box , out doors in the overcast and rainy day;
4. After inspection and maintenance, cover the sealing parts tightly , which avoids the electrical components from damage because of rain water and humidity;
5. The first time you operate the actuator electrically after assembly or reassembly, make sure that the valve is in the middle position and you must check the closed and opening directions , and test item by item according to the testing requirements, make sure all the parts work properly before put into

use;

6. This equipment utilizes three-phase asynchronous motor which is specially designed for the valve with rated working time less than 10 minutes, don't over work it which protects the motor from over heating;
7. The guard shield of the stem or the valve cap on this equipment must be turned tightly. When you remove them to maintain or repair, cover the top of the equipment to protect the stem / nut from the damage by dust, sand or other foreign objects;
8. Prior to the manual operation, push the transfer handle in accordance with the direction of the arrow. If you fail to push it, you should turn the handwheel as you push the transfer handle. Don't push transfer handle with force or turn back it to the electric position with force , or else the internal parts will be damaged;
9. When the valve is rarely used, make rules to inspect the electric equipment at regular intervals.

Problems and Solutions

Items	Problems	Reason	Solutions
1	Can't be started	The power cords disconnect; Control lines disengage; Travelling or the moment of ; force apparatus fail;	Check the power cords; Fix the lines; Remove the problem of; the traveling and the moment of force apparatus;
2	The rotational direction of the output haft doesn't conform to the stipulation	The phase sequence of power source is connected improperly	Exchange two random power cords
3	The motor overheat	The running time is too long; Motor cannot match with the electric actuator; One phase disengages;	Stop operating and cool the electromotor; Check the necessary condition; Check the power cords;
4	Motor stops during the operation	The actuator is over loaded and the moment of force acts; The valve has a breakdown;	Increase the setting moment of force; Inspect the valve;
5	The motor still rotates or the light is not bright though the valve is in the right position	The travelling or the moment of force apparatus has a break down; Travelling controller may not be adjusted properly;	Inspect the setting moment of force apparatus; Readjust the traveling control apparatus;
6	No position signal available	Remote transmission potentiometer has breakdown; The fixing screw of the potentiometer gear gets loosen;	Inspect or change the potentiome; Tighten up the fixing screw of the potentiometer gear;

Notice for Orders

1. Please specify the model number and the necessary torque of the close / opening direction. We will provide you with the actuators according to the specifications of ours unless you specify;
2. You must state clearly if the actuator must be used under the explosive environment which must conform to the stipulations of the explosion-proof standard in this user's guide;
3. Please specify the standard of connection dimension, the diameter and extension length of the stem. If they don't conform to this guide , please consult us for possible solutions;
4. A clockwise rotation of the hand wheel is assumed to closed valve, please specify if your practice is just the opposite;
5. We provide the electric actuators of other rotational speed according to the customer's requirements.