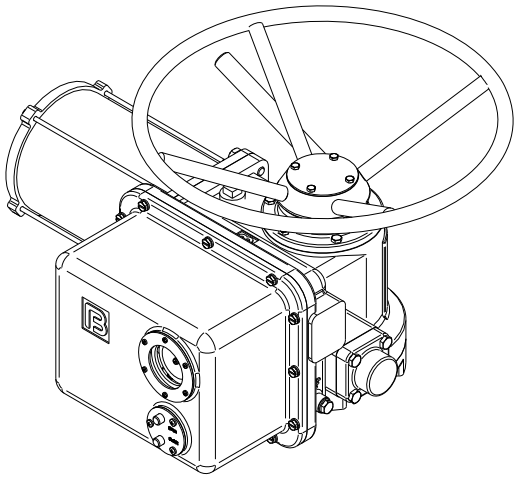
903 SERIES ELECTRIC ACTUATORS

INSTRUCTION MANUAL



TIANJIN BEIFANG VALVE ACTUATOR CO., LTD

BF/TM 903.01-E2015

ISSUE 201510

Thank you for purchasing and using our products. This manual is valid for standard 903 series electric multi-turn actuators.

Please before you operate your product, be sure to read this booklet carefully. These operation instructions are only valid for "**clockwise closing**", i.e. driven shaft turns clockwise to close the valve.

WHERE TO FIND INFORMATION

1. Summarize……..……..……..……..2
1.1 Range of application……..……..……2
1.2 Brief……..……..……..……..2
1.3 Warnings and notes……..……...2

2. Technical data ……..……..……..……..2

3. Construction……..……..……..……4

4. Principles of operation……..……..……..5
4.1 Motor operation……..……..……..……...5
4.2 Hand/Auto switch……..……..……..……6
4.3 Limit switch……..……..……..……...7
4.4 Torque switch……..……..……..……7

5. Lubrication ……..……..……..……..7

6. Transport and storage……..……..……..……..8
6.1 Transport……..……..……..……..8
6.2 Storage……..……..……..……....8

7. Installation ……..……..……..……...8
7.1 Plug sleeve connection……..……..……..8
7.2 For stem nut connection……..……..……8
7.3 Electrical connection……..……..……9

8. Setting the torque switch……..……..……10

9. Setting the limit switch……..……..……11
9.1 Setting the limit switch……..……..……11
9.2 Setting the counter……..……..……12

10. Setting the position indicator……..……..13

11. Control package……..……..……...14
11.1 Structure……..……..……..……14
11.2 Operation……..……..……..……...14

Appendix A：Primary electrical components……..……...15

Appendix B：Typical wiring diagram……..……..……..……16

Appendix C: Familiar problem and trouble-shooting……**back cover**

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Please tell us some information about your product when contact with us:

Model, Factory Number, Production Date, etc.

1.Summarize

1.1 Range of application

903 series electric actuators provide a reliable position control of gate, stop valves, as well as similar ones. Combining with 402 series valve gear-box made in our company can be used on quarter-turn applications, such as butterfly and ball valves.

1.2 Brief

- 903 series valve actuators powered by electric have limit and torque switch in both end positions, in addition, they can output torque or thrust.
- 903 series electric actuators with control package integrate the startup of motor and other control units in a watertight box.

1.3 Warnings and notes

Non-observance of the **warnings** and **notes** may lead to serious injuries or damages. Qualified personnel must be thoroughly familiar with all **warnings** and **notes** in these operation instructions.

This sign means：**Hint！**
Explain the topic in detail.

This sign means ： **Note！**
Non-observance of these notes may lead to the blight to products or the failure of operation.

This sign means ： **Warning！**
If not carried out the “warnings” correctly can affect the safety of persons or material.

2.Technical data

Power: Standard: 380V/50Hz/3ph AC, voltage vibration range: ±10%, frequency vibration range: ±5%.

Options: PTL——Three phase three line, 380V/50Hz AC
PSP——220V/50Hz/1ph AC（apply with sizes 9030 ~ 9032）

Work system: Standard: S2 system. 15 minutes cyclic running time, the startup interval is 2～ 3 times running time. 60 starts/hr. for application, do not exceed 600 starts/hr. when adjusting.

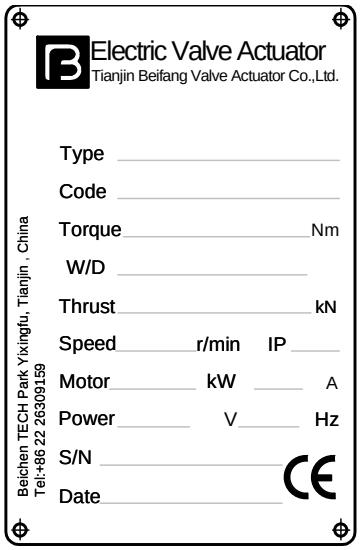
Options: S4 system, used for precise adjusting, 1200 starts/hr.

Protection: Standard: A temperature protection switch embedded in the windings of the motor will trip the actuator control circuit if the motor windings overheat. There mounted thermal overload relay in the control package.

Options: LPP——Protect the three-phase motor from running short of phase.
DAP——Ensure the three-phase motor to rotate with correct phase.

Temperature: Standard: －20℃～＋70℃
－20℃～＋40℃（for ex-proof actuators）

Marking:



Housing: Standard: IP65 (IEC 60529:2001)

Options: WT7——IP67 (IEC 60529:2001)
WT8——IP68 (IEC 60529:2001)
EXP——An ex-proof enclosure to Exd ⅡB T4 Gb (IEC 60079-0:2007, IEC 60079-1:2007)

•Outputting data:

Output speed r/min	12	18	24	36	48	72	12	18	24	36	48	72
Type code	Output torque Nm						Motor power kW（380V/50Hz/3ph AC）					
9030(CP)	50	50	50	50	40	-	0.06	0.09	0.12	0.18	0.18	-
	70	70	70	70	-	-	0.09	0.12	0.18	0.25	-	-
9031(B)(CP)	100	100	100	100	90	90	0.12	0.18	0.25	0.37	0.37	0.55
	150	150	150	150	140	-	0.18	0.25	0.37	0.55	0.55	-
9032(B)(CP)	200	200	200	200	180	180	0.25	0.37	0.55	0.75	0.75	1.1
	300	300	300	300	280	-	0.37	0.55	0.75	1.1	1.1	-
9033(B)(CP)	450	450	450	450	400	380	0.55	0.75	1.1	1.5	1.5	2.2
	600	600	600	600	580	-	0.75	1.1	1.5	2.2	2.2	-
9034(B)(CP)	900	900	900	900	850	800	1.1	1.5	2.2	3	3	4
	1200	1200	1200	1200	1100	-	1.5	2.2	3	4	4	-
9035(B)(CP)	1800	1800	1800	1600	1500	1400	2.2	3	4	5.5	5.5	7.5
	2500	2500	2500	2300	2000	-	3	4	5.5	7.5	7.5	-
9036(B)(CP)	3500	3500	3500	3500	-	-	4	5.5	7.5	11	-	-
	5000	5000	5000	-	-	-	5.5	7.5	11	-	-	-

•Motor: （380VAC/3ph/50Hz）

Power kW	0.06	0.09	0.12	0.18	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11
Rated current A	0.6	0.7	1.0	1.2	1.5	1.6	2.3	2.8	4.3	6	9.8	11	13.5	16	22	26
Start current A	2	2.1	3.2	5	6	7	12	16	21	32	50	64	82	105	145	195

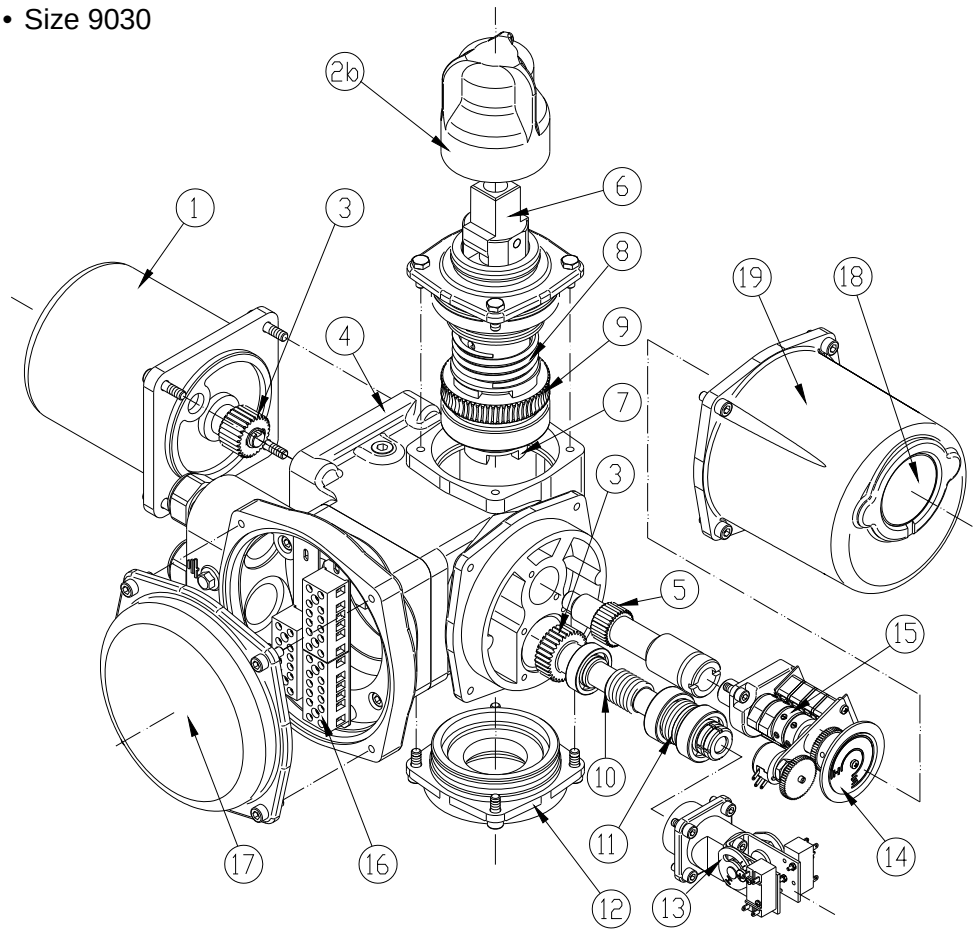
•Mechanical data:

		9030 (CP)	**9031 (B)(CP)**	**9032 (B)(CP)**	**9033 (B)(CP)**	**9034 (B)(CP)**	**9035 (B)(CP)**	**9036 (B)(CP)**
Max-dia of stem mm	Plug sleeve	Φ26	Φ28	Φ40	Φ50	Φ65	Φ95	Φ120
	Stem nut							
Travel range (turns)	Type Ⅰ	5.5～9	1～26		1～35			
	Type Ⅱ	9～25	26～302		35～405			
Allowable thrust (stem nut) kN		35	45	70	75	108	230	670
Manual gear ratio		1	1	1	33.3	40	25	40
Weight		24	32	47	75	106	185	258

It is natural that the temperature of the motor surface reach or exceed 80℃ when working, do not touch the motor for fear scald.

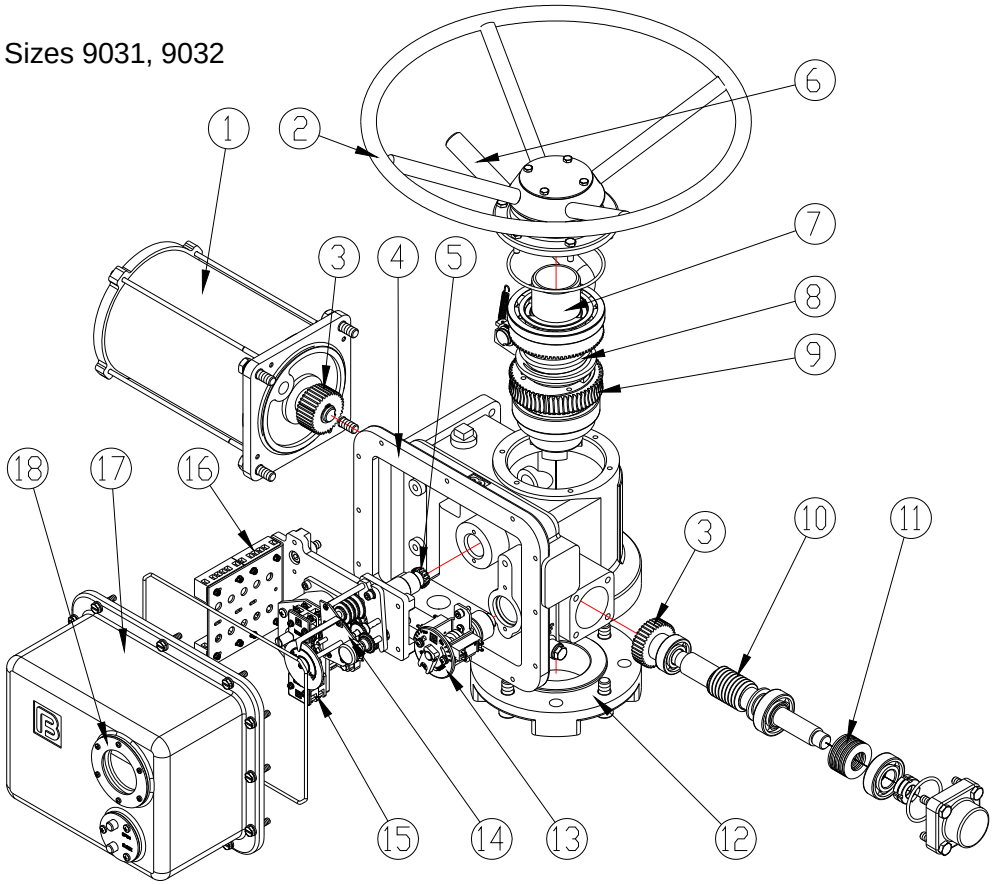
3.Construction

- Size 9030



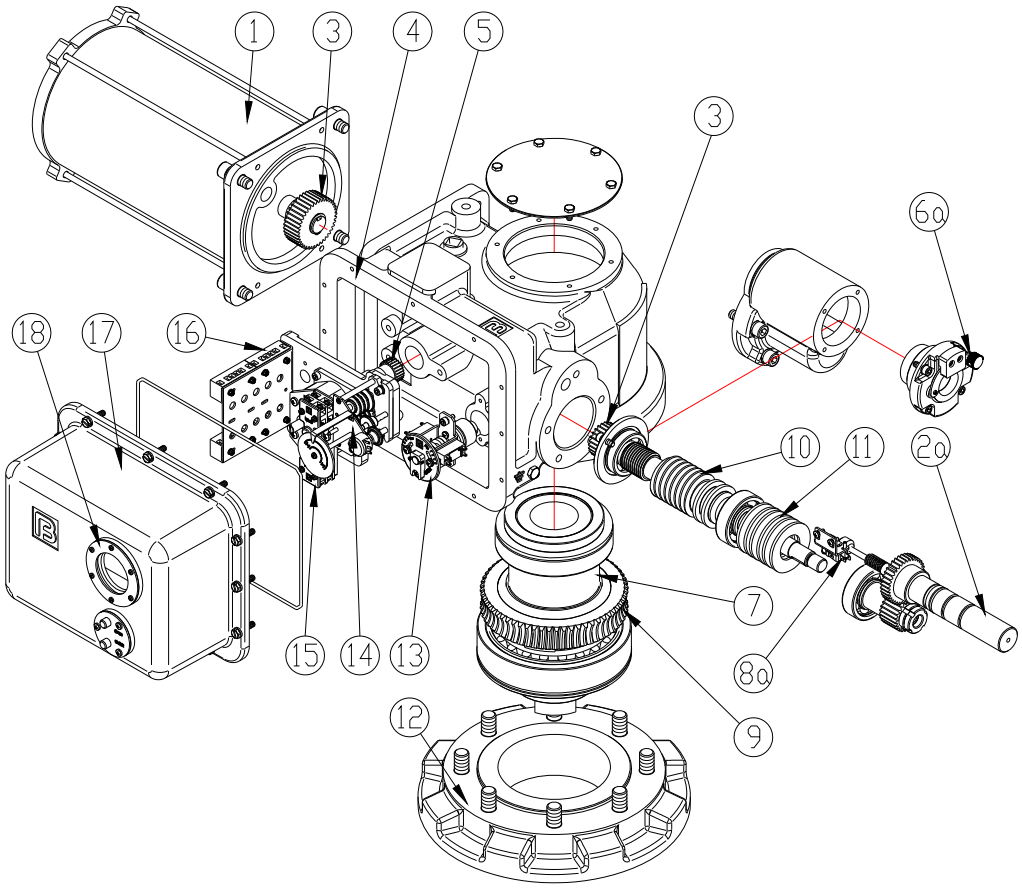
1	Motor
2b	Switch protective sleeve
3	Spur gear set
4	Main house
5	Limit shaft
6	Hand /Auto lever
7	Drive sleeve
8	Press reed
9	Worm gear
10	Worm shaft
11	Disk spring
12	Joint flange
13	Torque switch
14	Position indicator
15	Limit switch
16	Terminal strips
17	Cover
18	Indication window
19	Switch cover

- Sizes 9031, 9032



1	Motor
2	Handwheel
3	Spur gear set
4	Main house
5	Limit shaft
6	Hand /Auto lever
7	Drive sleeve
8	Press reed
9	Worm gear
10	Worm shaft
11	Disk spring
12	Joint flange
13	Torque switch
14	Position indicator
15	Limit switch
16	Terminal strips
17	Cover
18	Indication window

• Sizes 9033～9036



1	Motor
2a	Handwheel shaft
3	Spur gear set
4	Main house
5	Limit shaft
6a	Hand /auto lock sheet
7	Drive sleeve
8a	Hand /auto switch
9	Worm gear
10	Worm shaft
11	Disk spring
12	Joint flange
13	Torque switch
14	Position indicator
15	Limit switch
16	Terminal strips
17	Cover
18	Indication window

4.Principles of operation

4.1 Motor operation

The spur gear set #3 drives the worm shaft #10 and worm gear #9, which drives the drive sleeve #7 by the plug sleeve（a clutch is supplied in sizes 9030 ~ 9032）. Thereby, rotates producing the required output rotary motion.

The BF series controllers made in our company can be used together with 903 series electric actuators to meet different requirement.

- **For sizes 9031 and 9032, your actuator is always available for motor operation whenever the motor is energized.**
- **During the motor operation, moving the hand/auto lever #6 should be avoided for fear damaging the parts.**
- **For sizes 9031 and 9032 there mounted O-ring between the handwheel and the drive sleeve, so the friction may lead to the slight running of the handwheel.**

4.2 Hand /auto switch

For 903 series actuators, the hand/auto shift is easy. The manual operation can be used when the product is need to be adjusted and repaired, or meet an emergency of motor failure.

•Size 9030：

Rotate the switch protective sleeve #2b and demount it. Then drive the hand/auto lever #6 for 90° while manual drive is engaged. And then the drive sleeve can be driven by rotating the hand/auto lever. After finishing the manual operation, **raise up the hand/auto lever to upright position** and mount the switch protective sleeve.

The size of the hand/auto lever is 22×22 with a Φ15.2 hole. The appropriate wrench or steel bar could be used to operate the hand/auto lever.

When revert to motor mode after manual operation, the hand/auto lever could shake, here nothing remains but to mount the switch protective sleeve. The hand/auto lever will automatically get back to upright position when energization of the motor.

•Sizes 9031, 9032：

By operating the hand/auto lever #6 into the desired direction according to the direction board, manual drive is engaged. And the hand/auto lever is locked to prevent from mistaken operation.

If the hand/auto switch failure occurs, do not move the lever forcibly, turn the handwheel until the hand/auto switch succeed.

Do not move the hand/auto lever forcibly after finishing the manual operation. Energization of the motor will automatically re-engages power operation by spring action of press reed #8.

•Sizes 9033～9035：

Loosen the bolt on hand/auto lock sheet #6a and turn the lock sheet to unhitch the slot on handwheel shaft #2a. Then draw out the handwheel, the hand/auto switch #8a works at the same time and the motor is disengaged. Then turn the lock sheet again to lock the other slot on handwheel shaft and screw the bolt, the manual operation is engaged. When the manual operation is finished, push back the handwheel according to reverse procedure, the handwheel and the handwheel shaft will come to the initial position, the motor operation is engaged.

Both hand/auto position can be lockable to prevent from mistaken operation.

- **Do not switch forcibly with hand/auto lock sheet locking handwheel shaft.**
- **The hand/auto switch #8a must be wired according to the "CK" in "Appendix B: Typical Wiring Diagram".**

4.3 Limit switch

•Size 9030：

By worm shaft and worm gear, the travel (the turns of the drive sleeve) is transmitted to the limit shaft #5 which drive the camshaft of the limit switch #15. Once the drive sleeve turns to the setting position the limit switch will be operated and so the motor will be switched off.

•Sizes 9031~9036：

The travel（the turns of the drive sleeve）is transmitted to the limit shaft #5 by the worm shaft and worm gear（the bevel gears are for sizes 9031 and 9032）. By means of the spur gear set the limit shaft connects with the counter which memorizes the turns. Once the drive sleeve turns to the setting position, the limit switch will be operated and so the motor will be switched off.

4.4 Torque switch

The disk spring #11 is mounted on the worm shaft #10 and the axial move of the worm shaft is proportionable to the torque generated by the actuator. Two torque switches in open/close direction in the torque switch #13 sense the movement of the worm shaft and interrupt the power to the motor.

5.Lubrication

- There are O-rings between the main house #4 and its contacting portion. The main house is fully filled with 00# gear lubricating grease to lubricate the worm shaft, worm gear, gears and bearings.
- No seal can remain absolutely tight at all times, therefore, it is not unusual to find a very small amount of weeping around shaft seals-especially during long periods of idleness such as storage. Once the equipment has begun operating, this phenomenon should disappear.
- It is not need to refresh the lubricating grease periodically. If the lubricant is deficient in quantity or its quality has changed, please infuse the lubricating grease with the same trademark or the same performance from the grease fitting.

00# gear lubricating grease:

Base	Lithium
Temperature range	-20 ~ +120℃

6. Transport and storage

6.1 Transport

- **Do not attach ropes or hooks to the motor, handwheel or the hand/auto level for the purpose of lifting by hoist, to avoid damaging the connecting pieces of motor or the handwheel fall off.**
- **If the actuator is mounted on valve, do not attach ropes or hooks to the actuator for the purpose of lifting by hoist, to avoid damaging the actuator.**

6.2 Storage

- Units should be stored in the clean, dry environment.
- Connect the internal space heater regularly, or place desiccant in the compartment to protect the switches.

7.Installation

Two output drive types (plug sleeve and stem nut) are available to adapt the actuators to the different types of valves. Prior to mounting the actuator please check if joint flange fits the valve. If possible, mount motors on a horizontal position.

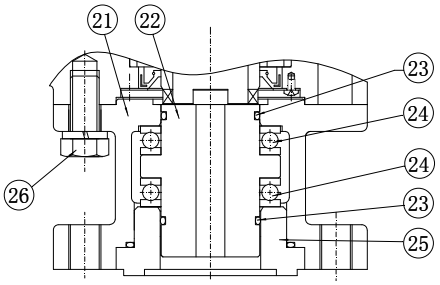
7.1 Plug sleeve connection

For plug sleeve connection, only adjust the position of the actuator, to make the drive sleeve #7 engage with the stem of the valve, and then tighten the joint flange #12 and valve with bolts.

7.2 For stem nut connection

The stem nut is for transmission of torque and bearing thrust.

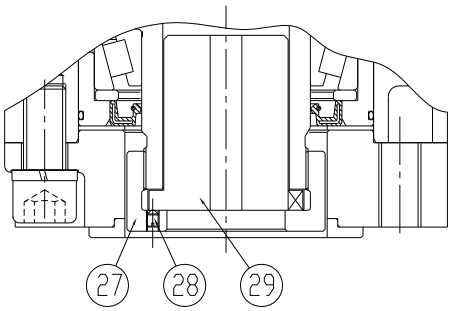
Sizes 9030~9032,9036：



1.Thrust will be accepted by the mounting flange attached to the actuator.

2.The stem nut #22 will be supplied with a pilot hole. For size 9030, loose #26 bolt and dismantle mounting flange #21. For size 9031～9032 and 9036 only need to dismantle seam allowance #25. And then take out stem nut to machine ,make sure the thread must match the thread of the valve stem.

3.After finishing machining of stem nut, test and make sure stem nut run true. Then re-insert stem nut and thrust bearings #24 into mounting flange and make sure the O-rings #23 are not damaged.



Sizes 9033~9035

1.Thrust will be accepted directly by sizes 9033～9035.

2.The stem nut #29 will be supplied with a pilot hole. Loose bolts #28, screw out locknut #27, take out stem nut to machine, and make sure the thread must match the thread of the valve stem.

3.After finishing machining of stem nut, test and make sure stem nut run true. Then re-insert stem nut, and fasten the locknut and the bolts.

4.When mount the actuator ,make it in manual mode, rotate the handwheel to screw stem nut into the valve stem, adjust the relative position of the actuator and the valve, and then tighten them with bolts. When dismantle the actuator, make it in manual mode, rotate the handwheel to screw out the stem nut from the valve stem.

7.3 Electrical Connection

When finish installation，connect wires according to the wiring diagram supplied with the unit.

⚠ **Work on the electrical system or equipment must only be carried out by an electrician who possess operating certificate or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.**

1.Shut off all incoming power.

2.Open cover #17, keep the compartment of the main house #4 clean and dry.

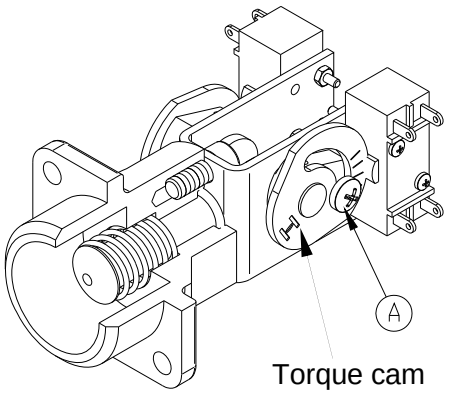
3.Check the stickup code to ensure that it coincides with the code of the wiring diagram supplied with the unit and connect wires properly. Conduit entries in the main house provide two openings for routing the pilot cable and the dynamic cable. Seal the openings after wiring.

4.Manual operates the unit to keep the valve in the intermediate position, then turn power on and check the rotating direction of the motor. If the direction is wrong, interchange any two leads on three phase motors.

Sizes 9031 and 9032 do not provide the hand/auto switch “CK”.

☞ **For sizes 9031~9036, open the cover carefully to avoid damaging switches or terminals for the pushbuttons in cover are wiring the terminal strip.**

8.Setting the torque switch

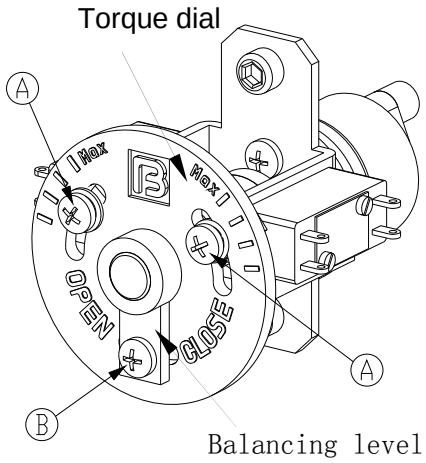


- The torque switch is designed to avoid damaging the motor, mechanical parts, the valve and so on. **The switch was set at the factory. The setting torque is equal to the "Max. Output Torque " in the nameplate. It is not need to be reset generally.**
- When need to adjust the torque switch, proceed as follows:

Size 9030：

1.Loosen lock screw （A）and over against the torque cam, clockwise rotating the cam could minish the torque value. Contrarily, increase the torque value.

2.Tighten lock screw（A）, motor operates the valve to check that if the output torque is meet the requirement when the power to motor is interrupted. If not, repeat the above process to reset.



Sizes 9031~9036：

1.Loosen lock screw（A）, move the screw with block to set to the required torque according to the scale in the torque dial. Then tighten the lock screw.

2.Motor operates the valve to check that if the output torque is meet the requirement when the power to motor is interrupted. If not, repeat the above process to reset.

- For sizes 9031~9036, if the torque switch has been removed from the unit or if a new torque switch is being installed, the torque switch must be rebalanced according to the following procedure:

1.Make sure that both lock screws（A）are symmetrical and tighten them.

2.Loosen balancing screw（B）, ensure the actuator in an unloaded condition. Install the torque switch on main house, make the brace in the slot of the worm shaft, tighten balancing screw with the balancing level in physical slot.

3.Reset to the required torque according to the above process.

☞ • **Letters in the torque dial are only valid for "clockwise closing".**

• **For sizes 9031~9036, the balance screw should not be loosened except during the balancing procedure, otherwise the previous adjustment to the torque switch will fail.**

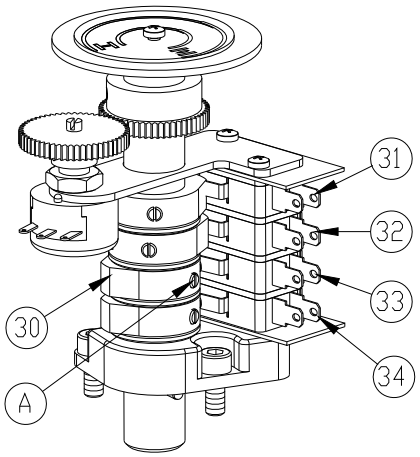
⚠ **Disconnect all incoming power before opening or closing the cover or the switch cover.**

9.Setting the limit switch

The limit switch must be adjusted after the actuator has been mounted on its associated equipment to make the responding contacts can be operated once the valve reach the required position.

For sizes 9031~9036, the limit switch include limit switches used for disconnecting the power and a counter used for memorizing the turns of drive sleeve. There is no counter in size 9030, so the limit is controlled by the limit switches.

9.1 Setting the limit switch



Size 9030：

The unit is supplied with 4 switches, each of which has 3 contacts. From the top down, the 4 switches is for full open, opening additional position and full close, closing additional position in turn. The adjusting proceed as follows:

1.Disconnect all incoming power to the unit prior to opening the switch cover #19.

2.If a potentiometer is supplied, check to ensure that its upper gear is disengaged.

3.Manual operate the valve to full close position.

4.Adjust the cam beside the power switch #33: Loosen screw (A), clockwise rotate the cam, once it touch the microswitch, tighten the screw.

5.Adjust the cam beside the additional switch #34: Loosen the screw, clockwise rotate the cam and make it touch the microswitch earlier than the above cam, then tighten the screw.

6.Manual operate the valve to full open position.

7.Adjust the cam beside the power switch #31: loosen the screw, counterclockwise rotate the cam, once it touch the microswitch, tighten the screw.

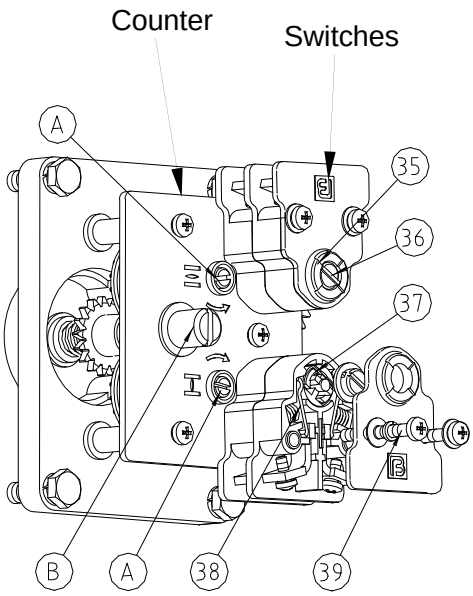
8.Adjust the cam beside the additional switch #32: loosen the screw, counterclockwise rotate the cam and make it touch the microswitch earlier than the above cam, then tighten the screw.

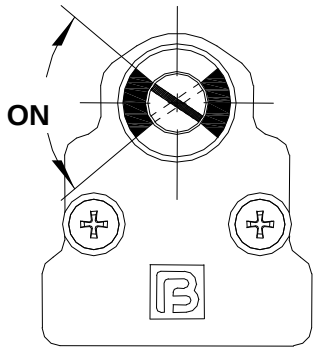
9.When the above adjustment finished, energize the actuator to test its operation 1~2 times.

Sizes 9031~9036：

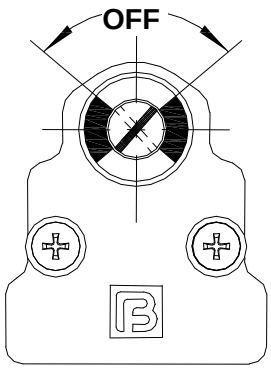
- There are 4 positions can be supplied at best, full open position, full close position and two additional positions in open/close direction. 4 contacts can be supplied at best for each control position. The topside contacts in the full open (close) position is used for cutting off power when the valve reaches to full open (close) position, and the others are auxiliary.
- The contact is composed of contact slice #36 and rotor #35, and its state of on or off can be changed: Loosen screw #37, take out the conductive ring seat and turn it for 90° , then remount it.

9.2 Setting the counter





On state



Off state

When the actuator first installed or re-installed, must set the counter. The goal is: when the valve is in the position required by users, the contacts of the corresponding location can be accurately on or off. When the whites on the indicator #36 and the switch cover #35 overlap exactly, the top switch is on state. When the whites on the indicator and the switch cover are separated, the top switch is off state. Adjusting proceed of the counter as follows:

1. Disconnect all incoming power to the unit prior to opening the cover.
2. If a potentiometer is supplied, check to ensure that its gear is disengaged.
3. Make the actuator in a state of manual operation. Manual operates the valve to the full open position, then turn handwheel back for one turn.
4. Push sleeve（B）and clockwise rotate it.
5. If the whites on the indicator and the switch cover on the fully open position are separated, turn adjusting pole （A）to opposite direction of the arrow till the whites overlap. Then turn adjusting pole carefully to the same direction of the arrow till the whites just exactly separate each other. the adjustment finish.
6. If the whites on the indicator and the switch cover on fully the open position exactly overlap, turn adjusting pole (A) to the same direction of the arrow till the whites just exactly separate each other. The adjustment finish.
7. When the adjustment of the fully open position finished, counter-clockwise rotate sleeve（B）, it will come to the initial position by spring action. The counter are well engaged if adjusting pole （A）could not be turned.
8. Refer to process 4~7 to adjust other positions.

- **Limit switch is not factory set. It must be set when the unit is installed on the valve.**
- **Reset the limit switch prior to motor operation if the unit has been dismantled or removed from the valve.**
- **Do not motor operate the valve without first setting the limit switch.**
- **The adjustment force will increase when the conductive ring seat rotates, which is normal during adjusting.**
- **When the counter setting is finished, the users should motor operate the actuator to ensure the limit switch is meet the requirement, or reset the counter.**

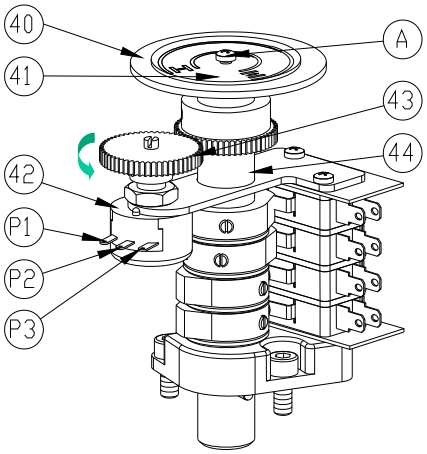
- **Disconnect all incoming power before opening or closing the cover.**
- **Check to ensure that the valve is in the fully open position when the unit is dismantled from the valve.**
- **Check to ensure that the potentiometer gear is disengaged.**
- **When finish adjusting, the sleeve（B）must come to the initial position. If not, the adjustment or the counter will be damaged.**

10.Setting the position indicator

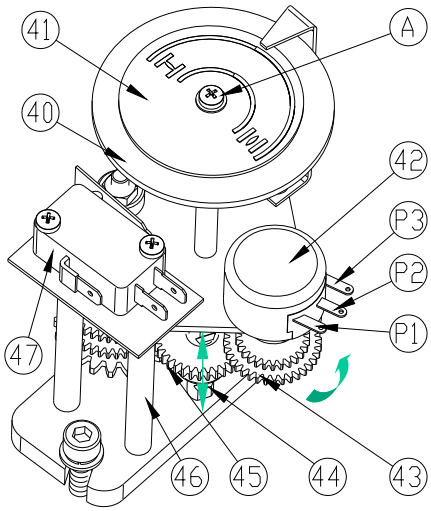
903 series electric actuator provide mechanical valve position indicator, a potentiometer #42 is supplied for remote indication. The normal type can indicate an exact turn and the adjustable type can meet the requirement of a broad range of turns. A blinking switch #47 may be supplied for sizes 9031~9036 if need.

The consumer may use a voltmeter chosen according to the relevant wiring diagram to remotely read the valve position indication signal or accept 4~20mADC analog position indication signal output by the transmitter VPT2 or VPT4 purchased at the time of order.

- **The position indicator must be set after finishing the setting of counter.**
- **Among 3 leads of potentiometer, P2 connects wiper arm, resistance between P2 and P3 increases with valve moving towards opening.**
- **The following instructions are only valid for "clockwise closing".**



Size 9030



Sizes 9031~9036

Check to insure that gear #43 and the gear in shaft #44 are not engaging, or loosen the screw to let them disengage.

- **Adjusting mechanical valve position indicator as follows:**

1.Operate the valve to the full close position, and then shut off the power.

2.For sizes 9031~9036, move the gear #45 in shaft #44 to the position corresponding to the number (just equal to or exceed the actual turns of drive sleeve) in label #46, and ensure the slice of the gear in the slot of shaft #44.

3.Loosen screw （A）, turn the close dial #40 to let close sign over against the pointer, and then tighten the screw.

4.Operate the valve to the full open position, and then shut off the power.

5.Loosen screw （A）again, turn the open dial #41 with keeping the close dial not moving to let open sign over against the pointer, and then tighten the screw.

- **Adjusting potentiometer setting as follows：**

1.Place the valve in the fully closed position after finishing the adjusting of the position indicator.

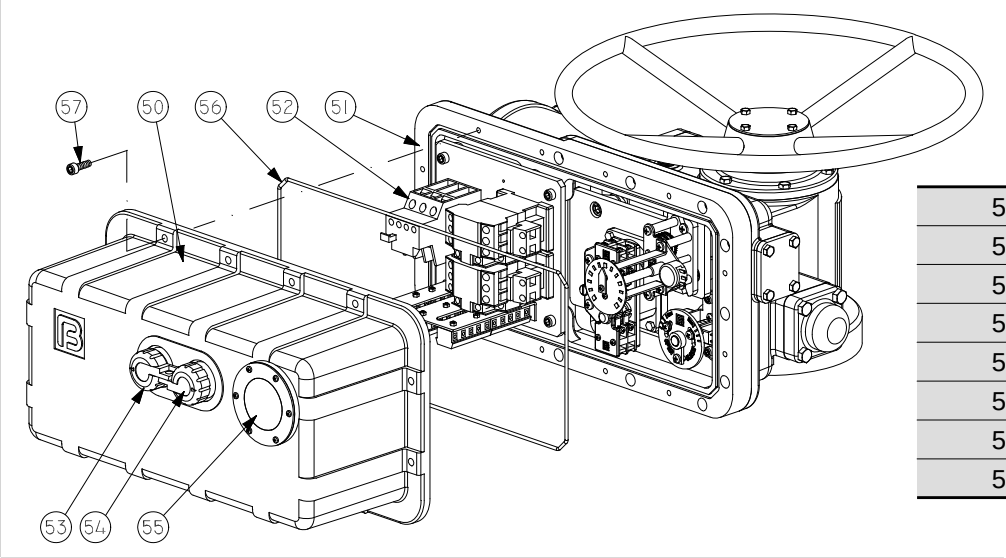
2.Loosen screw in gear #43, take out the gear, turn the shaft of potentiometer to end point according to arrowhead in the drawing, then mount the gear.

3.For sizes 9031~9036, it is necessary to observe the relative position of open and close dial: in the close sign position, if the indicatrix of open dial is not in the indicatrix range of close dial, let the smaller pinion of gear #43 engage the gear in shaft #44 and tighten the screw. If not, the other opinion should be engaged.

11.CONTROL PACKAGE

11.1 Structure

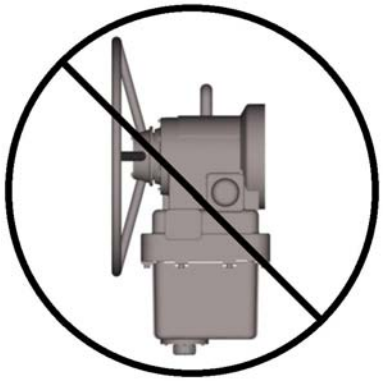
- Control package is a watertight box integrates the startup of motor and other control units. The king of actuator includes open/close type and with modulating control unite type
- Component group #52 includes open contact, close contact, thermal overload relay, etc. An EPC module with function of automatically controlling by means of inputting/outputting 4~20mADC signal and a power used for indicating lights could be supplied if need.
- The package cover #50 is equipped with a “local/remote” selector #53 and an open/close/stop control button #54. The LED indicating lights could be supplied if necessary.



50	Package Cover
51	Transition Plate
52	Component Group
53	“Local/Remote” Selector
54	Control Button
55	Indication Window
56	Seal Ring
57	Bolt

11.2 Operation

- When the ”local/remote” selector points to “remote”, the actuator may be remotely controlled.
- When the “local/remote” selector points to “local”， turning the open/close/stop control button may control the actuator in site.
- When the control button is in “stop” and the selector is in “remote”, they can be locked to prevent from mistaken operation.

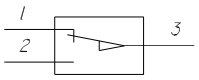


- **Installation with control package’s underside should be avoided or the reliability and life time of the contacts will be reduced.**
- **Open the package cover carefully to avoid damaging switches or terminals for the control button is wiring the terminal strip.**

- **Disconnect all incoming power to the unit prior to opening or closing the package cover.**

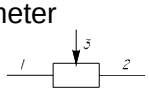
Appendix A：Primary electrical components

1.Microswitch



- Load factor：250VAC，15A
- Temperature：– 55 ~ + 60℃
- Mechanic life：10^6 times
- Electric life：10^5 times

2.Potentiometer



- Rated load：3 W（70℃）
- Rotation angle：300° ± 10°

3.Space heater

- Prevent the actuators from humidity and condensation.
- Voltage：220VAC
- Resistance: 6.8kΩ。

4.Transmitter (purchase part)

4.1 summarize

● VPT2：Two-wire system. Input 24VDC and feedback 4～20mA DC signal to show valves' real-time opening with two wires.

- Voltage :24±2VDC
- Resistance :≤250Ω
- Output current :4～20mA
- Output liner error:<2.5%

● VPT4：Four-wire system. Input 24VDC with two wires, and feedback 4～20mA DC signal to show valves' real-time opening with the other two wires.

- Voltage :220V AC±10%, 50Hz
- Resistance :≤450Ω
- Output liner error:<2.5%

4.2 Calibrating and adjustment

After calibrating and adjusting zero, calibrate and adjust full scale.

1.Connect wires according to the wiring diagram with the product.

2.Applying power, the indicator lights, and the transmitter is normal.

3.Calibrating and adjusting zero: Place valve in the fully close position, push the "SET" button for 5 second, then the indicator light flashes and repeat flashing. The zero has been calibrated. Now the transmitter is in fine adjustment state, if the zero (4mA) is not accurate, push "SET" button till zero is accurate (one-click "SET" button is"-", double-click is "+")

4.After continuously press button for 5 second, it returns to normal and the light is on. If no pressing the button, it automatically returns to normal.

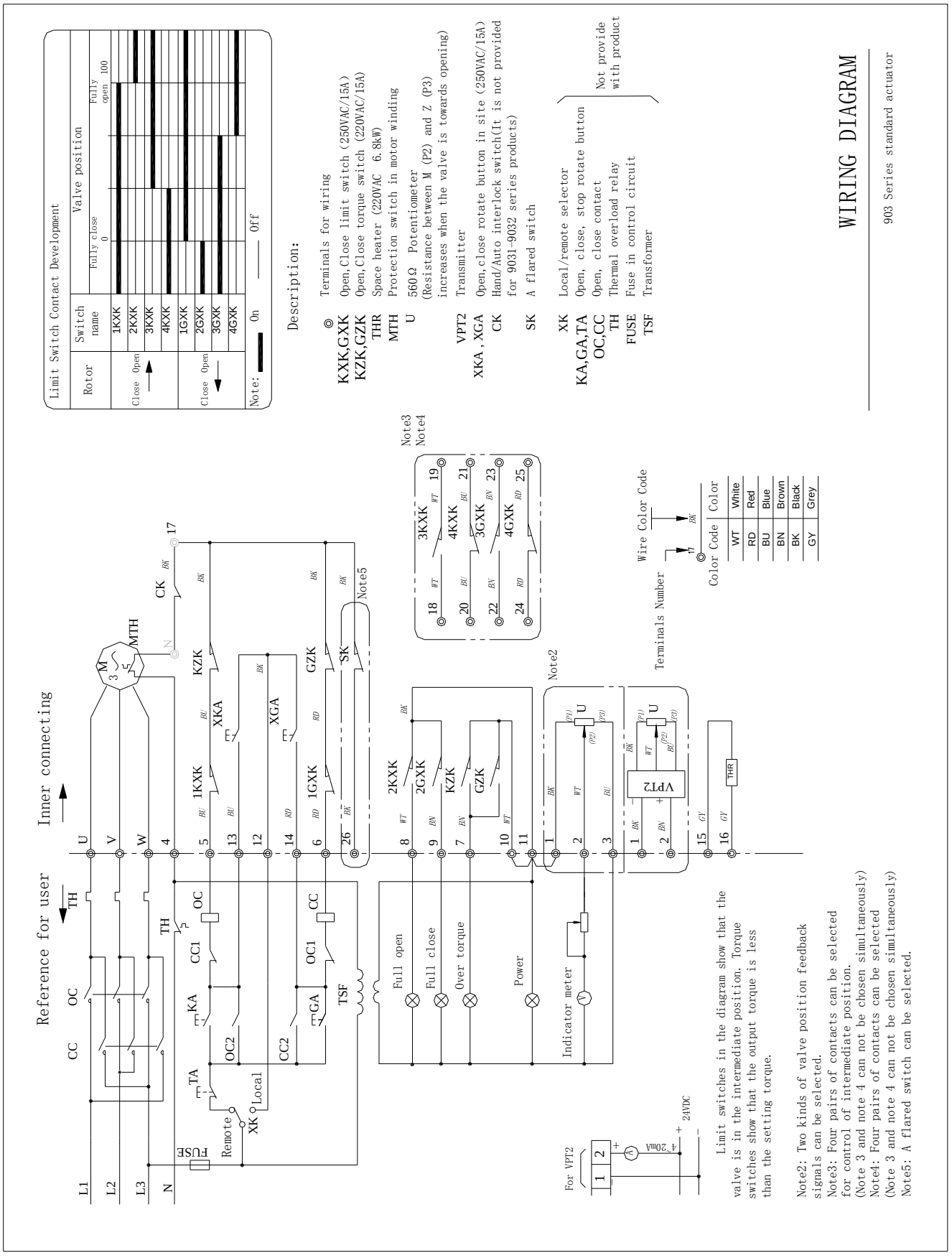
5.Calibrating and adjusting full scale: place valve in the fully open in normal state, repeat 3 to calibrate full scale (20mA).

6.Repeat 4 to return to normal state.

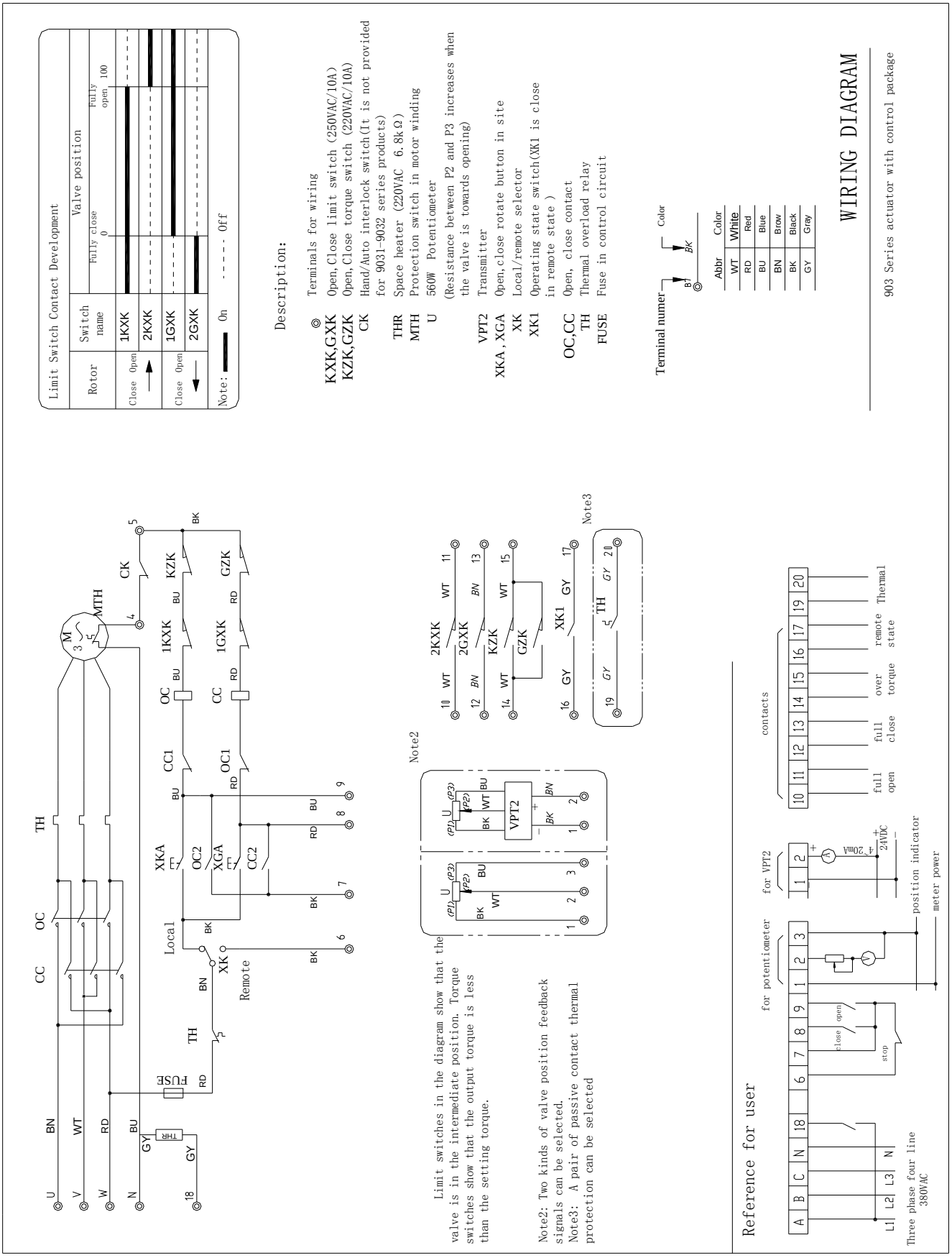
Appendix B：Typical wiring diagram

(Please connect wires by the wiring diagram with the product.)

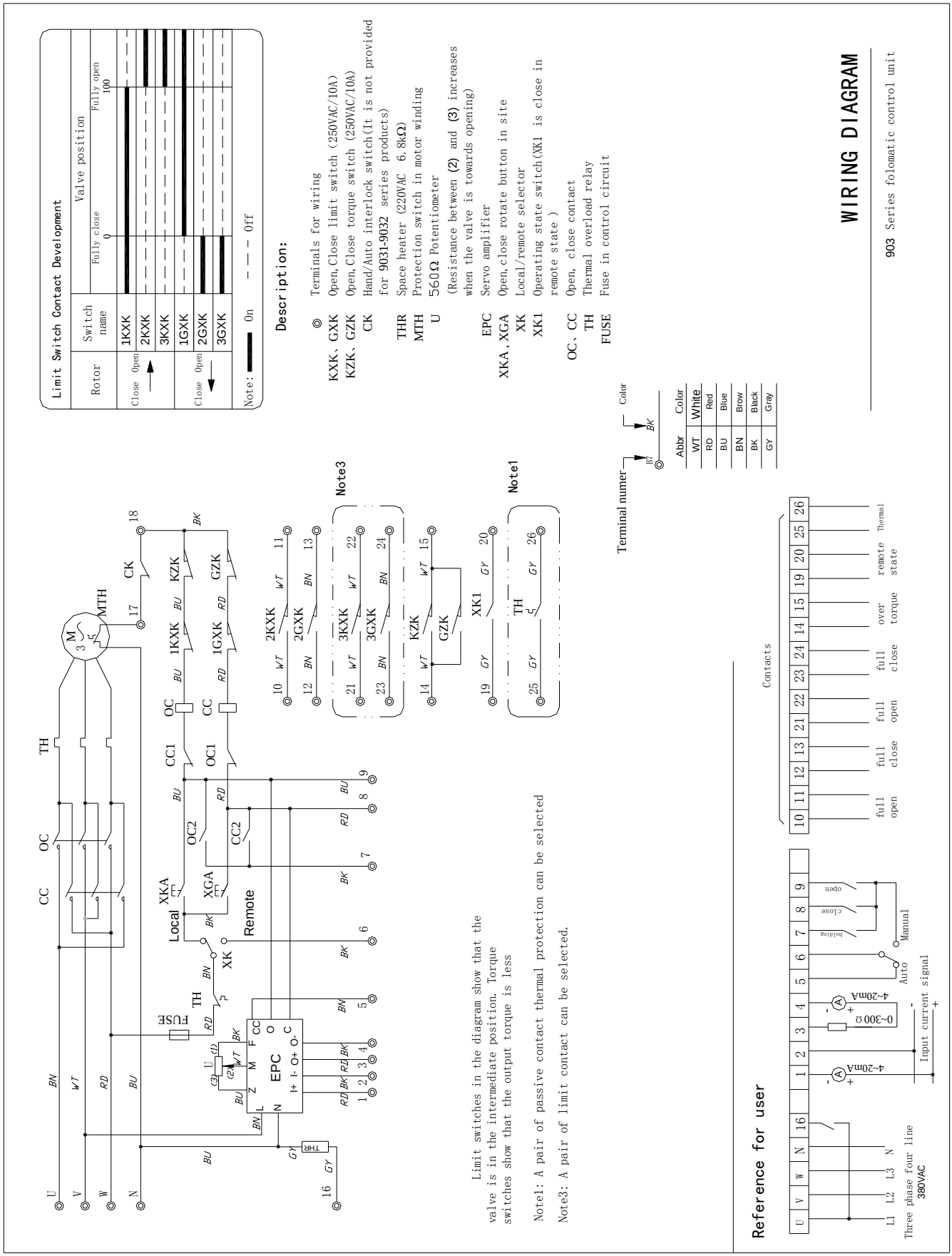
B.1 Wiring diagram for the standard actuator



B.2 Wiring diagram with control package of open/close type



B.3 Wiring diagram for actuator with modulating control unite



Appendix C: Familiar problem and trouble-shooting

Problem	Reason	Trouble-shooting	Remark
Unable to operate by motor or emergency stop	Power problem	Check power supply.	
	Damage of motor	Repair or replace the motor.	
	Torque switch works	Check and ensure the valve is not damaged, and then set to increase the torque value.	
Limit switch fails to stop valve travel	Wire is not connected	Connect the wire.	
	The limit switch is not set correctly	Reset the limit switch.	
	Gears in the counter are not engaged	Restore the sleeve.	
	Damage of some parts	Replace the damaged parts.	
Failure of opening indicator	Damage of potentiometer	Replace the potentiometer.	
	Looseness of the potentiometer gear or the gear in opening shaft	Readjust and tighten the gear screw.	
	The wire is not connected	Connect the wire.	
Failure of hand switch	The tooth of clutch and handwheel are disengaged	Turn the handwheel until the hand switch succeed.	For 9031~9032
	The lock sheet hitches the slot on handwheel shaft.	Loosen the bolt on hand/auto lock sheet and turn the lock sheet to unhitch the slot on handwheel shaft.	For 9033~9036
	The gears in the handwheel shaft and worm shaft are not engaged.	Turn the handwheel to make the gears engage.	

Please do not maintain the actuators by yourselves if you do not know the interior structure exactly and consult us in good time.

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