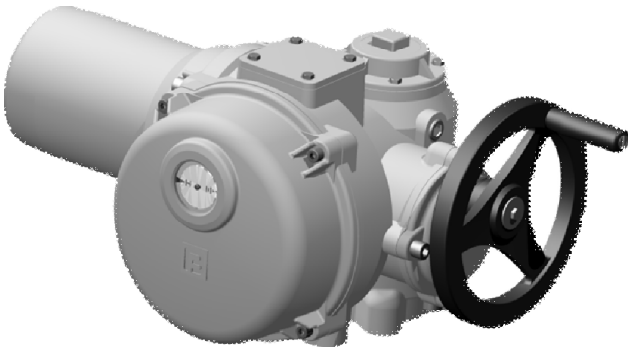
920 SERIES ELECTRIC ACTUATORS FOR MULTI-TURN APPLICATION

INSTRUCTION MANUAL



TIANJIN BEIFANG VALVE ACTUATOR CO.,LTD

BF/TM-920.03-E2016A

Issue 201603

Thank you for purchasing and using our products. This manual is valid for 920 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

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

Model, Factory number, Manufacturing date

1. Summarize

1.1 Brief

- 920 series electric multi-turn actuators powered by electric have limit and torque switch in both end position. In addition they can output torque or thrust.
- According to customer's requirements, 920 series electric actuators can be made the standard type, integral control with open/close, integral control with regulator module.

1.2 Range of application

920 series electric multi-turn actuators provide a reliable position control of gate, stop valve, as well as similar ones, and they can be combined with gearbox. About other applications, please contact us.

For any damage caused by improper use, the manufacture is not responsible for warranty. Such risk shall be borne by user alone. Strictly complying with the instruction manual is part of the operational requirements.

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. Performance parameters

Work type	Standard: S2-15 minutes short time work type. No more than 15 minutes cyclic running time, the startup interval is 2～3 times running time. 60 starts/hour for application, do not exceed 600 starts/hour when adjusting. Options: S4-25% intermittent work type. Used for precise adjusting, do not exceed 1200 starts/hour.
Power	Standard: 380V/50Hz/3ph AC, voltage vibration range:±10%, frequency vibration range:±5%. Options: 220V/50H/1ph AC (Apply to 9201 and 9202).
Protection	A temperature protection switch embedded in the windings of the motor will trip the actuator control circuit if the motor winding overheat.
Insulation grade	Standard: F, heat resistance. Options: H, heat resistance.
Self-locking	Have. The actuator is not self-locking when the output speed is more than 48r/min.
Limit control	Limit range of counter from ”Open” to “Close”. Standard: 1~50 turns. Options：1~490 turns Travel switches are provided for “Open” and “Close” separately. Standard: 1NC and 1NO (Switches on and off can be changed on the worksite). Options: 1NC and 2NO(Switches on and off can be changed on the worksite). 1NC and 3NO (Switches on and off can be changed on the worksite). Add up to four the middle position switches.
Torque control	Torque switches are provided for “Open” and “Close” separately Standard:1NC and 1NO. Options：Add up to two torque switches (On and off can be specified by the user).
position indicator	Continuous display of adjustable dial with “Open” and “Close” mark.
Hand /auto switch	Automatic reset structure for motor mode first. Whenever the motor is energized, the clutch automatically revert to motor mode in order to ensure safe operation The electric actuator can be locked by additional lock.
Conduit entries	Standard: 2-G3/4” Options: 2-NPT1” 2-M33×2 Or according to user need.

Running indicator	Options: Flashing switch for running
Protection provided by enclosure	Standard: IP65 (GB4208-2008) Options: IP67 (GB4208-2008) IP68 (Protection from dust and operating 10 times when submersing in water to a depth of 3m for 48 hours.) Ex-proof type: Exd Ⅱ CT4 Gb（GB3836.1-2010、3836.2-2010）
Coating	Standard: Epoxy and acrylic acid coating. Options：Other coating required by customer。
Coating color	Standard: Gray (RAL7030) Option: Other color required by customer.
Installation height	Standard: Installing the actuator below 2000 meters above seal level. Options: When installing the actuator above 2000 meters above seal level, please contact us.
Temperature	Standard: -25℃ ~ +70℃。 Low temperature type: -40℃ ~ +70℃。 Ultralow temperature type: -60℃ ~ +50℃。 Ex-proof: -20℃ ~ +40℃。
Humidity	Ambient humidity below 90% (25℃).
Lifetime	At least 8000 times.（Cycle of operation: Open—Close—open, each cycle is 20 turns).
Feedback signal	Standard: Self-adjusting potentiometer. Option: Feedback 4~20mA analog position indication signal.

⚠ **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. Identifiers

- “BF” logo is cast in the apparent position of each electric actuator.
- Each electric actuator has a nameplate printed with company name, ”BF” logo, “CE” mark and so on. Content of nameplate includes:
  - •Type code
  - •Main code
  - •Wiring diagram No.
  - •Maximum torque
  - •Output speed
  - •Allowable thrust: Used for stem nut connection
  - •Supply voltage
  - •Rate power of motor
  - •Rate current of motor
  - •Degree of protection provided by enclosure
  - •Manufacturing No.
  - •Manufacturing date
  - •Address

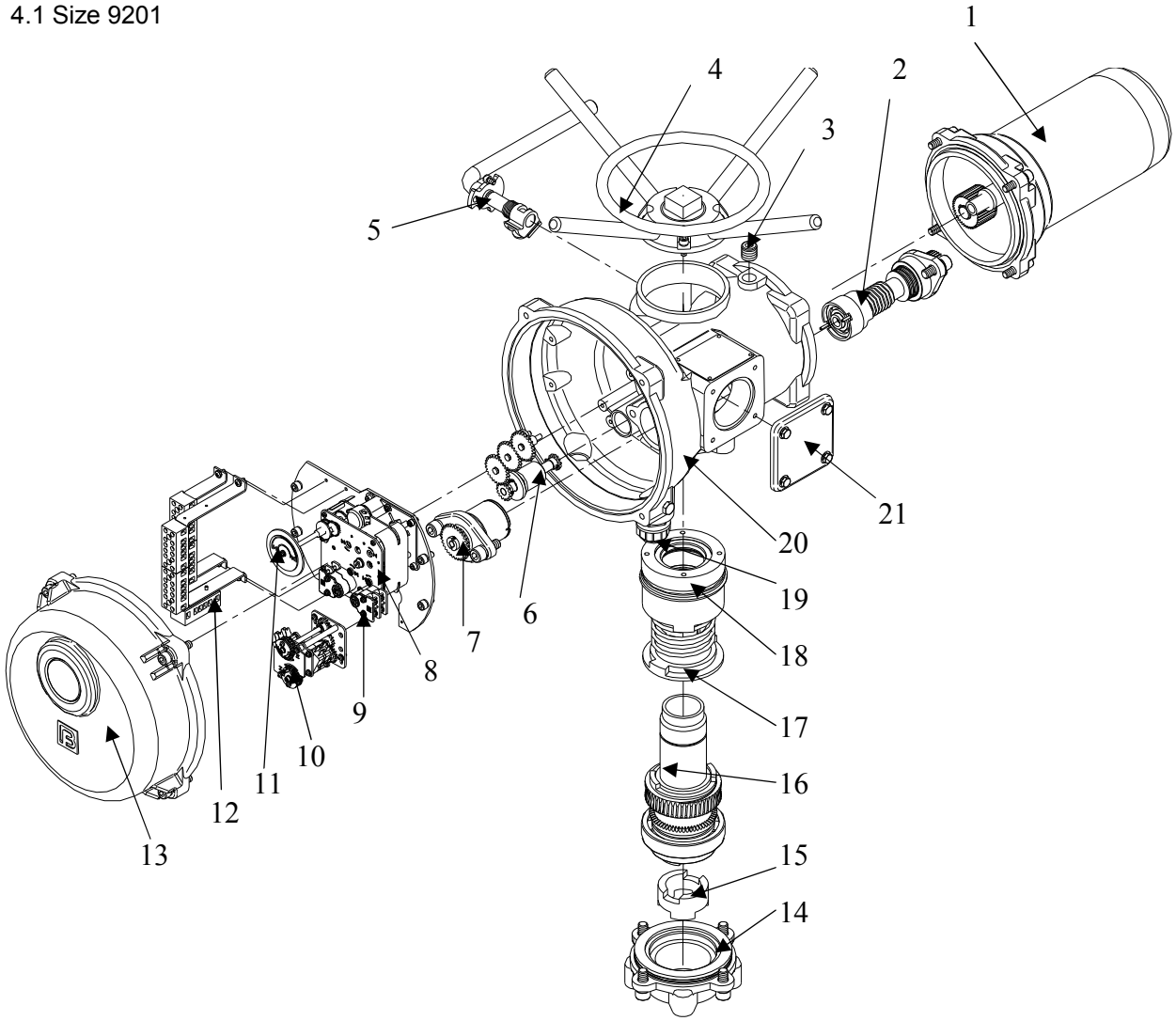
Content nameplate of ex-proof product also includes:

- •Ex-proof degree of protection provide by enclosure
- •Certification No.

Only manufacturing No. in each product is a basis of accurately tracing product. Please keep it well.

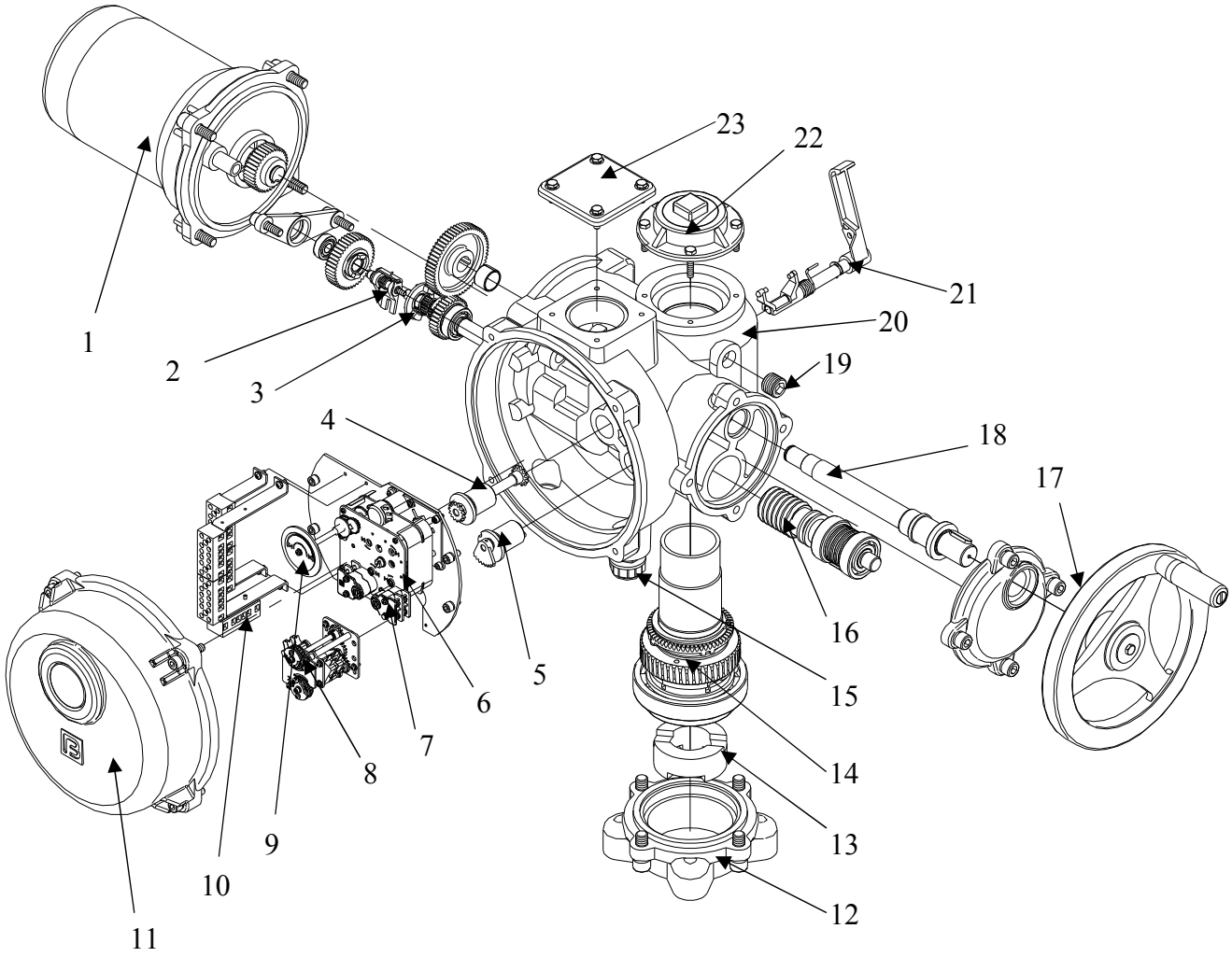
4.Structure

4.1 Size 9201



No.	Name	No.	Name
1	Motor	13	Cover
2	Worm shaft component	14	Output flange
3	Screwed plug for injection grease hole	15	Driven sleeve
4	Handwheel component	16	Driven shaft component
5	Hand /auto lever component	17	Clutch
6	Limit transmission component	18	Body of handwheel
7	Torque transmission component	19	Conduit entries
8	counter	20	Main house
9	Limit switch	21	Wiring-box cover
10	Torque switch		
11	Position indicator		
12	Terminal strips		

4.2 Sizes 9202 ～ 9205



No.	Name	No.	Name
1	Motor	13	Driven sleeve
2	Hand /auto component	14	Driven shaft component
3	Clutch	15	Conduit entries
4	Limit transmission component	16	Worm shaft component
5	Torque transmission component	17	Handwheel component
6	counter	18	Handwheel shaft
7	Limit switch	19	Screwed plug for injection grease hole
8	Torque switch	20	Main house
9	Position indicator	21	Hand /auto lever component
10	Terminal strips	22	Housing cover component
11	Cover	23	Wiring-box cover
12	Output flange		

5. Transport and storage

5.1 Transport

- **It is necessary to use solid package during transportation.**
- **When lifting the electric actuator by hoist, please attach ropes or hook to enclosure. Do not attach ropes or hooks to handwheel, hand/auto lever or wiring-box.**
- **If the electric actuator has been mounted to the gearbox, please attach ropes or hooks to the gearbox rather than to the electric actuator for the purpose of lifting by hoist.**
- **If the electric actuator has been mounted to the valve, please attach ropes or hooks to the valve rather than to the electric actuator for the purpose of lifting by hoist.**
- **Do not stand under the dangling electric actuator.**

5.2 storage

- Units should be stored in the well ventilated, dry, non-corrosive room.
- Units should be placed on bracket or the dry wooden flooring.
- If necessary, units are covered with dust guard.
- Long-term storage (more than 6 months).
- To avoid corrosion, wipe handwheel shaft, driven shaft, driven sleeve and mounting surface with anti-rust oil.
- Check the units for rust every 6 months. If there is any rust, please treat again for rust prevention.

6. Lubrication

- There are O-rings or lip seal between the main house and its contacting portion. The main house is fully filled with 00# lithium grease to lubricate the worm shaft, worm gear, gears, bearings and so on.
- No seal can remain absolutely tight at all time, therefore, it is not unusual to find a very small amount of weeping around shaft sealing-especially during long periods of idleness such as long-term storage. Once the equipment has begun operating, this phenomenon will automatically 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 injecting grease hole.

00# gear lubricating grease used by the standard units

Principal component	Lithium soap thickened mineral oil
Temperature range	-25 ~ +120℃

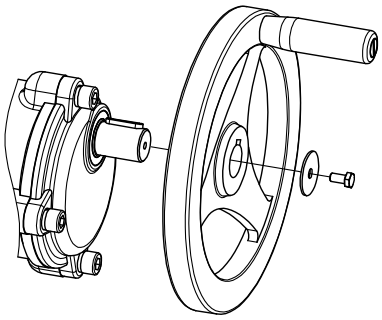
7. Installation

⚠ • **Warning: If electric actuators are installed in the hazardous gas area, must check whether the ex-proof degree on the nameplate is appropriate.**

• In the hazardous area, it is prohibited that conductive body and thermal conductor contact with the electric actuator. Except special allowable work, the units must be cut off power, remove from the hazardous area for repair or maintenance.

7.1 Installing handwheel

For easier transport, the handwheels of sizes 9202~9205 are placed separately, so please mount the handwheel on the manual shaft, before doing manual operation.



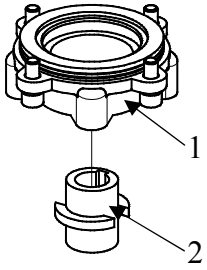
• Handwheel of size 9201 is directly mounted on the product.

• Design of 920 series ensure man power can drive manual operation, no need to use the force rod.

7.2 Installation to valves or gearboxes

7.2.1 Plug sleeve connection

• Apply for the valve stems which can rotate and not lift: Driven sleeve has two types of structure-one with hole and keyway and one with jaw.



Driven sleeve with hole and keyway

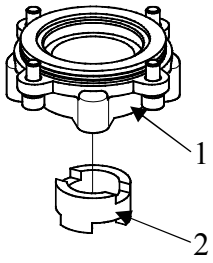
1.Check whether each mating surface of joint flange fits the valve's.

2.Check whether dimensions of input shaft and key or jaw in the valve or gearbox fit the electric actuator's.

3.Clean up grease on the mating surface of joint flange.

4.When connecting with shaft and key, a little of greases is smeared on the shaft

5.When installing the electric actuator, tighten the screws after ensuring mating of the joint flange and shaft or jaw is good.



Driven sleeve with jaw

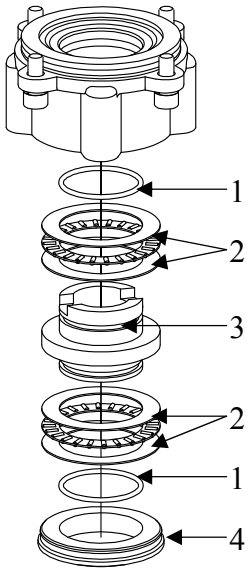
• Without removing joint flange #1, drive sleeve #2 can be directly removed. Therefore install the drive sleeve to the shaft or jaw of the valve ,and then connect the electric actuator with the flange of the valve.

• When the valve stem is shaft with key, the valve stem must have a step for prevent drive sleeve from moving.

• After installation is complete, check and repair the damage coating .

☞ Material performance level of the parts which connect the electric actuator with the valve or gear is 8.8 class. Yield strength is 628N/mm² .

7.2.2 Stem nut connection



• Apply for the valve stem which can lift and not rotate: 920 series apply independent thrust plate component to bear thrust. The stem nut is supplied with a pilot hole or blind hole. Before installing the actuator to the valve, users need to machine the stem nut according to the dimension of the valve stem.

Machining the stem nut:

1.Put down the electric actuator, and then loosen the screw fixed seam allowance #4.

2.In turn take out seam allowance with O-rings and stem nut with bearings from the thrust plate component.

3.Take out O-rings #1 and thrust bearings #2 in sequence from the stem nut. Notice: Do not damage to O-ring.

4.Machine the stem nut to make sure the thread must match the thread of the valve tem；

5.Clean up foreign matter on the stem nut, assemble thrust bearings with some lithium grease, and then assemble the O-rings.

6.Re-insert the assembled stem nut and seam allowance into the actuator, and then screw.

Connecting to the valve：

1.Check whether the flange of the actuator fit one of the valve.

2.Clean up the grease on the mounting surface of joint flange.

3.Smear some grease on the thread of the stem nut or the valve stem.

4.Install the actuator to the valve stem, engage manual operation, and turn handwheel to make the stem nut mesh with the valve stem.

5.Continue to turn handwheel until the flange of the actuator touch the flang of the valve, turn the hanwheel two laps again to make the flanges fit closely, and then screw the bolts to fix the actuator and the valve.

• When disassembling and assembling, do not damage the O-rings.

• The flange of the valve can bear enough thrust.

• After installation is complete, check and repair the damage coating.

☞ Material performance level of the parts which connect the electric actuator with the valve or gear is 8.8 class. Yield strength is 628N/mm².

8. Electrical connection

If you do not obey the warning ,will cause serious injury or property damage.

- Electrical connection must be done by the qualified personal。
- Before wiring, please comply with the relevant provisions of the clause 。
- There are the wiring diagram and <920 series electric actuators for multi-turn application instruction manual> in the sealed plastic bag with the unit. You can also directly ask for them fromTianjin Beifang Valve Actuator Co., Ltd by offering Manufacturing No in the nameplate, or you can get them from www.tj-beifang.com。

8.1 Before wiring

Check whether current type, voltage and frequency of the power fit the motor parameters in the nameplate.

8.2 Wring

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

Electrical component in the unite with high voltage, 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 the cover, keep the compartment of the main house 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 according to the wiring diagram

4.Conduit entries in the main house provide two openings for routing the pilot cable and the dynamic cable. Seal the opening after wiring.

5.Manual operate the unit to keep the valve in the intermediate position, turn power on and check the rotating direction of the valve, then cut off power supply. If the direction is wrong, interchange any two leads of the three phase.

- If the cable joint is not used, remove it, and block the conduit entry with the plug. The openings are 2-G3/4″ for the standard products
- To ensure IP on the nameplate, the cable joints must be compatible with the cable.

- Check whether the PE wire of the cable is connected with the ⏚ . If do not connect the PE wire, electrocution can occur.

9.Manual operation

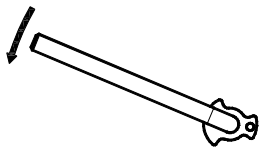
- When adjusting the product or trail run of the product, the manual operation can be used.
- If the motor or power is failure, the manual operation is used.

Carry out manual operation:

1.After the motor operation, the handwheel is separated from the output component automatically. If need the handwheel to operate, please move the hand/auto lever to the direction of arrow on the lever and gently turn the handle until the handwheel and the clutch are in full engagement.

2.After loosening the hand/auto lever, the manual operation is engaged.

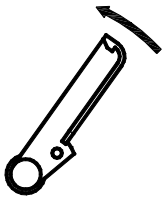
3.Turn the handwheel according to need. If close the valve, turn the handwheel clockwise, and the output shaft will be turn clockwise to close the valve.



The hand/auto lever for size 9201

The hand/auto lever can be locked in the motor mode by a padlock to prevent the local manual operation. Our company does not supply the padlock.

- During the motor operation, pull and hold the hand/auto lever to make the electric drive disengage imminently.
- No need to use the force rod for manual operation.



The hand/auto lever for sizes 9202~9205

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

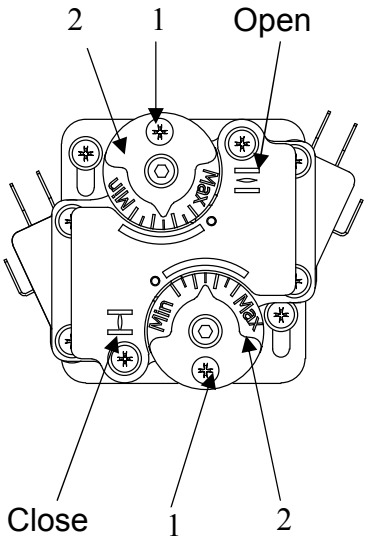
Stop manual operation：

When opening or closing the valve, the motor operation will be engaged automatically, and the manual operation will stop.

During the period of the motor operation, the handwheel will not rotate.

☞ **Do not move the hand/auto lever forcibly after finishing the manual operation. Energization of the motor will make the clutch automatically out of jointing with handwheel, and re-engage power operation.**

10.Setting the torque switch



The torque switch is respectively designed to protect the actuator and the valve in the direction of “open” and “close”. **The switch was set at the factory. The setting torque is equal to “Rate output torque” in the nameplate. It is not need to reset generally.**

When need to adjust the torque switch, set the torque of “open” and “close” respectively as follow after the manufacturer agree.

1.Clear the adjustment direction of the torque: White mark is “Open”, and black mark is “Close”.

2.Loosen lock screw #1 on the torque dial #2 to adjust torque.

3.Turn the torque dial #2 to the required output torque. When turning the indicator to “Min”, reduce the torque value. When turning the indicator to “Max”, increase the torque value.

4.Tighten lock screw #1 on the torque dial #2.

5.Applying power, motor operate the valve to check whether the torque is meet the requirement when the torque switch automatically cut off the power. If not, repeat the above process to reset.

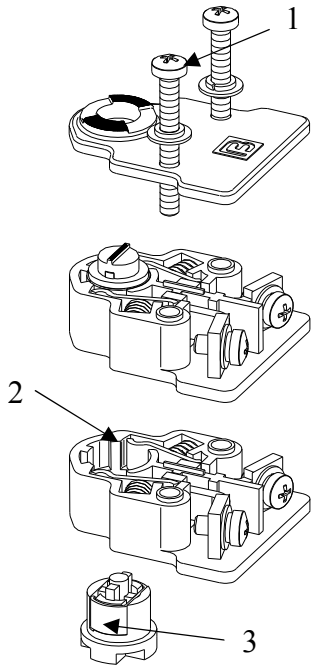
⚠ **When adjusting the torque, must cut off the power.**

11.Setting the limit control mechanism

When the actuator first installed or re-installed, must adjust the limit control mechanism to make the responding contacts can be accurately operated once the valve reaches the required position.

For 920 series products, the limit control mechanism includes limit switches used for disconnecting the power and a counter used for memorizing the turns of the driven shaft.

11.1 Setting the limit switch



- According to requirement, the limit switches of 920 series product can be provide in up to four control positions, respectively “Full open”, “Full close” and the middle position of “Open” and “Close” . Up to four contacts are provided in each control position. The upside contacts on “Full open” and “Full close” are used for cutting off the power to motor when the valve reaches to the full open position or the full close position, and the others are auxiliary contacts.
- Each switch is independent contact, and the contact can be wilfully change to open or close. Adjusting method as follow:

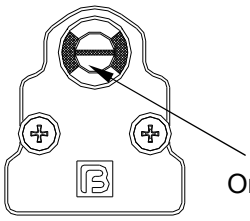
1.Loosen the screws #1 fastening switches.

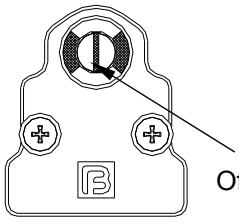
2.Take out conductive seat #3 from switch seat #2.

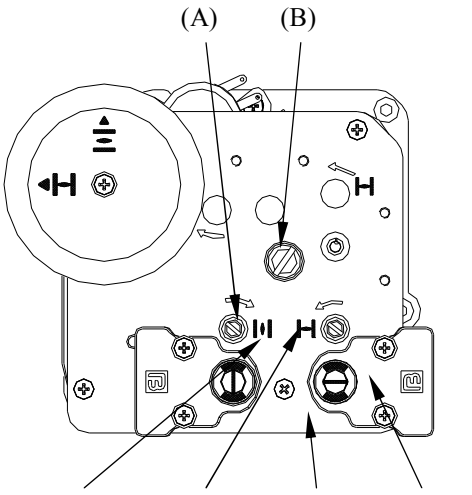
3.Rotate the conductive seat for 90° , and re-insert the switch seat.

4.Tighten the screw #1.

11.2 Setting counter







When the actuator first installed or re-installed, must adjust the counter to make the responding contacts can be accurately operated once the valve reaches the position required by user.

By observing the location of white mark on the switch, judge the top switch contacts is the state of on or off. As shown in the left image, the switch is on when the white marks are connected together, and the switch is off when the white marks are disconnected.

Adjustment process of the counter as follows:

1.Disconnect all incoming power to the unit prior to opening the cover。

2.Making the actuator in the state of manual operation, manual operates the valve to the full open position, then turn the handwheel back for one turn to leave a short buffer for the operation of driven shaft.

3.Push the sleeve (B), clockwise turn it, lock it in the depressed position, and then loosen it.

4.If the upside contact is off state, turn adjusting pole (A) to opposite direction of the arrow till the contact on the opening valve position is on state. Then turn adjusting pole to the same direction of the arrow till once the contact on the opening valve position just disconnect. The adjustment finishes. (When clockwise rotating to open valve, turn adjusting pole to opposite the direction described above, the same as below.)

5.If the upside contact is off state, turn adjusting pole to the same direction of the arrow till once the contact on the opening valve position just disconnect. The adjustment is finished。

6.After adjustment of full open position finishes, counter-clockwise turn the sleeve (B), and it will come to initial position by spring action. The counter is well engaged if the adjusting pole mildly rotated could not be turned, so can do the following adjustment.

7.Refer to process 3~6 to adjust other positions.

- **Limit control mechanism is not factory set. It must be set when the unit installs on the valve.**
- **After replacing the valve or reinstalling the unit, reset the limit control mechanism prior to motor operation.**
- **Do not motor operate the valve without first setting the limit control mechanism.**
- **The adjustment force will increase when the contact changes from on state (or off state) to off sate (or on state), which is normal during adjusting.**
- **When the counter setting is finished, the user should motor operate the unite to ensure the limit control meet the requirement, or reset the counter.**

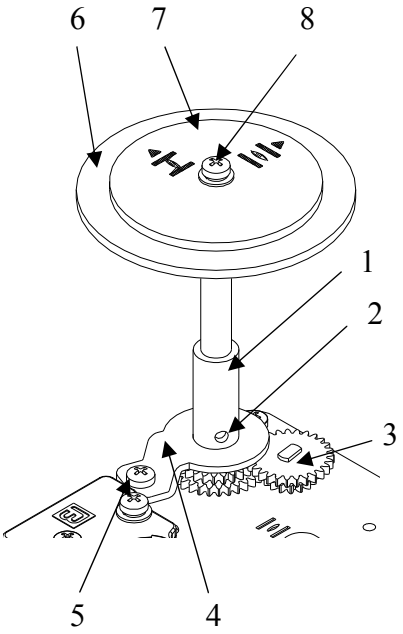
- **Must cut off all incoming power to the unit prior to opening or closing the cover.**
- **Check to ensure the valve is in full open position before removing the unit from the valve.**
- **When finishing adjusting, the sleeve (B) must come to the initial position. If not, the adjustment will be damaged by any manual or motor operation.**

12.Setting the position indicator

920 series electric actuator provide mechanical valve position indicator, and a potentiometer is supplied for remote indication.

The consumer may use a voltmeter 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.



Adjustment process of mechanical valve position indicator as follows:

- Determine the turns of driven shaft, and then select and change the potentiometer gear #3.
- The way of changing the potentiometer gear #3 is shown below.

1.Referring to the table below, select the potentiometer gear with corresponding mark according to the turns of driven shaft.

2.If the potentiometer gear matching the turns of driven shaft is default, the following steps can be omitted .

3.If the potentiometer gear matching the turns of driven shaft is one marking 2 or 3, pick out the potentiometer gear marking 2 or 3 with the unit.

4.Loosen the screw #5 (no need to screw out completely), loose the platen #4, replace the potentiometer gear required, and confirm the gears meshing completely.

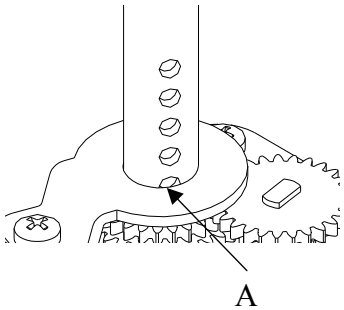
5.Adjust well the position of platen, and tighten the screw #5

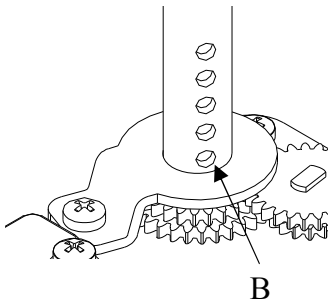
- Adjusting the sleeve #1.

1.Move the sleeve #1 hard up and down to make the number of hole #2 completely exposed correspond with the turns of driven shaft, referring to the table below, and the bottom hole only can be exposed half of hole (refer to the position of A in the left image). Turn the sleeve #1 to conform it rotates freely.

2.Operating the electric actuator to the full close position, clockwise turn the sleeve #1 until it does not rotate, and then measure the resistance between terminal 2 and terminal in the wiring diagram. The resistance valve should be between0~10Ω.

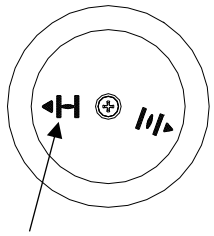
3.Gently move the sleeve up to make the bottom half hole exposed fully (refer to the position of B in the left image), and then turn the sleeve to confirm it does not rotate. The adjustment is finished.



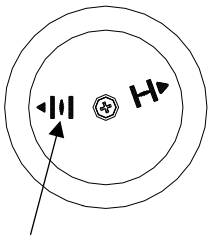


When the sleeve can not be moved up and down, operate the actuator to close or open for a short trip, and then try to move the sleeve up and down. If not, operate the actuator in reverse for a smaller trip than last operation.

Turns of driven shaft		Number of the hole completely exposed on the sleeve				
		0	1	2	3	4
Potentiometer gear	Default	1~1.2	2.7~4.3	10~16	36.5~59	134.5~217
	Mark 2	1.2~1.8	4.3~6.6	16~24.5	59~90	217~331
	Mark 3	1.8~2.7	6.6~10	24.5~36.5	90~134.5	331~490



Full close position of the valve

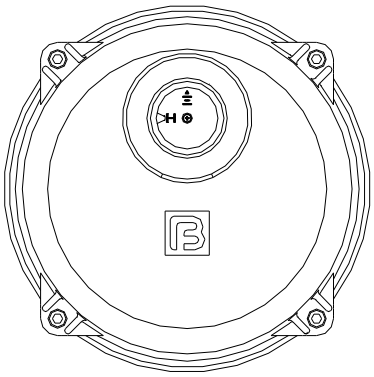


Full open position of the valve

- Adjusting the dials #6 and #7:
  1.Motor operates the valve to the full close position, and loosen screw #8.
  2.Adjust the dial #6 to the full close position of the valve as shown in the figure, and tighten the screw #8.
  3. Motor operates the valve to the full open position, hold on dial #6, and then loosen screw #8.
  4.Keep dial #6 fixed, rotate dial #7 to the full open position of the valve as shown in the figure, and tighten screw #8.

Operating the valve to close, the dials rotate clockwise. Operating the valve to open, the dials rotate counterclockwise.

13.Installing the cover



- Clean the sealing surface of cover and main house.
- Smear a thin layer of acidic grease evenly on the sealing surface.
- Check whether O-ring is intact.
- Mount the cover。
- Engage the motor operation, check whether the indicator aims at the mark on the dials indicating position. If not, removing the cover, re-adjust the dials indicating position.
- Symmetrically tighten the fastening screws.

After installation is completed, check the surface paint of the electric actuator, and repair the damage coating to prevent corrosion.