

**CONSIDER PEOPLE AS A BOAT  
CONSIDER SERIOUSNESS AS HER HELM  
CONSIDER WISDOM AS HER SAIL**



**Zhejiang Theoborn Auto-control Valves Co.,Ltd**

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Note: The company reserves the right to modify the technical parameters  
of the product without prior notice



# THEOBORN AUTO-CONTROL

BN Series Electric Actuator



Zhejiang Theoborn Auto-control Valves Co.,Ltd

[www.theoborn.com](http://www.theoborn.com)



## COMPANY PROFILE

Zhejiang Theoborn Auto-Control Valves Co., Ltd. is dedicated to manufacture pneumatic actuators, electric actuators. Our products fundamentally transform the complex traditional usage of valves, incorporating high technology with the control process of valves, greatly improving the efficient usage of valves, largely diminishing the controlling cost, and obtaining considerable profits for enterprises.

THEOBORN company is located in Wenzhou City which possesses a long history of manufacturing valves and pumps. Inspired by our experience of manufacturing valves and pumps, supported by exquisite manufacturing technique, and enveloped with the special innovative consciousness and serious spirit. Theoborn endeavors to culminate the wisdom, aspires to make the best products, and desires to benefit human beings.

Theoborn people believe that we should consider people as a boat, consider wisdom as her helm and consider seriousness as her sail. Theoborn believes that professional technology, along with the sincere service, will obtain customers' hearts, win customers' credits, and move customers.



# BN

## Electric Actuator



Power & Energy

- Electricity/Transportation
- Petroleum/Chemical
- New energy



Industry & Machinery

- Mining/Building Materials
- Water/Purification
- Artificial intelligence



Buildings & homes

- Office building
- Public environment
- Infrastructure



 博恩  
THEOBORN

### BN electric actuator instructions

Please read the instructions before using. Before installation and usage, pls confirm as bellow:

a. Packing and documents;

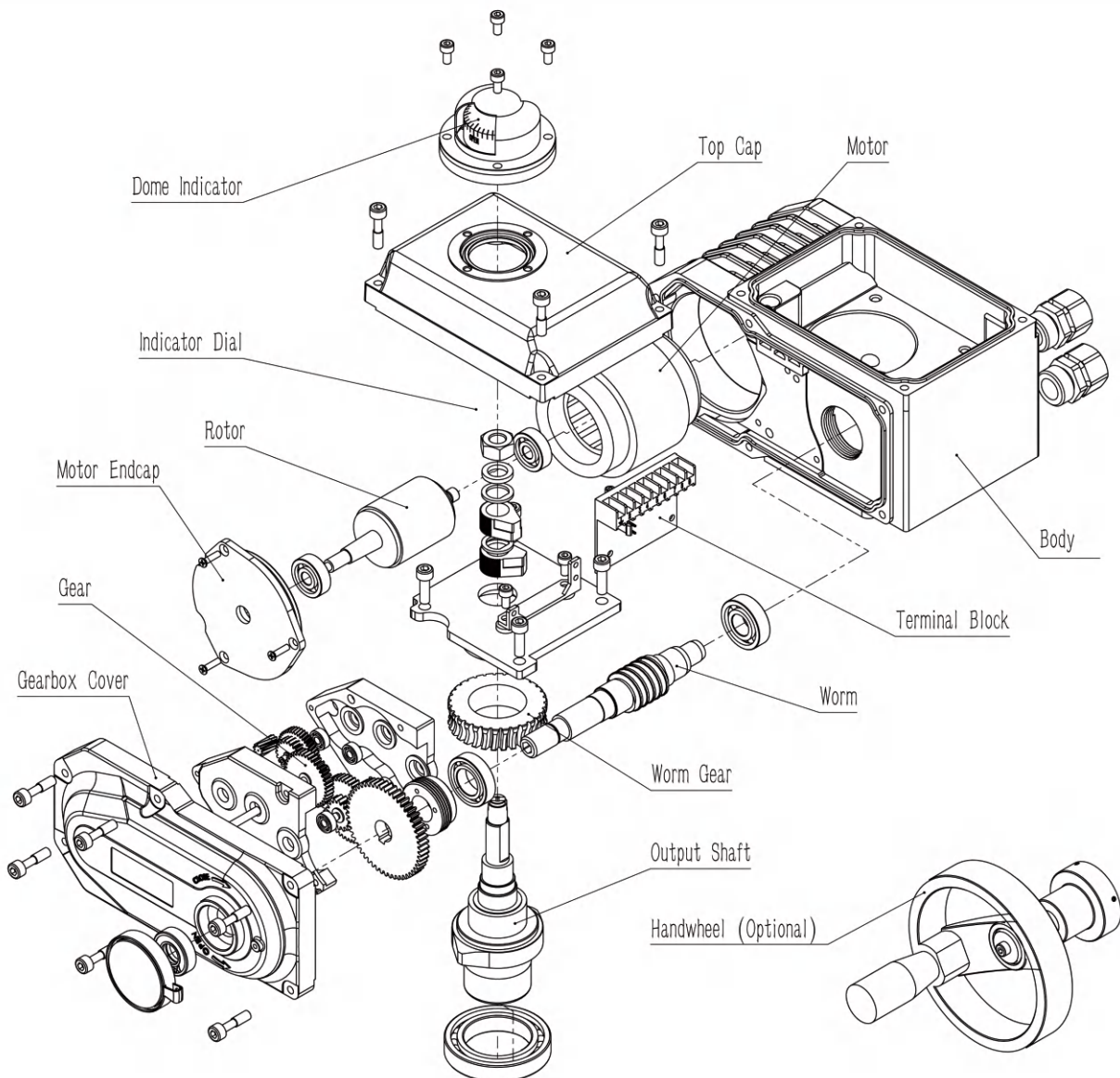
①product list ②test report ③wiring diagram;

b. Inspection report; Nameplate; Electrical wiring diagram is consistent with purchasing order;

c. Before the end of setting Limit switch. Do not make the actuator be in full-open or full-closed;

d. After Completing of electrical wiring, to deal with cable interface in seal method.

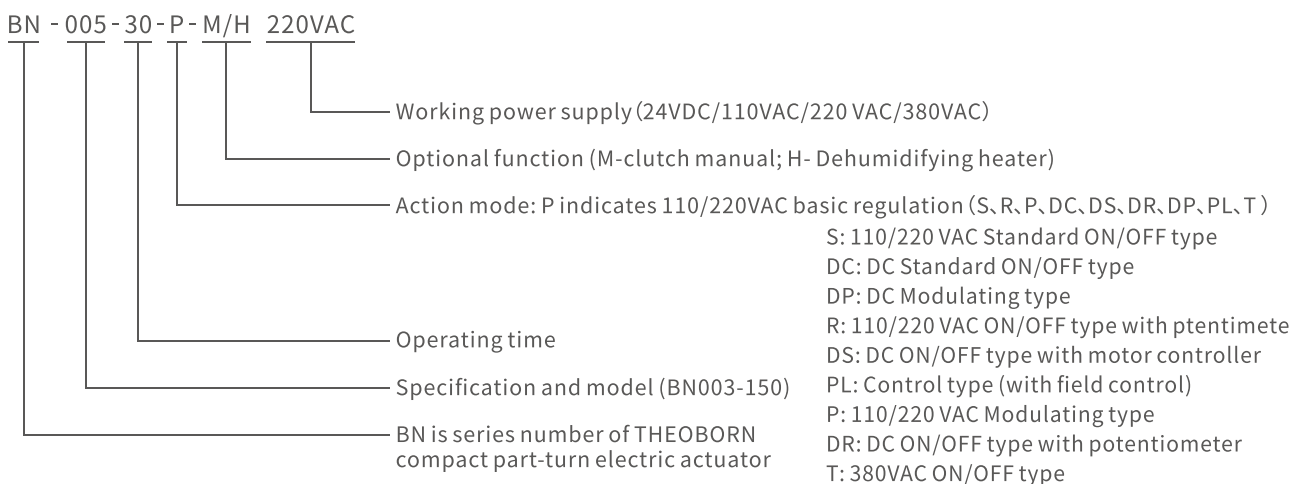
### The name of the product structure and some parts



## Product overview

BN series electric actuator is used to control 0-270° rotary valve, such as butterfly valve, ball valve, throttle, baffle valves, plug valves, etc. Widely used in petroleum, chemical industry, water treatment, ship, paper, power stations, heating supply, building automation, light industry etc. 380V/220V/110V AC power supply for driving power supply, 4-20 mA current signal, or 0-10 VDC voltage signal to be control signal, can make the valve movement to the required position, realize automation control. Maximum output torque is 1500 N.m

## Model designation



## Construction features

- **Housing**  
Aluminum alloy housing, polyester powder coated, strong corrosion resistance, protection class is IP66.
- **Motor**  
Squirrel-cage motor, small size, large torque, low inertia, insulation class is F, built-in overheat protection switch, can prevent the motor from overheating.
- **Manual operation**  
Safe and reliable handle design is very easy for manual operation. But make sure the power is "OFF" before manual operation. When the handle is free, put it in the socket beside the body for keeping.
- **Dome indicator**  
The sight mirror indicates clearly, and the observation is more intuitive and convenient.
- **Dryer**  
Dryer is used to control the temperature and avoid actuator internal moisture condensation caused by temperature or weather changes . To keep the electric elements dry.
- **Seal**  
Good seals. Standard product protection grade is IP66, and optional IP67 .
- **Limit switch**  
Mechanical and electronic double position limit. Mechanical limit screw is adjustable, safe and reliable; Electronic limit switch controlled by cam mechanism, easy adjusting the cam can set position accurately and conveniently, and is not affected by excess hand operation.
- **Self-locking**  
The high precision worm and gear mechanism has high effectively transfer and output large torque. And it's self-locking function, prevent reverse. transmission part is stable and reliable, no need more grease.
- **Anti-off bolt**  
When remove the cover, the bolt attached to the shell, will not fall off.
- **Installation**  
The bottom connection is according to ISO 5211/DIN 3337. Can be installed in both vertical and horizontal installation.
- **Circuit**  
Control circuit conforms to single or three-phase power supply standard, circuit layout is reasonable, compact terminals can effectively satisfy a variety of additional functional requirements.

### Circuit diagram

S

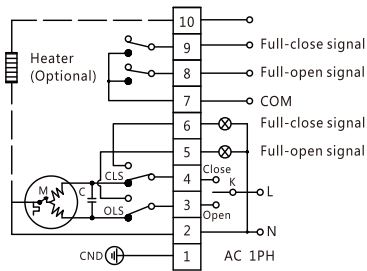


Fig 1 110/220 VAC  
Standard ON/OFF type

R

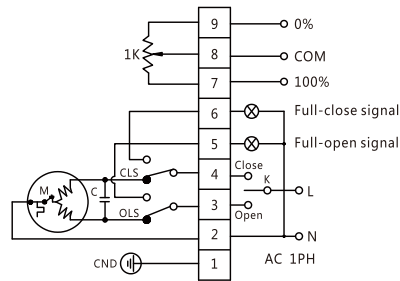


Fig 2 110/220 VAC  
ON/OFF type with potentiometer

P

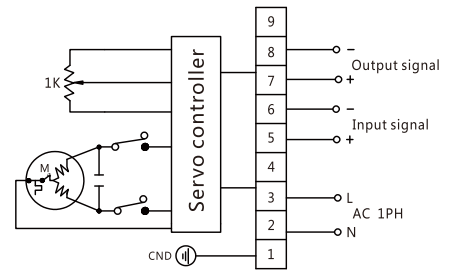


Fig 3 110/220 VAC  
Modulating type

DC

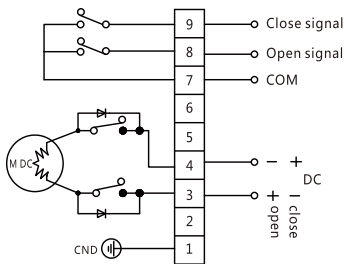


Fig 4  
DC Standard ON/OFF type

DS

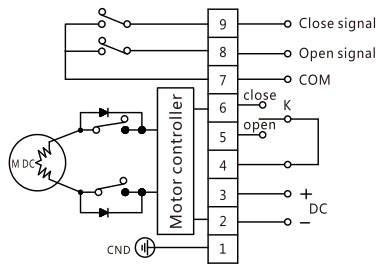


Fig 5  
DC ON/OFF type with motor controller

DR

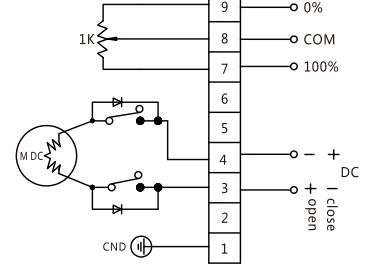


Fig 6  
DC ON/OFF type with potentiometer

DP

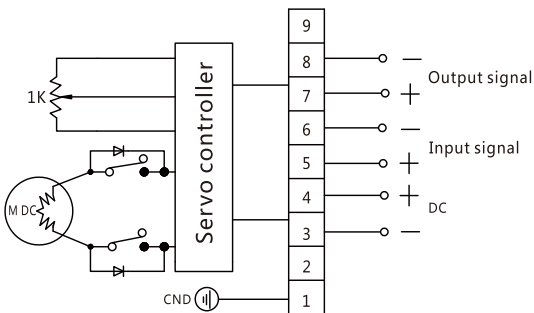


Fig 7  
DC Modulating type

T

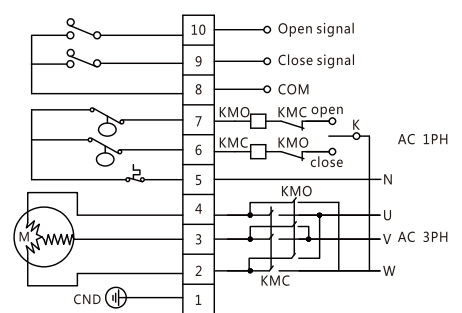


Fig 8  
380VAC ON/OFF type

Note: The circuit diagram of the control type (with field control) is referred to the module manual.

## BN003 Overall dimensions and performance parameters

|                       |                                                                         |                    |
|-----------------------|-------------------------------------------------------------------------|--------------------|
| Model                 | BN003                                                                   |                    |
| Power supply          | DC24V                                                                   | AC220V             |
| Motor power           | 15W                                                                     | 18W                |
| Rated current         | 2A                                                                      | 0.3A               |
| Output torque         | 10S/30Nm                                                                | 20S/30Nm           |
| Action type           | S R P DC DS DR DP                                                       |                    |
| Rotary Angle          | 0-90° for option                                                        |                    |
| Withstand voltage     | DC24V 500VDC 60S                                                        | AC220V 1500VAC 60S |
| Insulation resistance | 100MΩ/300VDC                                                            | 100MΩ/500VDC       |
| Protection class      | IP66                                                                    |                    |
| Couduit entry         | 2xM16x1.5 waterproof cable gland                                        |                    |
| Protective device     | (automatic recover type) thermal protector                              |                    |
| Limit switch          | Electric work: close/open limit switch<br>Manual work: mechanical limit |                    |
| Installation location | At any angle                                                            |                    |
| Working temperature   | -20°C-60°C                                                              |                    |
| Material of body      | Aluminium alloy                                                         |                    |
| Optional function     | Clutch hand wheel                                                       |                    |

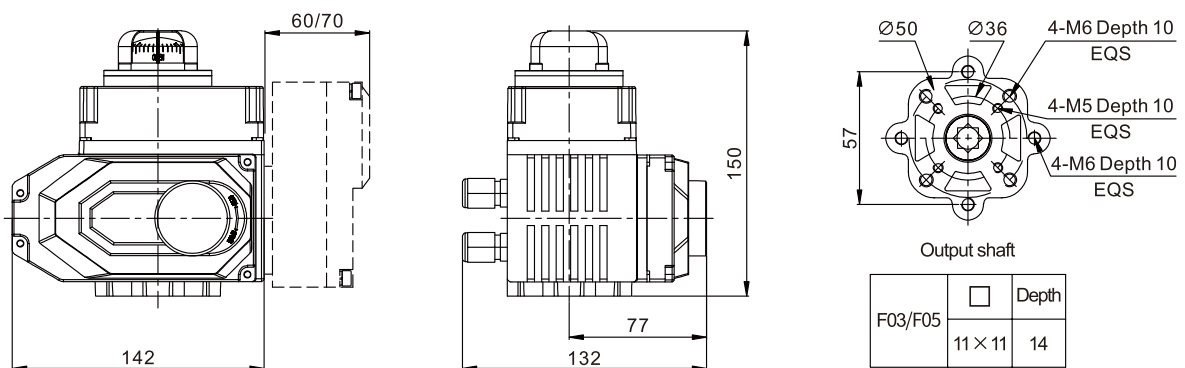


Fig 9

### BN005 Overall dimensions and performance parameters

|                          |                                                                        |                                     |        |        |        |
|--------------------------|------------------------------------------------------------------------|-------------------------------------|--------|--------|--------|
| Model                    | BN005                                                                  |                                     |        |        |        |
| Power supply             | DC24V                                                                  | AC24V                               | AC110V | AC220V | AC380V |
| Motor power              | 20W                                                                    | 15W                                 |        |        |        |
| Rated current            | 1.8A                                                                   | 2A                                  | 0.5A   | 0.3A   | 0.1A   |
| Standard time/<br>torque | 20S/50Nm                                                               | 30S/50Nm                            |        |        |        |
| Optional time/<br>torque | 25S/80Nm                                                               | 30S/50Nm 15S/30Nm 30S/30Nm 30S/80Nm |        |        |        |
| Action type              | S R P DC DS DR DP PL T                                                 |                                     |        |        |        |
| Rotary Angle             | 0-90° for option                                                       |                                     |        |        |        |
| Withstand voltage        | DC24V/AC24V 500VDC 60S AC110V/AC220V/AC380V 1500VAC 60S                |                                     |        |        |        |
| Insulation resistance    | DC24V/AC24V 100MQ/250VDC AC110V/AC220V/AC380V 100MQ/500VAC             |                                     |        |        |        |
| Protection class         | IP66                                                                   |                                     |        |        |        |
| Couduit entry            | 2xM18x1.5 waterproof cable gland                                       |                                     |        |        |        |
| Protective device        | (automatic recover type) thermal protector                             |                                     |        |        |        |
| Limit switch             | Electric work:close/open limit switch<br>Manual work: mechanical limit |                                     |        |        |        |
| Installation location    | At any angle                                                           |                                     |        |        |        |
| Working temperature      | -20°C- 60°C                                                            |                                     |        |        |        |
| Material of body         | Aluminium alloy                                                        |                                     |        |        |        |
| Optional function        | Dehumidifying heater, clutch hand wheel                                |                                     |        |        |        |
| Alternative model        | BN008                                                                  |                                     |        |        |        |

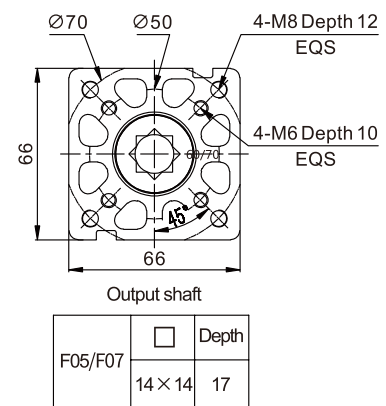
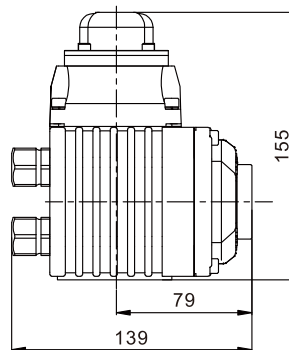
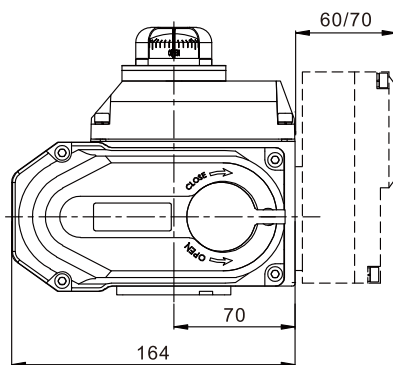


Fig 10

## BN010 Overall dimensions and performance parameters

|                          |                                                                        |           |        |        |        |
|--------------------------|------------------------------------------------------------------------|-----------|--------|--------|--------|
| Model                    | BN010                                                                  |           |        |        |        |
| Power supply             | DC24V                                                                  | AC24V     | AC110V | AC220V | AC380V |
| Motor power              | 25W                                                                    | 25W       |        |        |        |
| Rated current            | 2A                                                                     | 2.2A      | 0.6A   | 0.3A   | 0.2A   |
| Standard time/<br>torque | 20S/100Nm                                                              | 30S/100Nm |        |        |        |
| Optional time/<br>torque | 15S/100Nm 30S/150Nm                                                    |           |        |        |        |
| Action type              | S R P DC DS DR DP PL T                                                 |           |        |        |        |
| Rotary Angle             | 0-90° for option                                                       |           |        |        |        |
| Withstand voltage        | DC24V/AC24V 500VDC 60S AC110V/AC220V/AC380V 1500VAC 60S                |           |        |        |        |
| Insulation<br>resistance | DC24V/AC24V 100MΩ/250VDC AC110V/AC220V/AC380V 100MΩ/500VAC             |           |        |        |        |
| Protection class         | IP66                                                                   |           |        |        |        |
| Counduit entry           | 2xM18x1.5 waterproof cable gland                                       |           |        |        |        |
| Protective device        | (automatic recover type) thermal protector                             |           |        |        |        |
| Limit switch             | Electric work:close/open limit switch<br>Manual work: mechanical limit |           |        |        |        |
| Installation<br>location | At any angle                                                           |           |        |        |        |
| Working<br>temperature   | -20°C- 60°C                                                            |           |        |        |        |
| Material of body         | Aluminium alloy                                                        |           |        |        |        |
| Optional function        | Dehumidifying heater, clutch hand wheel                                |           |        |        |        |
| Alternative model        | BN015                                                                  |           |        |        |        |

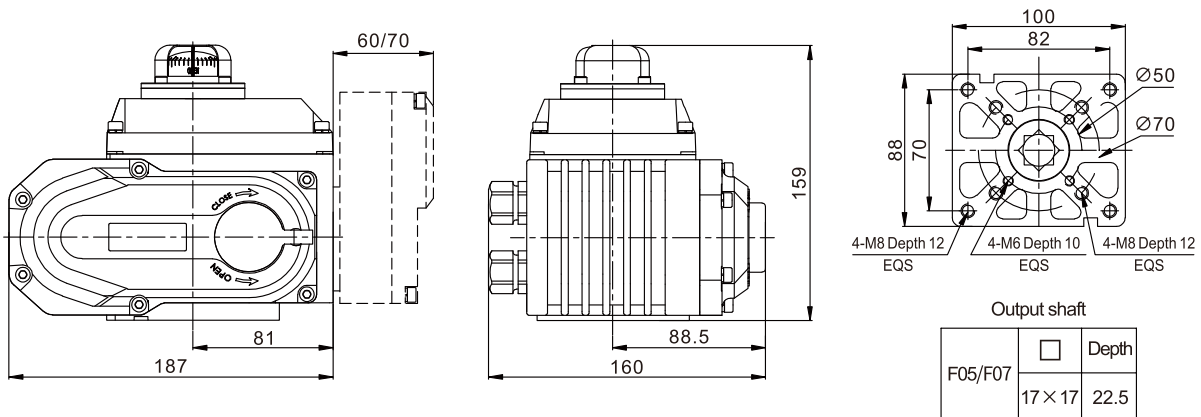


Fig 11

### BN020/040 Overall dimensions and performance parameters

| Model                    | BN020                                                                  |           |        |        | BN040     |        |        |
|--------------------------|------------------------------------------------------------------------|-----------|--------|--------|-----------|--------|--------|
| Power supply             | DC24V                                                                  | AC110V    | AC220V | AC380V | AC110V    | AC220V | AC380V |
| Motor power              | 35W                                                                    | 40W       | 40W    | 40W    | 60W       | 60W    | 60W    |
| Rated current            | 4.5A                                                                   | 0.8A      | 0.4A   | 0.2A   | 1A        | 0.5A   | 0.3A   |
| Standard time/<br>torque | 20S/200Nm                                                              | 40S/200Nm |        |        | 40S/400Nm |        |        |
| Optional time/<br>torque | 20S/200Nm                                                              |           |        |        | 20S/400Nm |        |        |
| Action type              | S R P DC DS DR DP PL T                                                 |           |        |        |           |        |        |
| Rotary Angle             | 0-90° for option                                                       |           |        |        |           |        |        |
| Withstandvoltage         | DC24V 500VDC 60S AC110V/AC220V/AC380V 1500VAC 60S                      |           |        |        |           |        |        |
| Insulation<br>resistance | DC24V 100MΩ/250VDC AC110V/AC220V/AC380V 100MΩ/500VAC                   |           |        |        |           |        |        |
| Protection class         | IP66                                                                   |           |        |        |           |        |        |
| Cooundit entry           | 2xM18x1.5 waterproof cable gland                                       |           |        |        |           |        |        |
| Protective device        | (automatic recover type) thermal protector                             |           |        |        |           |        |        |
| Limit switch             | Electric work:close/open limit switch<br>Manual work: mechanical limit |           |        |        |           |        |        |
| Installation<br>location | At any angle                                                           |           |        |        |           |        |        |
| Working<br>temperature   | -20°C- 60°C                                                            |           |        |        |           |        |        |
| Material of body         | Aluminium alloy                                                        |           |        |        |           |        |        |
| Optional function        | Dehumidifying heater, clutch hand wheel                                |           |        |        |           |        |        |

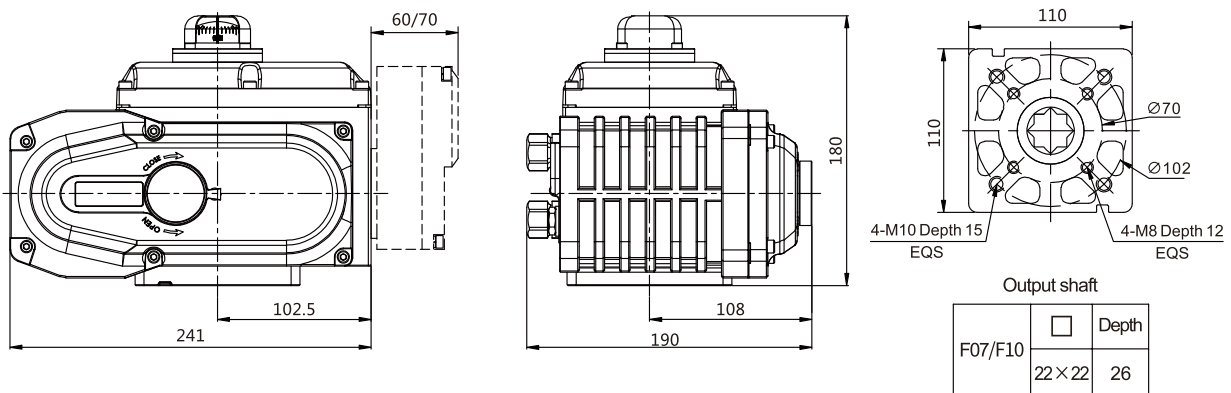


Fig 12

## BN060/100/150 Overall dimensions and performance parameters

| Model                    | BN060                                                                   |           |        |        | BN100      |        |        | BN150      |        |        |
|--------------------------|-------------------------------------------------------------------------|-----------|--------|--------|------------|--------|--------|------------|--------|--------|
| Power supply             | DC24V                                                                   | AC110V    | AC220V | AC380V | AC110V     | AC220V | AC380V | AC110V     | AC220V | AC380V |
| Motor power              | 70W                                                                     | 90W       | 90W    | 90W    | 120W       | 120W   | 120W   | 140W       | 140W   | 140W   |
| Rated current            | 7A                                                                      | 2.2A      | 1.1A   | 0.3A   | 2.4A       | 1.2A   | 0.4A   | 2.6A       | 1.3A   | 0.4A   |
| Standard time/<br>torque | 20S/<br>400Nm<br>30S/<br>600Nm                                          | 40S/600Nm |        |        | 40S/1000Nm |        |        | 55S/1500Nm |        |        |
| Action type              | S R P DC DS DR DP PL T                                                  |           |        |        |            |        |        |            |        |        |
| Rotary Angle             | 0-90° for option                                                        |           |        |        |            |        |        |            |        |        |
| Withstand voltage        | DC24V 500VDC 60S AC110V/AC220V/AC380V 1500VAC 60S                       |           |        |        |            |        |        |            |        |        |
| Insulation resistance    | DC24V 100MΩ/250VDC AC110V/AC220V/AC380V 100MΩ/500VAC                    |           |        |        |            |        |        |            |        |        |
| Protection class         | IP66                                                                    |           |        |        |            |        |        |            |        |        |
| Couduit entry            | 2xM18x1.5 waterproof cable gland                                        |           |        |        |            |        |        |            |        |        |
| Protective device        | (automatic recover type) thermal protector                              |           |        |        |            |        |        |            |        |        |
| Limit switch             | Electric work: close/open limit switch<br>Manual work: mechanical limit |           |        |        |            |        |        |            |        |        |
| Installation location    | At any angle                                                            |           |        |        |            |        |        |            |        |        |
| Working temperature      | -20℃- 60℃                                                               |           |        |        |            |        |        |            |        |        |
| Material of body         | Aluminium alloy                                                         |           |        |        |            |        |        |            |        |        |
| Optional function        | Dehumidifying heater, clutch hand wheel                                 |           |        |        |            |        |        |            |        |        |

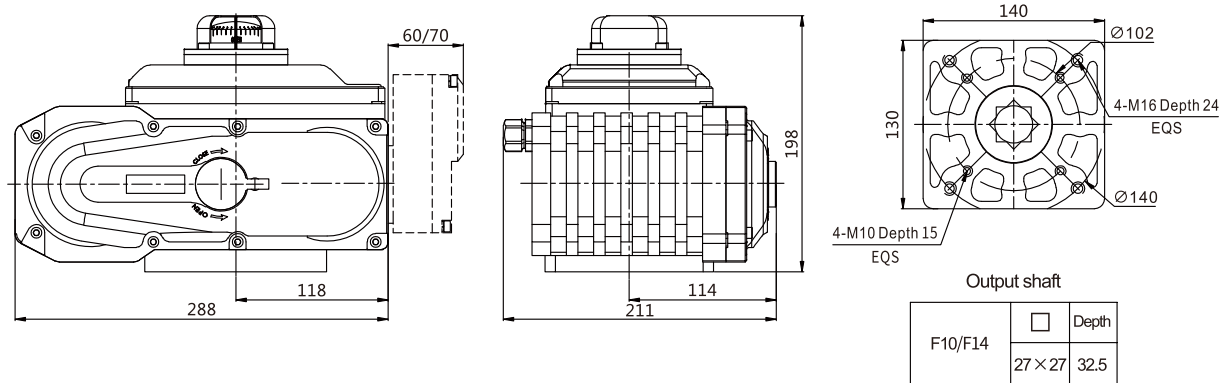


Fig 13

## Installation and adjusting

### 1 Installation environment requirements

- 1) This product is not explosion-proof. Do not use it in the environment with flammable gas or corrosive gas.
- 2) Installed in a water flooded and outdoor please explain in advance.
- 3) Please reserve wiring, maintenance space such as for manual operation.
- 4) In order to avoid the rain, direct sunlight, need to install the protection cover, or chooses IP67 protection level.
- 5) Basic installation direction to keep the window to the top, the vertical pipeline actuators installation, cable interface to the ground.

### 2 Ambient temperature, medium temperature

- 1) The ambient temperature is in the range of  $-30^{\circ}\text{C}$ ~ $60^{\circ}\text{C}$ .
- 2) When the ambient temperature is below zero, install a dehumidifier in the machine.
- 3) When the working medium is high temperature, the bracket connected with the valve plays a role in reducing heat conduction.
- 4) When the working medium temperature is below  $60^{\circ}\text{C}$ , please choose standard support.
- 5) When the working medium temperature is above  $60^{\circ}\text{C}$ , please choose high temperature bracket.

### 3 Valve connection

- 1) Manually turn the valve, confirm that there is no abnormal situation, and turn to the fully closed position, and fix the support on the valve.
- 2) Place the electric actuator on the support and screw it on gently with bolts and nuts.
- 3) Turn the electric actuator to the closed position, and fix the valve core shaft and the electric actuator output shaft with the coupling and screw.
- 4) Use the handle to turn the electric actuator, the movement is smooth, be careful not to cross the set limit switch limit.

Note:

When installing, make sure that the switch of the actuator is consistent with the switch of the valve. The flange at the bottom of the actuator meets the ISO5211 standard, and if the valve connected to it also meets this standard.

It can be easily connected; If this standard is not met, an additional bracket connection is required.

### 4 Adjustment

#### 1) Adjustment of Stroke limit

Turn the handwheel to move the actuator to the position where the valve is fully closed. Then, loosen the limit CAM tightening nut with a wrench, turn the limit CAM (yellow open, red close) to adjust it to just press the lower limit switch, and hear the 'click' sound for 2 times and then tighten the limit CAM, adjust the full close position, and set the full open position in the same way. (As shown in Figure 14)

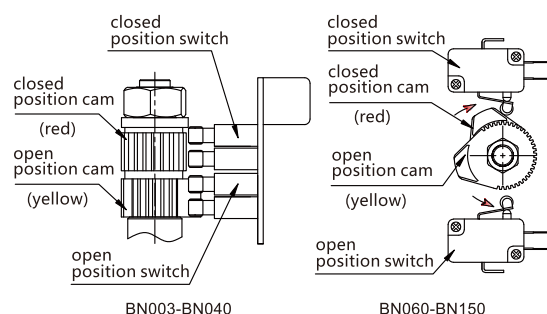


Fig 14

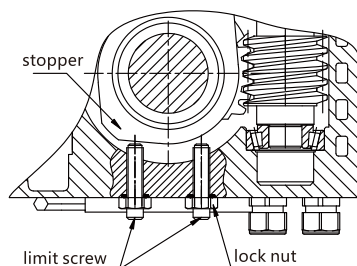


Fig 15

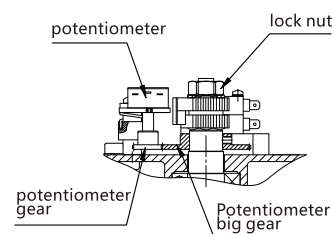


Fig 16

## 2) Adjustment of mechanical limit

Loosen nut mechanical limit and then make sure the actuator move to the full-closed position. Rotate limiting nuts, then stop rotate when it comes across the fan-shaped gear inside and then screw out two circles and screw the nuts at last. (Shown in Figure 15)

## 3) Adjustment of potentiometer

Potentiometer is output as a feedback signal in the actuator, with three output pins, the middle pin is the output, and the left and right sides are the power supply (note: the resistor should not have a resistance value of zero and jump phenomenon). Use the handle to turn the valve to the fully open position. Use a multimeter to measure the operation of the limit switch. Adjust the pin resistance on the terminal to the range of  $35\Omega$ - $60\Omega$ . If it is not correct, it can be adjusted by turning the potentiometer transmission gear. (As shown in Figure 16)

# 5 Test Operation

## 1) Manual Operation

Cut power off before making manual operation. Insert the manual handle into the hexagonal hole underneath the rubber cap.

Note: Opening to Full-open and full-closed position, after the limit switch turns half circle, it will come across mechanical block. If rotate excessively, it would result the damage of other parts, so it should be avoided excessive force.

## 2) Power operation

Before making power operation:

\*Confirm that the indication on the position meter and the valve opening are matching each other.

\*Confirm that the circuits are properly wired, also that the unit operates in correct direction with external switches.

1) Check the wiring diagram, power supply, input/output signal correctly.

2) Don't change the internal wiring.

3) Please check the rotating direction if the power supply is three-phase.

4) Make sure the actuator be in the on/off position, turn on the power and input the open signal.

5) If the actuator runs to the open direction, it means the wiring is correct.

6) If not, it must be changed 2 wiring lines of the 3 wiring line.

# 6 Maintenance & lubrication

1) The product uses special molybdenum base grease, so there is no need to add oil;

2) Regular rotation: When the valve does not work for a long time, the machine can be driven regularly to check for abnormalities;

3) For control type (with field control) structures, please refer to the actuator control module manual (technical document attachment).



Basic Modulating Type



Modulating Type (with local control)



ON-OFF Type



Modulating Type (with local control and handwheel)