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# 智能型电动执行机构Ⅱ

## Intelligent Model Electric Actuator Ⅱ

## (安装使用调试手册)

Operating instruction

CNAS Accredited by Member of the IAF & PAC MLA for QMS

Registration No.: CNAB009-Q

天津市自动化仪表七厂
天津津伯仪表技术有限公司
Tianjin Automatic Instruments No.7 Factory
Tianjin JINBO Instrument Technology Co., Ltd

# 简　介

SD-N、SA-N、SM-N系列电动执行机构是在我厂引进法国伯纳德电动执行机构基础上开发研制的新一代智能型产品。它是通过外部遥控设定，无需打开执行机构端盖即可进行校准、调试和参数设定的阀门电动执行机构。用字符数码显示执行机构的参数、功能设定全过程和执行机构运行状态。

使用智能型电动执行机构产品配套提供的手持红外线遥控器对着执行机构接收显示窗进行操作即可进入设定程序。使用遥控设定，即使在危险区域也可以安全、方便、快捷地对执行机构要求的各种参数和控制功能进行设定。标准的诊断功能将执行机构的工作状态和故障进行诊断并输出和显示相应的报警信号。

智能型电动执行机构和我厂生产的伯纳德标准调节型执行机构一样配有带有热保护的特种伺服电动机，过力矩保护机构、手轮、机械限位等。产品有单相、三相。品种有角行程、直行程、多转式。广泛应用于电力、冶金、石油、化工、轻工、建材、燃气热力、水处理等各个行业。智能型执行机构以其更齐全的功能、优良的性能，更高的可靠性，将为用户的过程控制提供更优异的调节品质。

本手册为智能型电动执行机构实际的调试、校验使用手册。具体规格、型号、安装尺寸等见我厂"天伯牌"电动执行机构产品样本。

## Brief introduction

SD–N, SA–N and SM–N ranges intelligent model electric actuators are designed on the base of the imported technology from BERNARD company of France. It is a kind of valve electric actuator that the parameters adjusting, setting, checking and operating have been set by the infrared ray remoter controller not having to open the case of the actuator. And the whole process of the parameters and functions setting and the turning state are displayed by the LED digital presentation.

The remoter controller can set the various parameters and controlling functions in a safe, convenient and short–cut way even if the actuator is in a dangerous zone. The standard diagnosing function can diagnose the fault and the working state of the actuator and then output and display the corresponding alarm signals.

The intelligent electric actuator is equipped with the specialized thermal protection servomotor, the over–torque protection mechanism, the hand wheel and the mechanical position limit etc. The products are classified into the single phase and three–phase quarter–turn, linear–turn and multi–turn models. It is widely used in the fields of the power station, the metallurgy, the petroleum, the chemistry, the mine, the light industry, the pharmacy, the thermal power, the building material and the water treatment etc. The intelligent actuator can provide the high level modulating quality in its complete functions, excellent performances and the high reliability.

This manual is the actual adjusting, checking and operating instruction of the intelligent model electric actuator. The detailed specifications, types and installing dimensions etc. refer to the product sample of brand TIANBO electric actuator.

## 1. 安装

◇ 注 意 ◇

- 环境温度不要超过允许温度，安装在发热体附近会使执行机构的温度变高，而降低可靠性及寿命；
- 执行机构应使用合适的螺栓，通过适当的接口与阀门进行可靠的连接，行程应一致；
- 安装时注意出线口位置不应向上，防止进水；
- 电机不宜设置在底部，潜在的内部冷凝水收集器；
- 安装时应将手轮及本机操作板置于便于操作位置；（SD系列提供手轮脱开和手轮随机运行两种形式的产品，手轮随机器转动不会对操作人员产生危险。）
- 现场震动频率不应超过规定，否则会造成机器内螺钉的松动；
- 安装时执行机构应正作用连接，面对输出轴方向：顺时针为开，逆时针为关。

## 2. 接线

◇ 危 险 ◇

- 确认电源处于断开状态下再进行接线，以避免发生触电及火灾；
- 请务必接上地线，以避免发生触电及火灾；
- 请专业技术人员进行接线，以避免发生触电及火灾。

◇ 注 意 ◇

- 要确认产品的额定电压和交流电源的电压一致，以避免发生伤害事故；
- 三相电源（U、V、W）相序不能接错，否则会造成执行机构失控；
- 电源线和信号线应通过不同的防水锁紧过孔引入接线盒内，输入和输出信号线必须采用带有屏蔽层的双绞线，以防止电磁干扰；
- 接线完毕应拧紧电器控制箱及行程控制箱的箱盖，防止进水。

## 1. Installation

◇ Caution ◇

- The environment temperature shouldn't exceed the permitted temperature. If the actuator is installed near the heat objects, its reliability and life can be reduced.
- The actuator should be reliably connected with the valve by using the appropriate blots. The travel should be identically.
- Please notice that the cable outlet shouldn't be upward to avoid entering into the water.
- The motor is not fit to be set on the bottom.
- Install the hand wheel and the local control plate at the position convenience for operating.
- The oscillate frequency shouldn't exceed the standard. Otherwise it can cause the nuts loosing.
- The actuator should be installed in the positive action. Face toward the output shaft: the clockwise is for open; the counter clockwise is for close.

## 2. Wiring

◇ Danger ◇

- Before the actuator is wired, please confirm that the power supply is at the state of cut-off to avoid getting an electric shock and firing.
- The ground line must be wired to avoid getting an electric shock and firing.
- The wiring must to be done by the specialized technician to avoid getting an electric shock and firing.

◇ Caution ◇

- Please conform that the rated voltage is the same as the voltage of the alternated current power supply to avoid causing fault.
- The phase order of the three-phase power supply (U, V, W) must not be wrongly wired. Otherwise it can cause the actuator to be out of control.
- The line of the power supply and the line of the signal are wired into the wiring box from the different waterproof lock-holes.
- The input and output signal lines must adopt the shield twisted-pair to protect from the electromagnetic disturbing.
- The cases of the electric control box and the travel control box should be tightened after the wiring has been done to protect from entering the water.

### 3. 运行

◇ 危 险 ◇

- 在通电过程中不要打开箱盖，以避免触电；
- 不要用湿手操作运行中的执行机构，以避免触电；
- 执行机构在通电时，即使处于停止状态也不要触摸执行机构的端子及内部，以避免触电。

### 4. 维护、检查和部件更换

◇ 注 意 ◇

- 执行机构在通电启动以前，应严格检查电源电压是否符合要求，接线是否正确；
- 通电前应检查机械手轮有无变形，并用手转动手轮，检查机件转动是否正常。

◇ 危 险 ◇

- 在进行维护和检查时要把输入电源断开，等待5分钟后再进行，以免触电；
- 非技术人员不能进行维护、检查或更换部件。[作业之前要把金属物品(手表、手镯等)拿掉]，请使用带绝缘保护的工具，以避免触电及受伤；
- 执行机构在通电时，即使处于停止状态也不要触摸执行机构的端子及内部，以避免触电；
- 请勿对本产品进行改造，如有需要请与厂家联系。

◇ 注 意 ◇

- 请维护人员定期紧一下端子螺钉，端子螺钉的松动可能造成执行机构的工作不正常。

## 3. Operating

◇ Danger ◇

- Please don't open the case during the power supply electrifying to avoid getting an electric shock.
- Please don't operate the working actuator by the wet hand to avoid getting an electric shock.
- Please don't touch the terminals and the inside parts of the actuator when the actuator is electrifying to avoid getting an electric shock, even if it is at the stopped state.

## 4. Maintenance, inspection and spare parts changing

◇ Caution ◇

- Please strictly check whether the voltage of the power supply is accordance with the specifications and the wiring is correct before the actuator is electrified.
- Please check whether the hand wheel is damaged or not, and turn it by hand to check whether the mechanical turning is in the normal use or not.

◇ Danger ◇

- If the actuator needs to be maintained and checked, please shut down the power supply firstly, then wait for 5 minutes to avoid getting an electric shock.
- Only the technician can perform maintaining, checking and spare parts changing. [Please take off the metal objects (watch and bracelet etc.) while the operating has been doing.] Please use the tools with the insulated protection to avoid getting an electric shock and being wounded.
- Please don't touch the terminals and the inside parts of the actuator when the actuator is electrifying to avoid getting an electric shock, even if it is at the stopped state.
- Please do not reconstruct this product. If any requirement is necessary, please contact us.

◇ Caution ◇

- The crews of the terminals loosing can make the actuator working abnormally, so please tighten them periodically.

# 前　言

承蒙购买天津津伯仪表技术有限公司（原天津市自动化仪表七厂）的智能型电动执行机构，非常感谢！

本使用说明书介绍了使用方法和注意事项，在使用本产品之前请务必熟读此说明书，以便能够正确使用。

## 安全注意事项

- 在安装、运行、维护、检查之前， 请务必熟读此说明书及其附属文件，以便正确的加以使用。
- 对有关设备的情况，安全信息及其注意事项均熟练的掌握之后再加以使用。
- 本使用说明书在安全注意事项栏中划分“危险”和“注意”两个档次。

◇ 危 险　发生误操作时会出现危险状况，有可能导致死亡或重伤的情况。

◇ 注 意　发生误操作时会出现危险状况，有可能导致中等程度或轻度的伤害的情况，以及可能发生物品损坏的情况。

另外，即使 ◇ 注 意 中所记入的事项，由于情况的不同，也可能导致严重的后果。

两种情况下所记录的均为重要内容，请务必严加遵守。

# Preface

We are greatly indebted to you for your purchase of the integral proportional modulating model electric actuator we manufactured.

This operating instruction introduces the operating methods and the cautions. It is very important that read carefully of this instruction before the product come into use.

## Cautions for security

- Before the actuator is installed, operated, maintained and checked, please read carefully of this instruction and the attached documents for using the product correctly.
- Please sure that of the situation of the related equipment, the security information and the cautions.
- This instruction is divided into two levels of danger and caution.

◇ DANGER Accidentally operating has caused the result of death or grievous bodily harm.

◇ CAUTION Accidentally operating has caused the result of medium or flesh wound and goods damaged.

In addition, as the conditions are different, the items in caution also can lead a grievous result.

Please strictly abide by the items in these two levels.

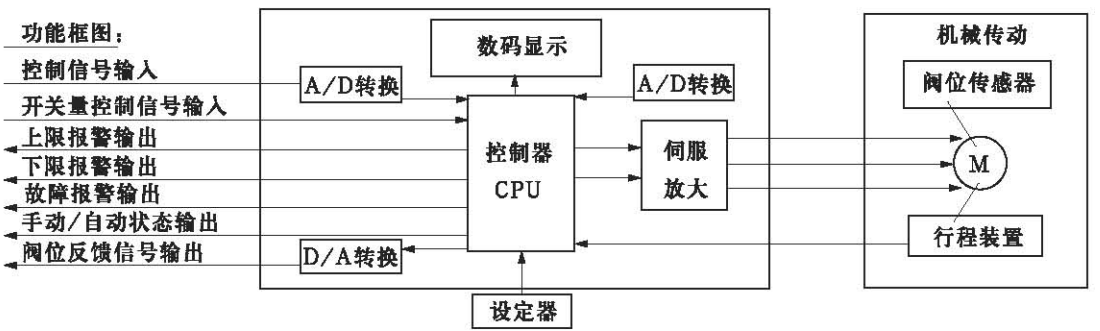
## 产品特点

- 智能型SD-N、SA-N、SM-N系列电动执行机构采用仪表专用大规模集成电路（CPU）以及传感器、红外接受单元、位置输出单元、无触点固态继电器等组成智能控制电路的硬件，与电动机、机械传动巧妙的结合，采用非侵入式结构设计形成一体化结构，配以系统软件（无需另配伺服放大器、操作器）即可实现调节控制。它可以直接接收来自调节器、DCS计算机的4-20mA模拟量信号或开关量信号完成自动调节。对执行机构的各种参数调整、设定、校准及操作无需打开端盖，

- 智能电子式调节型电动执行机构采用的均为特殊电动机，内设热保护开关，电机一旦过热，其开关量送达控制电路，以控制电机使其停转，SD-N 、SA-N系列电动执行机构的电动机动作可达1200次/小时，SM-N系列电动执行机构动作可达1800次/小时。
- 控制电路有闩锁功能和过力矩双重保护功能，即电动执行机构在控制阀门被卡住等意外情况下，执行机构电动机接收到运行指令8-10秒后，仍不能动作，则控制电路将自动断掉电机供电电源。另外执行机构内设有过力矩保护开关，当执行机构超过原设定力矩时，执行机构控制电路将自动保护，以保护被调节装置（各类阀门）。

## 工作原理

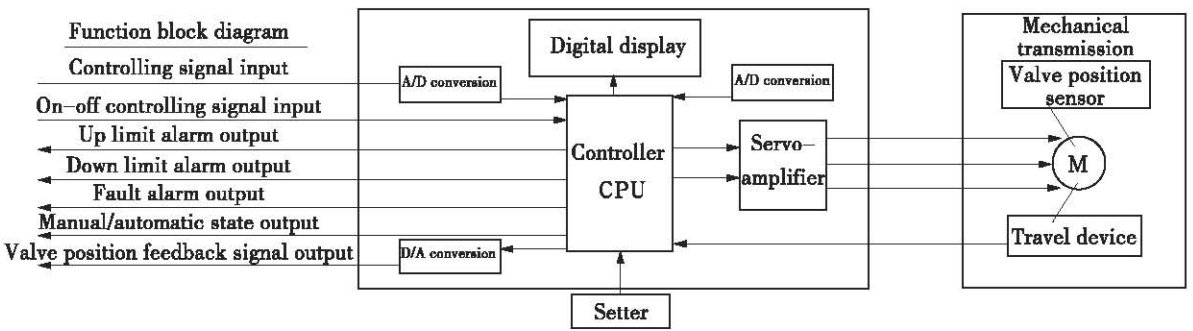
智能型电动执行机构的位置定位器是以高速低功耗单片机为核心的智能信号采集控制单元。控制单元部件无需调整，所有的参数设置、功能方式选择、模拟量输入输出的准确度标定均通过外部设定器实现。



- The intelligent electric mode modulating model electric actuator adopts the specialized motor with the thermal protecting switch inside. Once the motor is over-heat, the on-off quantity signal is sent to the controlling circuit to stop the motor. The motor of SD-N and SA-N ranges electric actuators can act 1200times/hour. SM-N range electric actuator can be up to 1800times/hour.
- The controlling circuit has the lock function and the over-torque dual protecting function. That namely in the case that the controlled valve is locked, after the motor of the actuator incepts the turning command for 8-10 seconds, it still can't turning, the controlling circuit can cut off the power supply of the motor automatically. In addition, the over-torque protecting switches are equipped inside the actuator. When the actuator exceeds the set torque, the actuator controlling circuit can be self protected automatically to protect the adjusted devices (the various valves).

## The working principle

The positioner of the intelligent model electric actuator is the intelligent signal collecting control unit used the high speed and low power consumption single-chip as a core. The control unit parts do not need to be adjusted, all the parameters setting, the function mode selecting and the accuracy demarcating for the analogue input and output can be realized by the outside set controller.



调节器或变送器的模拟信号经A/D转换后进入智能型电动执行机构，智能型电动执行机构的位置定位器的微机随时检测这个输入信号和反馈信号，当两个信号不平衡时，偏差一旦超出规定，立刻发出放大的控制信号，驱动智能位置定位器中的双向可控硅或固态继电器，使其导通带动电机向减小偏差的方向运转，进而带动减速机构并改变阀门的开度。与此同时，微机也将阀门开度的位置信号转换为数字脉冲信号送往显示器，从数显窗可观察阀门的开度。

智能型电动执行机构内有一个专责控制输入部分断线的识别系统，一旦输入部分出现不可预料的故障，可有保位、预置两种状态供选择。如果您有必要将断线故障状态输出，可在订货时注明此要求。

智能型电动执行机构有一个完全隔离的4-20mA的模拟量输出。

## 智能电子式控制电路技术特点

- 模拟输入信号通道一个：4-20mA （或任意线性输入1-5V、0-5V、0-10mA）
- 数码管显示：控制量%指示、阀位反馈%指示
- 输入信号、输出信号之间光电隔离，可直接与各类计算机或DCS相连
- 手操功能：可实现操作室的远程开关量控制
- 手/自动切换和状态输出
- 上、下限限幅值设置及上、下限报警功能
- 动作灵敏度设置：0.5%-3%连续可调
- 阀门反馈跟踪故障闪烁报警指示

The analogue signal of the modulator and the transmitter enters into the intelligent model electric actuator by A/D exchanging, the positioner of the intelligent electric actuator test the input signal and the feedback signal momentarily. When these two signals are not balance, once the deviation exceeds the specification, it send a amplified controlling signal at once, make the two-way silicon controlled rectifier or the solid state relay of the intelligent positioner electrified to drive the motor turning to the direction for reducing this deviation, therefore, drive the reducing mechanism to change the opened degree of the valve. Meantime, the positioner also exchange the position signal of the valve opened degree to the digital pulse signal and send it to the displayer, so the valve opened degree can be observed from a display window.

Inside the intelligent electric actuator, there has a distinguished system specialized charging of controlling the input part cut-off. Once the input part occurs an unpredictable fault, it has position holding and position presetting two states options for selecting. If it is necessary to output the cut-off fault state, please notice this requirement in your order.

The intelligent electric actuator has a completely isolated analogue quantity output of 4~20mA.

## The intelligent electronic mode controlling circuit technical characteristics

- One for the analogue input signal passage: 4~20mA (Or arbitrary linear input 1-5V, 0-5V, 0-10mA)
- Digital LED display: Control quantity % indicating and valve position feedback % indicating
- The input signal and the output are photo-electrically isolated, and can be connected with the computer and DCS directly.
- Manual operating function: Used for realize the remote on-off quantity control in the control room.
- Manual/automatic exchange and state output
- Up limit and down limit scope setting; up limit and down limit alarm function
- Sensitivity setting: 0.5%-3% continuously adjustable
- Valve feedback tracking fault twinkling alarm indicating

- 过力矩功能：当过力矩时，执行机构能切断强电输出
- 断信号功能：当断信号时，执行机构有两种状态可供选择：保位、预置
- 执行机构的输出角度可任意设置（在全量程的75%以下可设零点，25%以上可设满度）
- 执行机构可以设定正、反作用

## 主要技术参数

1．LED显示精度0.5级；分辨率：末位一个字；
2．模拟输出准确度：阀位反馈输出1.0级、控制量0.5级；
3．模拟输入通道阻抗：电流信号250Ω以下；电压信号　500KΩ以上；
4．模拟输出驱动负载阻抗：
　电流信号：4－20mA DC，输出阻抗≤750Ω；
5．基本误差：1%，2.5%；
6．回差：1.5%；
7．死区：0.5－3%连续可调；
8．阻尼特性：无摆动；
9．电源电压：交流220V、50Hz；允许电源电压变动：≤±10%；
10.工作环境：温度：－10～+55℃；相对湿度：≤95%周围空气不含有腐蚀性气体；

- Over-torque function: When the actuator is over-torque, it can cut the forced power output.
- Cut-off signal function: When the signal of the actuator is cut off, it has two states options: position holding and position presetting.
- The output angle of the actuator can be set arbitrarily. (Zero point can be set under 75% of the whole scope of the travel; the full range can be set over 25% of the whole scope travel.)
- The actuator can be set in clockwise action and counter clockwise action.

## The main technical parameters

1. LED display precision: Class 0.5; the distinguish ratio: the ending one bit.
2. Analogue output accuracy: The valve position feedback output is class 1.0; the controlling quantity is class 0.5.
3. Analogue input passage impedance: The current signal is under 250Ω.
   The voltage signal is over 500KΩ.
4. Analogue output driving load impedance:
   The current signal: 4-20mA DC, the output impedance≤750Ω
5. Basic error: 1%, 2.5%
6. Deviation: 1.5%
7. Deadline: 0.5-3% continuously adjustable
8. Damping characteristic: No-oscillating
9. Power supply: AC 220V 50Hz, the allowanced voltage changing: ≤ ± 10%
10. Working environment: Temperature: -10~+55℃,
    the relative humidity: ≤95% No corrosive characteristic exist in the ambient air.

11.防护等级：SD-N系列：符合IEC145 IP65
SA-N系列：符合IEC145 IP67
SM-N系列：符合IEC145 IP67

12．断电后设置的参数保持时间：≥20年。

## 显 示 窗

执行机构的显示窗接收红外编码指令和显示参数设定，过程字符及数位量及执行机构运行时输入和反馈信号值。

显示说明：

Ⅰ 运行方式时：

上排数码管显示输入信号（以控制量的形式显示 mA、V、%等）；

下排数码管显示阀位反馈量（以过程量形式显示：%）；

Ⅱ 参数设置方式时：

上排数码管显示设置参数的提示符；

下排数码管显示设定参数；

Ⅲ 指示灯：

A 正转指示灯　　E 反转指示灯

B 上限报警指示灯　　C 自动指示灯（下限报警指示灯）

D EM1状态指示灯　　G 手动指示灯

显 示 窗

11. Protecting class: SD–N range: Accordance with IEC 145 IP65
SA–N range: Accordance with IEC 145 IP67
SM–N range: Accordance with IEC 145 IP67
12. The parameter holding time after the power supply is turned off: ≥20years

## The display window

The display window of the actuator incepts the infrared code commands and displays the parameters setting, the processing characters, the digital quantum and the commissioning input and feedback signal value of the actuator.

The explanation of the display:

Ⅰ In the term of commission:

The up row digital tubes display the input signal (Display mA, V and % etc. in the term of the controlling quantum.).

The down row digital tubes display the valve position feedback quantum (Display % in the term of the processing quantum.).

Ⅱ In the term of the parameters setting:

The up row digital tubes display the prompt codes of the setting parameter.

The down row digital tubes display the setting parameter.

Display window

Ⅲ LED indicating lamps

A Clockwise turning indicating lamp
E Counter clockwise turning indicating lamp
B Up limit alarming indicating lamp
C Auto–operation indicating lamp(Down limit alarming indicating lamp)
D EM1 state indicating lamp
G Manual operation indicating lamp

## 红外、手持遥控设定器

红外手持遥控器用来对执行机构的控制、指示 、保护功能进行程序设定和参数调整，并且也可用来对执行机构进行无接触的遥控。

按键说明：

### 运行方式下：

SET 键：手动方式下无作用，自动方式下启动仪表进入参数设置方式；

▶键：无作用；

▲键：自动方式下无作用；手动方式下控制调节阀开度增大；

▼键：自动方式下无作用；手动方式下控制调节阀开度减小；

A/M键：手/自动方式换键。

### 参数设置方式下：

SET键：进入参数设置方式后参数修改确认键及控制仪表进入下一个参数设置，在设置完最后一个参数后提示End时，再按此键则退出设置方式。或在任何参数设置后与MAN键同时按下则退出参数设置方式；

▶键：设定参数光标位移键；

▲键：设定参数位移加键，当光标在最低位时可作参数的连续加键；

▼键：设定参数位移减键，当光标在最低位时可作参数的连续减键；

A/M键：控制仪表进入上一个参数设置，所设置的参数并不确认。在任何参数设置中与SET键同时按下则退出参数设置方式。

## The infrared portable remoter

The infrared portable remoter is used for performing the program setting and parameters adjustment on the controlling, indicating, protecting function, and it also can be used for non-contact remotely controlling the actuator.

### In the term of commission:

Key SET: There is no action at the manual operation mode. At the automatic operation mode, it starts up the instrument to enter into the parameters setting mode.
Key ▶: There is no action.
Key ▲: There is no action at the automatic operation mode. At the manual operation mode, it controls the open degrees of the modulating valve increasing.
Key ▼: There is no action at the automatic operation mode. At the manual operation mode, it controls the open degrees of the modulating valve decreasing.
Key A/M: It is the over-change key between the manual operation mode and the automatic operation mode.

### In the term of the parameters setting:

Key SET: After entering into the parameters setting mode, it is the key for parameters amended conforming and controlling the instrument to enter into the next parameter setting. After the final parameter has been set, it prompts 'End'. Then press this key to quit the setting mode. Or quit the parameter setting mode by pressing this key and the key MAN at the same time at any parameter setting.
Key ▶: The displacement key for the light mark for setting parameter
Key ▲: The displacement plus key for setting parameter. When the light mark is at the end place, it can be as the continuously plus key for setting parameter.
Key ▼: The displacement subtract key for the setting parameter. When the light mark is at the end place, it can be as the continuously subtract key for setting parameter.
Key A/M: It is used for controlling the instrument to enter the next parameter setting. Quit the parameter setting mode by pressing this key and the key MAN at the same time at any parameter setting.

**性能说明：**

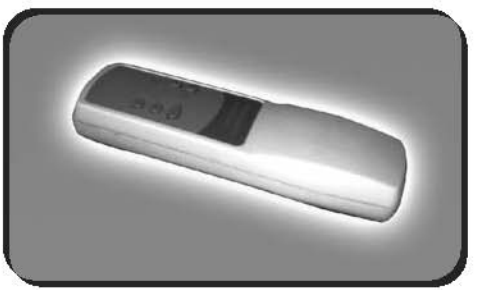
**防爆认证 ibⅡBT4(本安型)**

**使用距离：≤5米**

**电源：1.5×2电池（五号）**

**使用说明：**

**使用时，遥控器红外发射窗对准执行机构显示窗,距离最好在1.5米以内，按操作程序按键，则每按动一下，LED指示灯都将闪亮。如不亮，请检查电池是否接触良好或电池是否电压过低，如需更换电池，打开遥控器背面电池后盖即可更换，注意电池极性。更换电池必须在安全区域进行。**



Explanation of the performance:

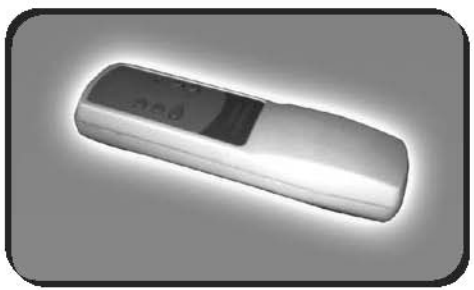
Certificate of explosive–proof: ib Ⅱ BT3 (Intrinsically safe model)

Operating distance: ≤5m

Power supply: 1.5V × 2 (No.5)

Explanation:

During the operation, the infrared emission window of the remoter should align the display window of the actuator, their distance would better be in 5 meters. Press the key according to the procedure, so the LED indicating lamps should be lighting in every time of pressing the key. If the LED lamps are not light, please check whether the batteries are connected well or the voltage of the batteries is too low. If it is necessary to change the batteries, only need to open the back case of the remoter. Please pay attention to the polarity of the batteries. Changing the batteries should be done at the safe area.



## 控制箱本机操作面板开关说明

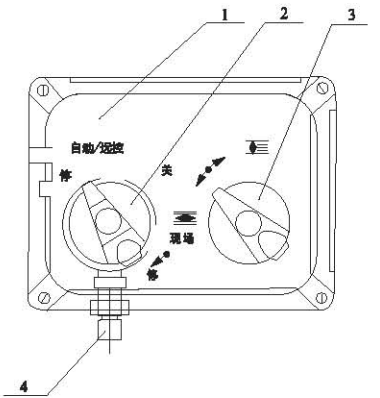
在现场无手持遥控器时，可用装在执行器上面的本机操作开关进行执行机构的电动操作。

1．控制箱本机操作面板

2．手动/自动转换开关旋钮2（红色）：当开关旋钮锁定在自动位置时，执行机构接收控制室的连续调节信号；开关旋钮锁定在现场位置时，通过旋钮3（兰色）实现本机操作。

3．阀开、阀关旋钮3（兰色）：当左边开关旋钮2(红色)锁定在现场位置时，右边兰色开关旋钮3旋转到阀开位置时，执行机构朝阀开方向旋转；开关旋钮转到阀关位置时，执行机构朝阀关方向旋转；该旋钮为自动复位旋钮。

4．锁定销：可锁定开关旋钮2(红色)在手动或自动位置，必要时可加锁，防止现场人员未经授权误操作。当开关旋钮在现场位置时，远程自动控制信号将不起作用。当回到自动位置，执行机构立即受控于远程自动控制信号。

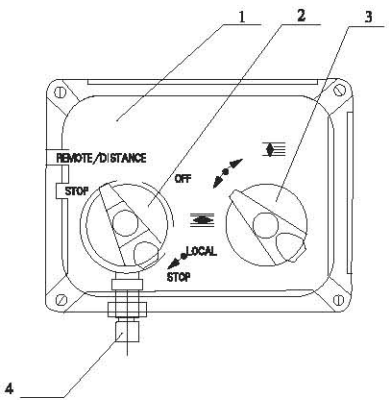



本 机 控 制

## The explanation of the switches on the local control faceplate of the control box

In the case of having no remoter in site, the local operating switches in the actuator can be used for electrically operating the actuator.

1. The local operating faceplate of the control box
2. Manual/auto over–change switch knob 2 (red): When the switch knob is locked at the automatic position, the actuator incepts the continuous modulating signal of the control station. When the switch knob is locked at the local position, the local operation can be realized by using the knob 3 (blue).
3. Valve open and valve close knob 3 (blue): When the left switch knob 2 (red) is locked at the local position, the right blue switch knob 3 is turned to the valve opened position for operating the actuator to turn for the valve opened direction, or it turned to the valve closed position for operating the actuator to turn for the valve closed direction. This knob is a kind of automatic reset knob.
4. Lock pin: It can lock the switch knob 2 (red) at the manual or the automatic position. If it is necessary, it can be added a lock to protect from the un–authorized operating. When the knob is locked at the local position, the remote automatic controlling signal will not be in action. When it is turned back the automatic position, the actuator will be controlled under the remote automatic controlling signal immediately.




Local control

## 参数设置

注：以下参数的设置在执行机构出厂时均已根据使用厂家要求设好，没有特殊情况请不要随意改动，如需更改应由仪表专业人员按以下步骤完成。

在“自动”状态下(C灯亮)，用手持遥控器对着显示窗口距离最好在1．5米以内进行。

① 先按手持设定器上面的SET键再按A／M键，此时显示板的上排数码管显示“SEL”、下排数码管显示“555”。

② 按位移键将光标移到第二个“5”的前面，再按“▲”键将“5”改为“8”，此时下排数码管显示“585”。“585”为仪表专业人员进入的菜单密码。不断按“SET”键将会出现下列各项设置菜单：

| 上排显示<br>提示符 | 下排显示<br>出厂值 | 功能方式 | 备　注 |
|---|---|---|---|
| In | 14 | 输入信号方式设置 | 默认值 |
| 三 二 一 | 5 | 抗干扰模式及强度 | 默认值 |
| Dip | 1 | 小数点位置设定 | 可设置0–3，小数点后位数0–3 |
| 一 一 一 | 0.0 | 显示位移量 | 默认值 |
| Ldo | 0.0 | 输入量程下限显示值 | 阀位全关位置时的显示值 |
| Lup | 100.0 | 输入量程上限显示值 | 阀位全开位置时的显示值 |
| Pid | 0043 | 执行机构控制方式设定 | 注1 |

## The parameters setting

Note: The parameters setting below has been set well before the actuator leaves the factory according to the requirements of the users. Please do not change them if no special conditions. If it is necessary to change them, please complete it according to the steps below:

At the 'AUT" state (Lamp C is light.), set the parameters by the portable remoter in the better distance of 1.5m.

①Press the key SET and then press the key A/M of the remoter, in this case, the up row digital tubes display 'SEL', the down row digital tubes display '555'.

②Pressing the displacement key to make the light mark to the front of the second five, then press key '▲' to change '5' to '8', so the down row digital tubes display '585'. '585' is the password for entering the menu. Continuously pressing the key 'SET", the setting menu of the items will occur.

| 上排显示<br>提示符 | 下排显示<br>出厂值 | Mode of function | Remarks |
|---|---|---|---|
| In | 14 | The input signal mode setting | The tacit value |
| 三 二 一 | 5 | Disturbance-resistance mode and intensity | The tacit value |
| Dip | 1 | The decimal point position setting | 0–3 Settable, 0–3 decimal places |
| 一 一 一 | 0.0 | Displacement quantum display | The tacit value |
| Ldo | 0.0 | The input range down limit display value | The display value at the valve full closed position |
| Lup | 100.0 | The input range up limit display value | The display value at the valve full opened position |
| Pid | 0043 | The controlling mode setting of the actuator | Note 1 |

| | | | |
|---|---|---|---|
| SP1 | 50.0 | 阀位预置值 | 注2 |
| H-L | 9900 | 上下限限幅值 | 99：阀位全开，00：阀位全关 |
| SPC | 05 | 状态设置 | 默认值 |
| dFh | 1.0 | 执行机构动作灵敏度 | 从0．1——25，5可选(%) |
| dFt | 0.4 | 伺服关闭后再次开启时间(秒) | 从0—25．5S可选 |
| dfc | 00 | 阀位偏差允许值 | 默认值 |
| Out | 0011 | 模拟量输出方式设置 | 注3 |
| End | XXXX | 仪表出厂编号 | X代表0—9的任意值 |

注1：Pid=0043，执行机构通电后进入自动状态，有手自动切换功能。

注2：Sp=50．0，控制信号断线后，执行机构运行到阀门开度的50%位置，SP的值可以在0%-100%之间任意位置。即为阀位预置值。此功能应在订货时注明。

注3：OUT=0011此为执行机构正作用时(即面对执行机构输出轴方向：／顷时针为开，逆时针为关)
OUT=0091此为执行机构反作用时(即面对执行机构输出轴方向：顺时针为关，逆时针为开)
执行机构在出厂时以按正作用调好，如需改反作用具体操作见“检验正、反作用功能(正阀改反阀)”

| | | | |
|---|---|---|---|
| SP1 | 50.0 | The valve position presetting value | Note 2 |
| H-L | 9900 | Up and down limit range value | 99: Valve full opened, 00: Valve full closed |
| SPC | 05 | State setting | The tacit value |
| dFh | 1.0 | Sensitivity of the actuator | 0,1~25,5 Optional |
| dFt | 0.4 | Re-startup time after servo closing | 0~25,55 Optional |
| dfc | 00 | The allowance value of the valve position error | The tacit value |
| Out | 0011 | Analogue quantum output mode setting | Note 3 |
| End | XXXX | Express the ex-factory code No. | X is expressed number 0-9 arbitrarily. |

Note 1: Pid=0043 The actuator enters into the automatic state after it is powered on. And it has the manual and automatic operating over-change function.

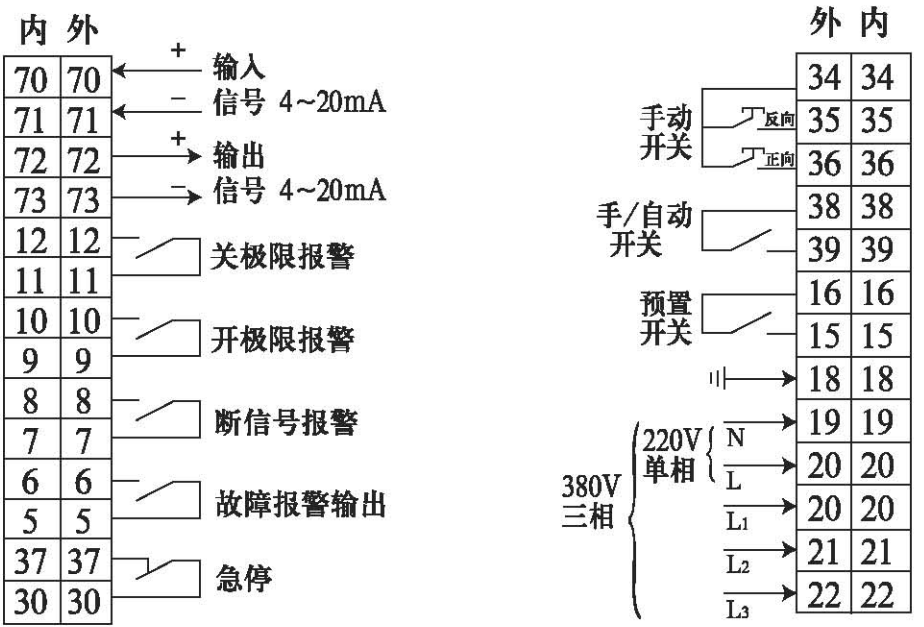
Note 2: Sp=50.0 After the controlling signal is cut-off, the actuator will be stopped at the position of 50% valve opened degrees. The valve of Sp can be set at any position in 0%~100%. It means the valve position presetting value. The requirement of this function should be given in the order.

Note 3: OUT=0011 The actuator is in the positive action. (It means that: Facing to the output shaft of the actuator, the clockwise direction is for open, the counter clockwise is for close.)

OUT=0091 The actuator is in the negative action.

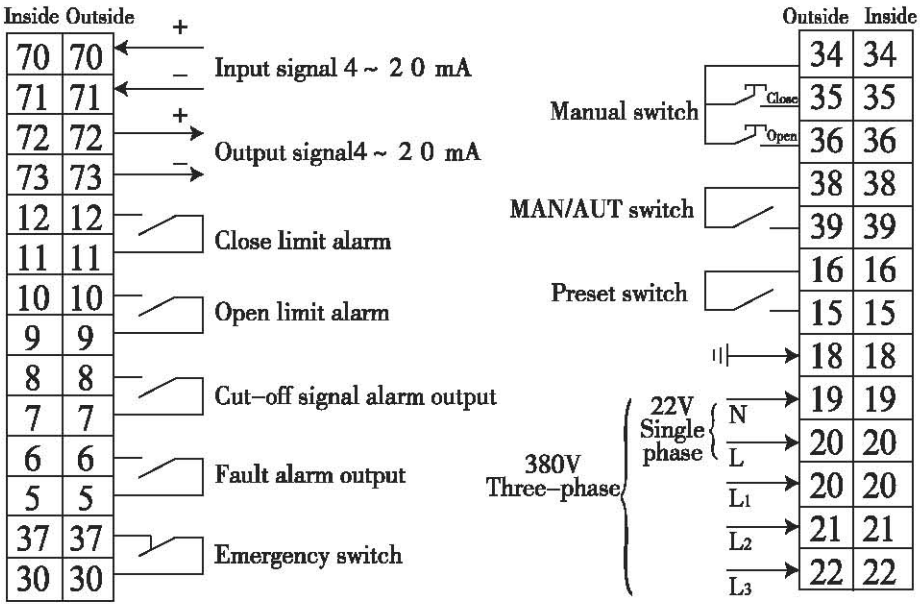
The actuator has been adjusted well identified with the positive action. If the negative action is required, the concrete steps refer to 'How to change the positive valve to the negative valve'.

## 执行机构外接线图




（注：预置开关、手/自动开关等均为无源开关）

## The outside wiring diagram of the actuator




Note: The preset switch and the MAN/AUT switch etc. are all the passive switches.

## 行程限位机构

智能型电动执行机构除具有电限位，还具有机械限位对执行机构起到双重保护。电限位见“5阀位反馈零点与满度的调整”。机械限位方法如下：通过一个特别设计装有四片独立可调的凸轮组件和微动开关构成。凸轮组件随执行机构输出轴转动，执行机构的行程范围由调整凸轮片与开关相对位置决定。见下图：用螺丝刀松开标号7的三个固定螺钉，取下电位器支架8，下面是凸轮盘。凸轮盘内装4片不同颜色和编号的凸轮片。下面的4和3（蓝色和黑色）为控制起始和终点的两片凸轮。转动执行器手轮到阀关位置，用螺丝刀对准凸轮板面上的4号调整螺丝槽，向下推转动凸轮片直到凸轮凸起部分刚好压动关位（CLOSE）行程开关。抬起螺丝刀凸轮片立即准确锁定在此位置上。然后反向转动手轮到阀全开位置，用同样方法调整3号凸轮片到压动开位（0PEN）行程开关。完成上述调整后，转动手轮使执行机构连接的阀门到半开位置。将电位器支架重新固定好。此时注意使电位器拨动杆10放入凸轮板面上：电位器拨杆定位槽。

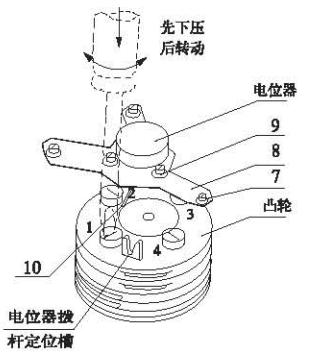



图2．凸轮机构

注：行程限位在出厂前均已调整好，无特殊要求不要改动，如需改动按上述方法进行。

## The travel limit mechanism

Besides the intelligent model electric actuator has the electric position limit, it also has the mechanical position limit to take the bi-production. The electric position limit refers to '5 Demarcation of the valve position feedback zero point and full range'. The way of mechanical position limit as follows: The electric position limit is composed of the cams with four individual adjustable cam and the micro-switches by specialized designing. The cams rotate along with the output shaft of the electric actuator. The scope of travel of the electric actuator is determined by adjusting the related position of the cam plates and the switches. See the below diagram: Loose the three screws code 7 by using the screwdriver and then remove the potentiometer supporter code 8, the cam plate can be seen. There are four cam chips with different color and code. The 4 and 3 (blue and black) cams control the beginning and the ending positions. Turn the hand wheel of the actuator to the valve closed position, align the adjusting screw slot of No.4 cam by the screwdriver, push it down and turn the cam for the closed direction, till the protruding part has just pressed the closed position (CLOSE) travel limit switch. Pulling up the screwdriver, the cam chip will be accurately locked at this position. Then turning for the inverse direction to the valve full opened position, adjust the No.3 cam chip till to have just pressed the opened position (OPEN) travel limit switch by using the same way. After the above adjustment has been finished, turn the hand wheel to make the valve connected with the actuator turn to the middle opened position. Fix the potentiometer supporter again. In this case, please pay attention to pull the potentiometer rod code 10 into the position slot on the cam plate.

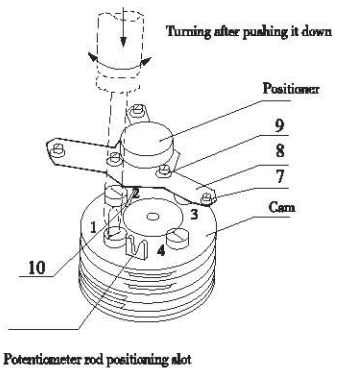



Fig.2 Cam mechanism

Note: The travel position limits have been adjusted well before the actuator leaves the factory. If there are not special requirements, please do not change them. If it is necessary to be changed, do it according to the above steps.

## 输入信号即控制信号的标定

确认执行机构已经处于自动状态下(C灯亮)，按下“SET”键再按“A／M”键此时显示板上排数码管显示“SEL”，下排显示“555”，按▶键、▲键或▼键，改变“555”显示为“1555”：此时将输入信号给定为4mA即0.0%同时按下位移“▶”键与减“▼”键，可多按几次直到显示板的上排数码管显示为0.0%；再将输入信号给定为20mA即100.0%,再同时按下位移“▶”键与减“▼”键，可多按几次直到显示板的上排数码管显示为100.0%；按“SET”键再按“A/M”键，显示板上排显示“SEL”下排显示“555”；(必须出现“SEL”“555”，否则标定不成。)按“SET”键退出。输入信号即控制信号的标定完成。

## 阀位输出的调整

### 1.确定运转方向：打开控制箱和行程限制机构的箱盖

首先检查接线，在外接端子的标号为18、19、20处接入电源的地线、N线、L线：接通电源，定位器在接通电源几秒钟后进入自动状态，按手持设定器的“A／M”键切换到手动(G灯亮)，分别按“▲”键、“▼”键，观察反馈跟踪、阀位开度是否一致，若不一致，应立即切断电源，检查接线是否有误。若阀位开度与要求相反应倒一下电机两转的头即标有2和3的端子处的两根线。按手持设定器的“A／M”键切换到手动(G灯亮)，按住“▲” 键看一下显示板的下排数码管的数字显示是否增大，如果是减小且不能连续运行时应倒一下电位器即标有4和6的端子处的两根线。

## Demarcation of the input signal namely the controlling signal

Conforming the actuator be at the automatic state (Lamp C is light.), Pressing the key 'SET' and then the key 'A/M', at this time, the up row digital tubes display 'SEL' and the down row digital tubes display '555'. Press the key ▶, the key ▲ or key ▼ for changing '555' to '1555'. In this case, set the input signal to 4 mA namely 0.0% and press the displacement key and subtract key ▶ at the ▼ same time till the up row digital tubes display 0.0%. Then set the input signal to 20 mA namely 100.0% and press the displacement key ▶ and subtract key ▼ at the same time till the up row digital tubes display 100.0%. Pressing the key 'SET' and then the key 'A/M', the up row digital tubes display 'SEL' and the down row digital tubes display '555'. (Only 'SEL' and '555' occur, the demarcation has been finished.) Press the key 'SET' to quit. The demarcation of the input signal namely controlling signal has been finished.

## Adjustment of the valve position output

### 1. Conform the turning direction: Open the case of the control box and the travel limit mechanism.

Firstly, check the wiring. Wire the line ground, line N and line L of the power supply via the outside terminals coded No. 18, 19 and 20. Then turn on the power supply. The positioner will enter into the automatic state in several seconds after it is powered on. Press the key ' A/M' for over–changing to the manual state (Lamp G is lighting.). Pressing the key ▲ and key ▼ separately, observe whether the feedback trading is identified with the valve opened degrees. If they are not identified, shut down the power immediately then check the wiring whether it correct or not. If the valve open degree is in reverse according to the requirement, exchange the two wires code No. 2 and 3. Press the key ' A/M' for over–changing to the manual state (Lamp G is lighting.). Press the key ▲ observe the digital display of down row digital tubes whether it is increased, if it is decreased and could not continuously commission, exchange the two wires code 4 and 6.

## 2. 检查行程开关：

手动状态使执行器正转，按下标有“OPEN”字样的最下面一个开关，执行器应停转：在执行器反转时按下标有“CLOSE”字样的最下面一个开关，执行器应停转。如果正好相反应倒一下行程开关即标有31和32的端子处的两根线。

## 3. 检查过力矩开关

在执行机构正向运行时，人为按下正向过力矩保护开关，则执行机构显示窗闪烁报警，正向可控硅截止，电机停止转动，执行机构进入保护状态，松开过力矩保护开关，显示窗依然闪烁，执行器仍处于保护状态。

如果正好相反应倒一下过力矩开关即标有61和62的端子处的两根线。

解除过力矩保护方法：

①输入小于阀位值的控制信号，执行器反向运行，则退出保护状态，显示恢复正常，执行器正常工作。

②切断执行机构电源，经过十几秒钟后，重新给执行机构通电，过力矩保护解除。

## 4. 灵敏度设置：

以上几项检查无误后，按下A／M键切换到自动，此时反馈跟踪信号应趋近于外给定输入信号，当两信号差值进入误差允许范围内时，如果执行器正反向抖动，应重新设置灵敏度dFh值。对于灵敏度的值我们是从0%—25．5%可设的，但您最好设定在0．5%-2%即dFh值设为0．5-2。因为灵敏度设定的值太低执行机构会振荡，太大时对系统就有影响。具体操作见“参数设置”项。

## 2. Check the travel switches

Operating the actuator turn to the clockwise direction at the manual state, press the lowest switch under the mark 'OPEN', the actuator will be stopped. Operating the actuator turn to the counter clockwise direction, press the lowest switch under the mark 'CLOSE', the actuator will be stopped. If they've just been in reverse, exchange the two wires of the travel switches mark 31 and 32.

## 3. Check the over-torque switches

When the actuator is turning to the clockwise direction, manually press the over–torque switch for the clockwise direction, the display window of the actuator should alarm twinkling, the motor will be stopped and the actuator will enter into the protection state. Release the over–torque switch, the display window is still twinkling, the actuator is still in the protection state.

If they've just been in reverse, exchange the two wires of the over–torque switches mark 61 and 62.

The way for removing the over–torque protection:

① Inputting a controlling signal less than the valve position value, the actuator will turn to the reverse direction to quit the protection state. The display and the actuator come back to the normal.

② Shut down the power supply. After tens of second, return on the power supply, the over–torque protection has been removed.

## 4. Set the sensitivity

After the above items have been finished checking, press the key A/M for exchanging to the automatic state. In this case, the feedback signal should be similar to the external set input signal. When the difference value of these two signals is in the scope of the allowance error value, if the actuator vibrates, the dFh value of the sensitivity should be reset. The dFh value would better be set between 0.5% and 2% namely 0.5~2, because that if the sensitivity is too low, the actuator will vibrate, if it is too high, the system could be effected. The concrete operation refers to the item 'The parameters setting'.

## 5. 阀位反馈零点与满度的标定

手动标定：确认执行机构已经处于自动状态下(C灯亮)，按下“SET”键再按“A/M”键此时显示板上排数码管显示“SEL”，下排显示“555”，按▶键、▲键或▼键，改变“555”显示为“4728”。按“SET”键再按“A/M”键，切换到手动(G灯亮)，再按下“▼”键使执行机构运行到您所需要的全关位置后同时按位移“▶”键与“▲”键；按下“▲”键使执行机构运行到您所需要的全开位置后同时按位移“▶”键与加“▲”键，校准完毕后为了防止误操作再次同时按下“▶”键与“▲”键；按下“▼”键再向下运行10%后；按“A/M”键切换到自动（C灯亮）时按“SET”键、“A/M”键后出现提示符“SEL”和“555”。后直接按“SET”键退出即可。此时手动校准0点与满度完成。控制器进入自动运行状态。

自动标定：除上面的密码“4728”手动标定阀位反馈零点与满度外还有一种是自动标定。方法如下：将给定信号给到50%；确认执行机构已经处于自动状态下(C灯亮)，按下“SET”键再按“A/M”键此时显示板上排数码管显示“SEL”，下排显示“555”，按▶键、▲键或▼键，改变“555”显示为“372 1”后按“SET”键退出后此时显示板的自动灯C和正转灯A同时亮，执行机构自动向全开方向运行直到压上您已设定好的全开位置的行程开关；然后自动灯C和反转灯E同时亮，执行机构自动向全关方向运行直到压上您已设定好的全关位置的行程开关；再往开方向运行到您已设定的50%的位置后停止。按“SET”键、“A/M”键后出现提示符“SEL”和“555”。后直接按“SET”键退出即可。此时自动校准0点与满度完成。控制器进入自动运行状态。

## 5. Demarcation of the valve position feedback zero point and full range

Manual demarcation: Please conform that the actuator has already been at automatic state (Lamp C is lighting.). Pressing the key 'SET' and then the key 'A/M', at this time, the up row digital tubes display 'SEL' and the down row digital tubes display '555'. Press the key▶,the key ▲ or key ▼ for changing '555' to '4728'. Pressing the key 'SET' and then the key 'A/M', it is over-changed to the manual state (Lamp G is lighting.). Press the key ▼ again to make the actuator turning to the required full closed position, then press the displacement key▶and the key ▲ at the same time. Press the key ▲ to make the actuator turning to the required full opened position, then press the displacement key▶and the key ▲ at the same time. Press the displacement key▼and the key ▲ at the same time again to avoid operating wrongly. Press the key ▲ to make the actuator turn to the closed position of 10%, then press the key 'A/M' for over-changing to the automatic state (Lamp C is lighting.). Pressing the key 'SET' and then the key 'A/M', at this time, the up row digital tubes display 'SEL' and the down row digital tubes display '555'. Press the key 'SET' directly to quit. The manual demarcation has been finished. The controller enters into the auto operating state.

Automatic demarcation: Besides the above way of the manual demarcation, there has another way for the demarcation. That is the automatic demarcation. The steps as follows: Give the set signal of 50%. Please conform that the actuator has already been at automatic state (Lamp C is lighting.). Pressing the key 'SET' and then the key 'A/M', at this time, the up row digital tubes display 'SEL' and the down row digital tubes display '555'. Press the key▶,the key ▲ or key ▼ for changing '555' to '3721'. Press the key 'SET' for quitting. At this time, the lamp C and lamp A are lighting at the same time, the actuator turns to the full opened direction till it has just pressed the set travel switch of the full opened position. Then the lamp C and lamp E are lighting at the same time, the actuator turns to the full closed direction till it has just pressed the set travel switch of the full closed position. Then make it turn to the set position of 50%. Pressing the key 'SET' and then the key 'A/M', at this time, the up row digital tubes display 'SEL' and the down row digital tubes display '555'. Press the key 'SET' directly to quit. The automatic demarcation has been finished. The controller enters into the auto operating state.

## 阀位反馈输出信号的标定

以上几项调试完成后，将输入信号给到4mA即0.0%，执行机构将运行到平衡位置。看一下您的反馈输出是否与给定一致，若不一致应通过密码“585”进入B菜单，(进入B菜单的步骤详见“参数设置”项。）在下拉菜单中找到“Out，0011”项，将“0011”改为“0051”，按“Set”键将出现“OE1”项，若输出值大于给定值，可通过按“位移▶”键改变小数点位置并配合“减▼”键直到反馈输出值与输入信号一致。若输出值小于给定值，可通过按“位移▶”键改变小数点位数配合“加▲”键直到反馈输出值与输入信号一致。按“Set”键退出菜单。

再将输入信号给定为20mA即100.0%，执行机构将运行到平衡位置。再按上述步骤进入B菜单将“Out”的值改为“0051”按“Set”键找到“OE2”按上述步骤改变“OE2”的值直到反馈输出值与输入信号一致。按“Set”键退出菜单，阀位反馈输出信号的标定完成。

## 正阀改反阀

不改变执行机构的接线，按照“参数设置”项的打码进入菜单找到“OUT＝0011”项，(出厂默认正作用)将“0011”改为“0091”，执行机构的正作用改为反作用。

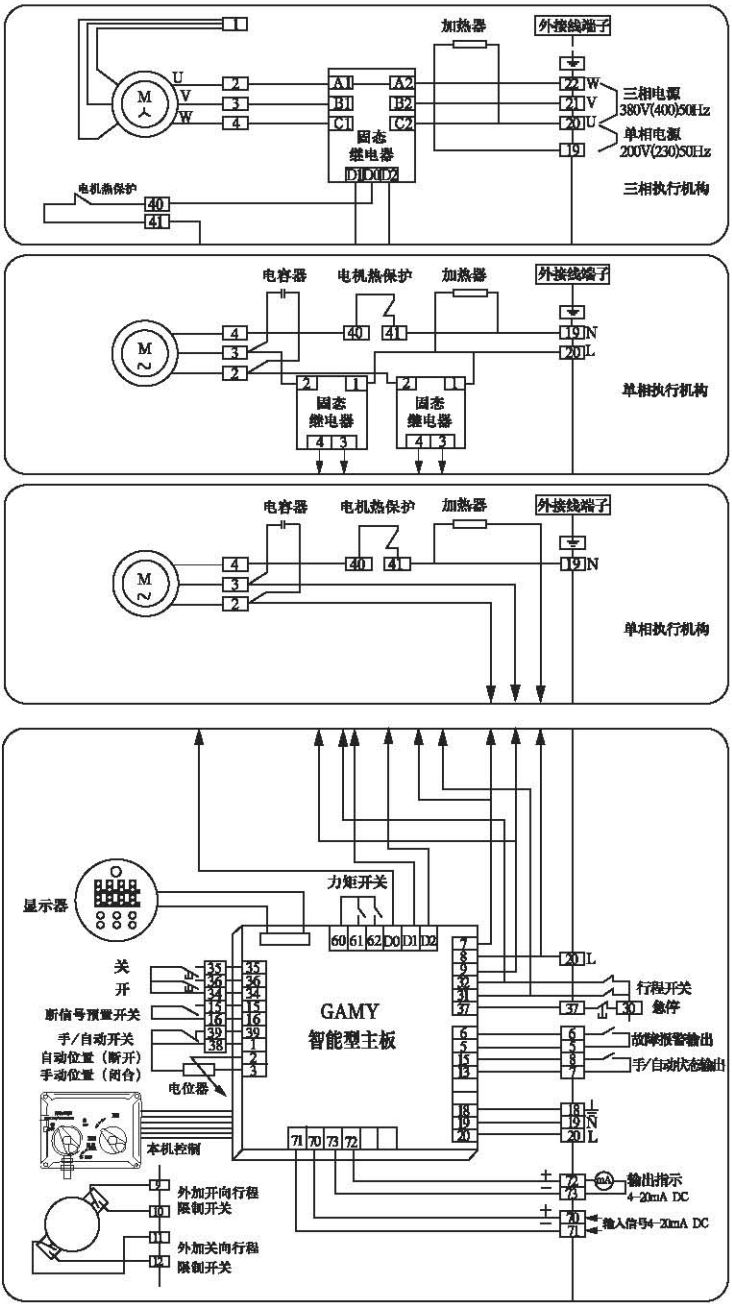
## Demarcate the valve position output signal

After finishing the above adjustment, give the input signal to 4mA namely 0.0%, the actuator will be operated to the balance position. Please check whether the feedback output is identical with the set signal. If they are not identical, please enter into menu B via the password '585'. (The steps of entering into menu B refer to the item 'Parameters setting'.) Find out the item ' OUT, 0011' in the pull-down menu, change '0011' to '0051'. If the output value is larger than the set value, change the position of the decimal point by pressing the displacement key▶and coordinate with the subtraction key▼to make the feedback output identical with the input signal. If the output value is less than the set value, change the position of the decimal point by pressing the displacement key▶and coordinate with the plus key▲to make the feedback output identical with the input signal. Press the key 'SET' to quit the menu.

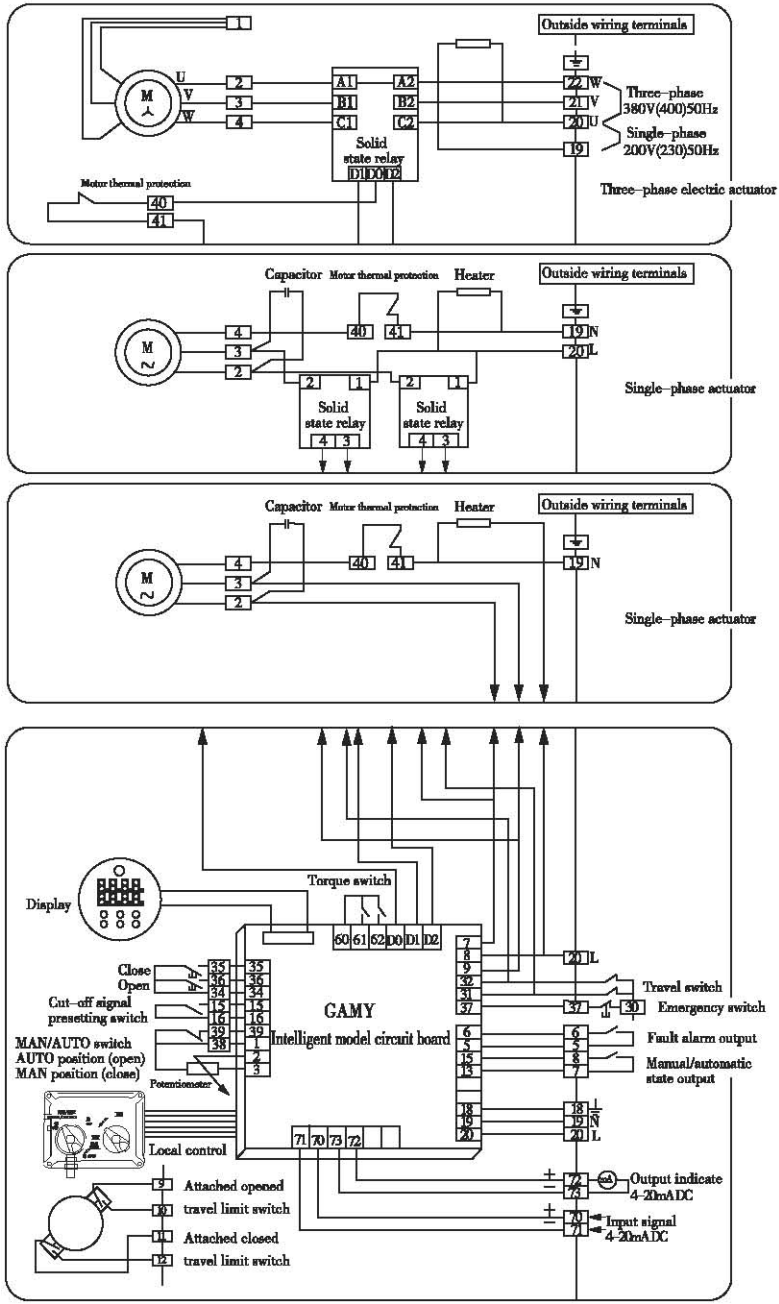
Then give the input signal to 20 mA namely 100%, the actuator will be operated to the balance position. Entering into the menu B according to the above steps, change the value of 'OUT' to '0051'. Pressing the key 'SET' to find out 'OE2', change the value of 'OE2' according to the above steps till the feedback output value is identified with the input signal. Press the key 'SET' to quit the menu. The demarcation of the valve position output signal has been finished.

## How to change the positive valve to the negative valve

Not to change the wiring of the actuator, enter into the menu to find out the item 'OUT=0011', according to the codes of the 'Parameters setting', (The positive action is the tacit ex-factory function.), then change '0011' to '0091', the positive action of the actuator has been changed to the negative one.




单、三相智能型电动执行机构接线图




34 Single-phase and three-phase intelligent electric actuator wiring diagram

## 智能型电动执行机构的安装与维护

1．执行器应在技术要求规定的工作条件进行安装和使用，且环境温度与相对湿度等条件应符合技术要求。

2．执行器出厂前根据您的定货要求已经进行了正确的设置，若要改变相应的设置参数，必须由熟悉工业控制的技术人员在充分了解了本仪表性能的基础上才能操作。

3．执行器在使用前，首先应检查现场的电源是否符合规定，在检查外接线是否牢固可靠并且接线正确后方可通电使用。

4．智能型电动执行机构的电机、机械内部具体结构、传动原理、特点及结构尺寸等，请见我厂“天津—伯纳德”电动执行机构产品样本。

5．您在使用中有好的建议和设想，请转告我厂，以便为您提供更好的产品和服务。

6．本品保留对执行器功能、内部参数含义及说明书修改的权利。

## The installation and the maintenance of the intelligent model electric actuator

1. The electric actuator should be installed and operated under the prescribed working condition in the technical specifications. And the environment temperature and the relative humidity should accord with the technical specifications.

2. The electric actuator has been adjusted to the correct position according to the requirement of the users, if it is necessary to change the corresponding parameters, only the technician who know well on the industrial control can operate it based on adequately understand the instrument performance.

3. Before the electric actuator is put into use, please check whether the power supply in the site accords with the specifications or not firstly, and then check whether the external wiring is fastened reliably or not. After the actuator is wired correctly, it can be electrified for operating.

4. The motor, the internal mechanical structure, the transmission principle, the characteristics and the configuration dimensions of the electric actuator please refer to the 'TIANJIN–BERNARD' electric actuator sample book.

5. If you have a good suggestion and idea, please send it to us for we can provide you a better product and service.

6. We hold our right on amending the function, the internal parameters and the instruction of the actuator.