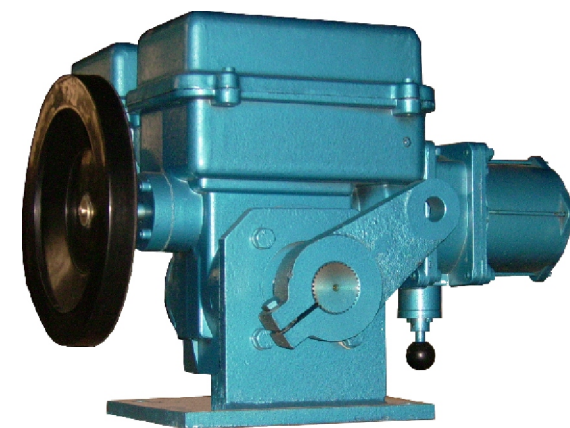


MD系列安装维护手册
MD Range
Installation and Maintenance Instruction

电动执行机构
ELECTRIC ACTUATOR



天津市宝恒控制阀门有限公司
BAOHNEG VALVE-CONTROL Co., Ltd



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1: 相关安全事项

电动执行机构装备于大电流工作条件下的工业场所，在使用过程中，设备内部带有危险的、未经过绝缘的、裸露的电器零件，同时具有运动或旋转的机械部件。所有不经过授权的打开机壳、不恰当的使用、不正确的操作或维修都有可能伤害到人身安全或者造成财产的损失。

产品使用工厂的安全负责人员应该确保遵守以下内容

- 只有具备资质的工程师可以进行设备的安装调试
- 应该向经常操作使用设备的相关人员提供正确的操作手册及其它的相关设备文件，以确保他们在所有时间内都能遵循设备手册或文件的指导内容进行操作使用。
- 不具备相关资质的人员不允许操作设备或接近设备
- 注意设备可以使用范围的技术数据和技术参数（安装、连接、环境及使用条件），以上数据应该包括在产品样本、订货合同、操作手册中。用户应该在产品文件中保留产品铭牌的详细内容。

如果用户对产品有疑问，特别是对产品技术参数的疑问，可以通过我公司的销售部门进行确认。确认时请提供使用产品的铭牌数据及系列号。

1: Terms concerned with safety

The electric actuators are equipment which is intended for use in heavy current industrial plants. During operation, this equipment has dangerous, uninsulated live parts and moving or rotating parts. Serious damage to health or property can therefore result from unauthorized removal of the necessary covers, improper use, incorrect operation or inadequate maintenance.

Those persons responsible for plant safety must therefore ensure that

- Only qualified persons are instructed to perform work on the equipment
- These persons have constant access to the operating instructions supplied and all other product documentation that is applicable to the work being carried out and that they are instructed to observe this documentation at all times
- Unqualified persons are not permitted to work on the machines or in the vicinity of the machines
- The technical data and specification concerning the permitted use (installation, connection, ambient and operating conditions) which are included in the catalogue, order documentation, operating instructions, the details on the name and rating plate and the remaining product documentation

In the event of doubt, especially in cases of a lack of product-specific details, clarification must be obtained via our sales department. Please quote the product type and serial number in any correspondence.

2: 运输与存储

- 使用坚固的包装将电动执行机构运输到安装地点
- 不允许使用设备的手轮作为吊装位置
- 电动执行机构应该存储在干燥、通风良好的房间里
- 电动执行机构在一年中应该至少接通电源一次，以保证电容器充满电（防止电解液干枯）
- 设备要避免放置于潮湿地面，应置于货架托盘之上
- 应当保证电器密封盖密封紧密，即使电缆出口也要严格密闭

3: 产品安装

- 在安装电动执行机构之前应检查其外形及安装尺寸，安装时执行机构周围要留出足够的空间以便调试、操作及检修。同时要避免执行机构受到强烈震动。
 - 虽然执行机构本身具有防水外壳，但是不能侵入水中使用，如果安装位置可能长期受水冲刷，用户应考虑额外的防水措施。
 - 对于直连式法兰安装的设备，电动执行机构可以水平、垂直或倾斜安装。法兰尺寸符合ISO5216的设计标准。如果需要非标准的安装尺寸请及时于我公司联系。
 - 对于底座型安装的设备，电动执行机构通常建议水平安装。安装平面应平整。使用球形铰链或其它连接形式应该注意以下几个问题。
- ① 连接阀门的输出臂尺寸应该与电动执行机构的输出臂尺寸长度相同。
- ② 两个输出臂在安装时应保持平行并且在一个平面上。执行机构的机械零位应于阀门零位保持一致。

2: Transport and storage

- Transport equipment to the installation location in rigid packaging
- Do not attach lifting gear to the hand-wheel
- Store in a dry, well-ventilated room
- The actuators are to be connected the main supply at least once per year to fully regenerate the capacitor
- Protect against damp floors by storing on a shelf or palette
- Keep covers of the electrical control unit closed as well as the through-holes for cables

3: Installation

- Before installation, checked the configuration and dimensions of actuator. When the actuator is mounted, it should have enough space to manual operation, adjustment and inspection.
 - For flange mounted equipment, the actuator may be installed vertically, horizontally or inclined, the dimension of flange is keeping with the ISO 5216 standard. If it is non-standerd, please consult with us.
 - For foot-plate mounted equipment, the actuator recommend be installed horizontally. The installation plane should be smooth. The connection of actuator with valve can be realized by means of link lever or ball-joints. To pay attention to the following notes:
- ① The valve connective size of output arm in keeping with actuator`s.
- ② The two output arms should be mounted to keep parallel and keep in the same plane.

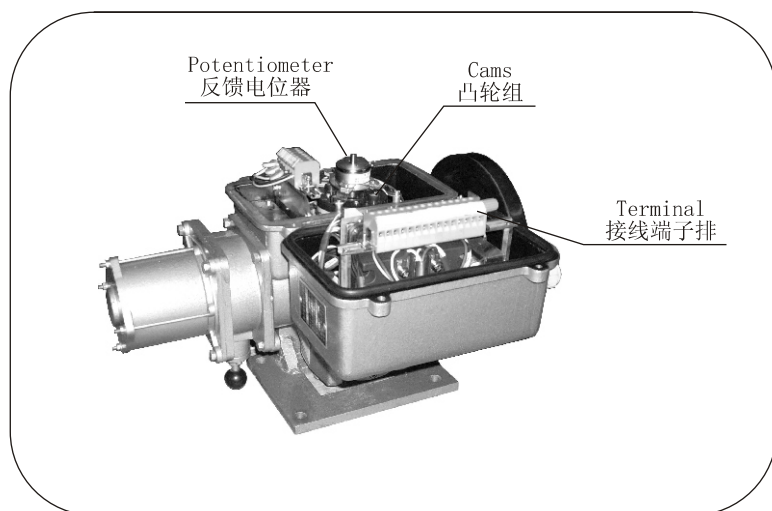


③ 两个球形铰链的张力作用点应在一个平面上，两个输出臂保持在平行平面以避免附加力矩。

④ 出于防锈及维修考虑所有与阀门的安装配合面应涂抹润滑脂，并且定期检查加油。

4: 电器连接

- 电动执行机构一旦正确接线，在所有接线端子上会带有危险的电压，请勿直接触摸端子区域，防止触电。
- 所有的电动执行机构控制元件均连接到接线端子排上，打开接线端子外盖，通过电缆接线孔将电缆引入执行机构并接到端子排上。在接线前请检查电源电压是否与产品的铭牌相符合，按照接线图的正确接线。接线后，通过手轮将执行机构旋转到中间位置，通电检查执行机构的旋转方向是否正确。



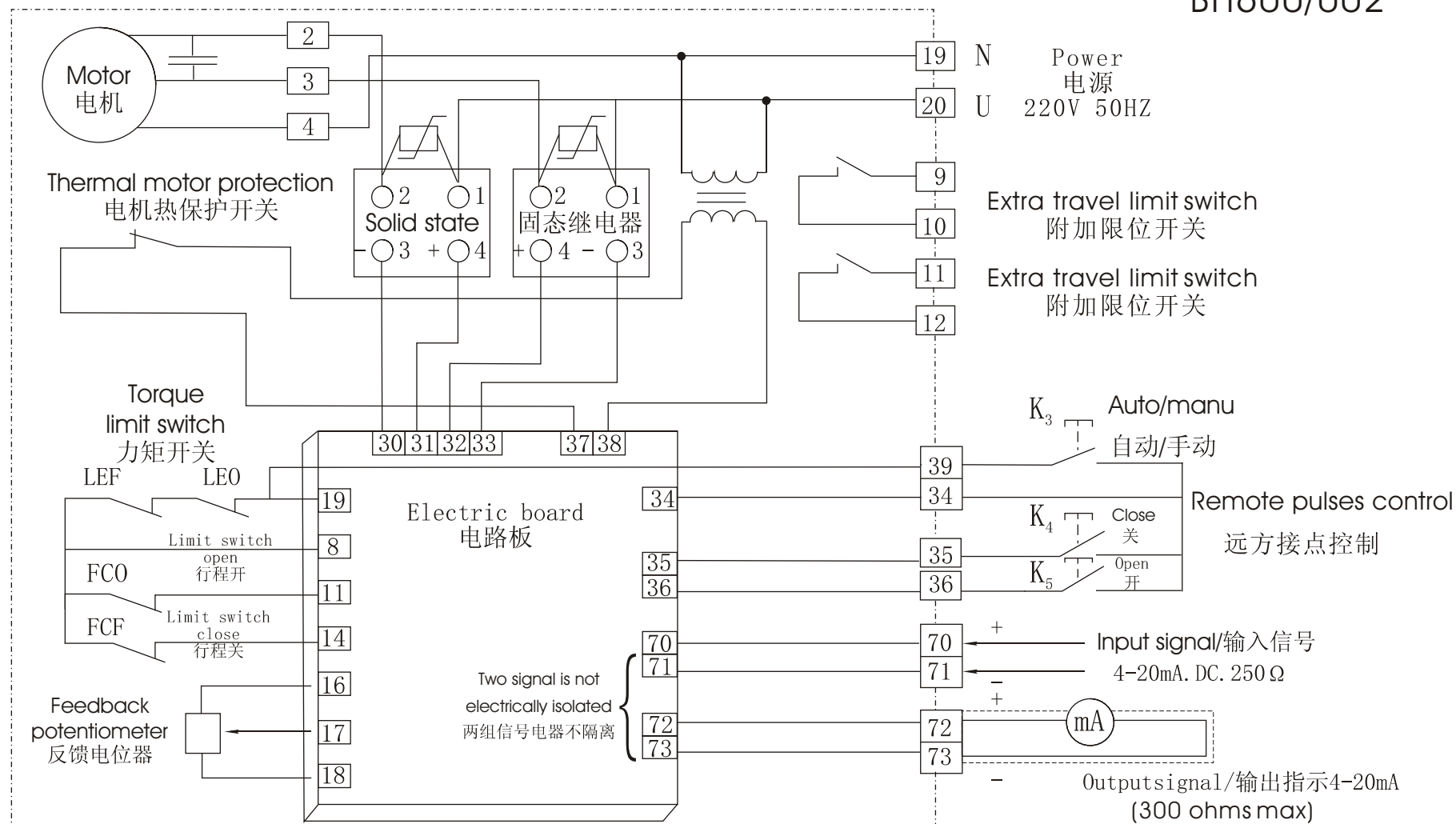
③ The tension point of two ball-joints is keeping same plane, it is necessary to keep parallel with the plane of two output arms, to avoid the additional torque.

④ For the rust proof and convenient maintenance to coat the grease on the mounted plane when the actuator connected with valve.

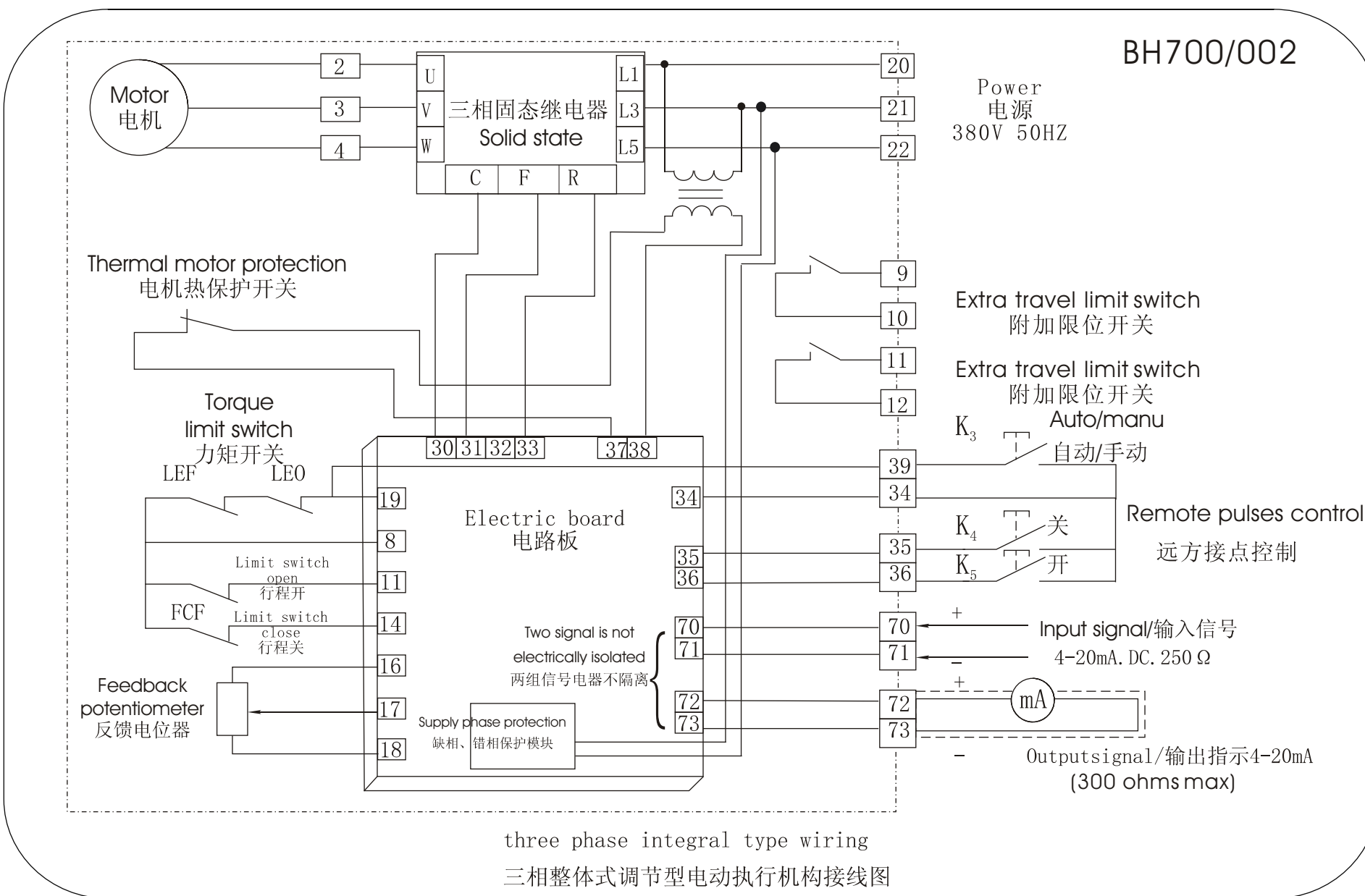
4: Electric connection

- DANGER: The component are designed such that once correctly connected, uninsulated, live parts cannot be touched directly in the terminal area. Protection against electric shock is provide.
- All actuator control elements are wire to a terminal strip in the switch compartment. Remove the cover and insert the cables through the cable glands in order to reach the terminal strip. The connections are made in accordance with the diagram. Before beginning this procedure, make sure that power supply voltage is in accordance with the actuator nameplate. After the terminal connections have been made, move the valve manually to the half-open position and verify proper rotation electrically.

BH600/002



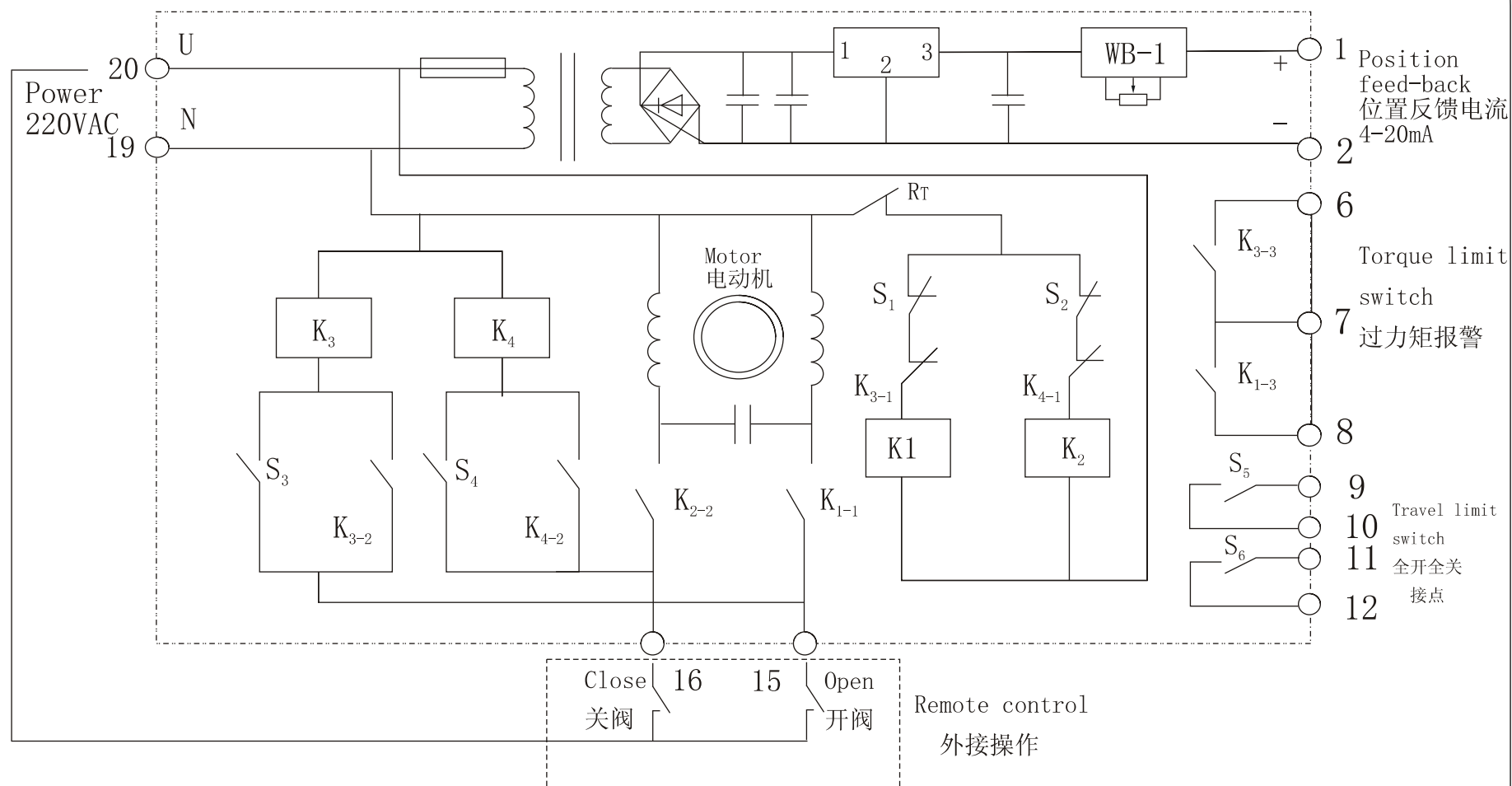
Single phase integral type wiring
单相整体式调节型电动执行机构接线图



● MD 系列相关的接线图

● Wiring diagram of MD range

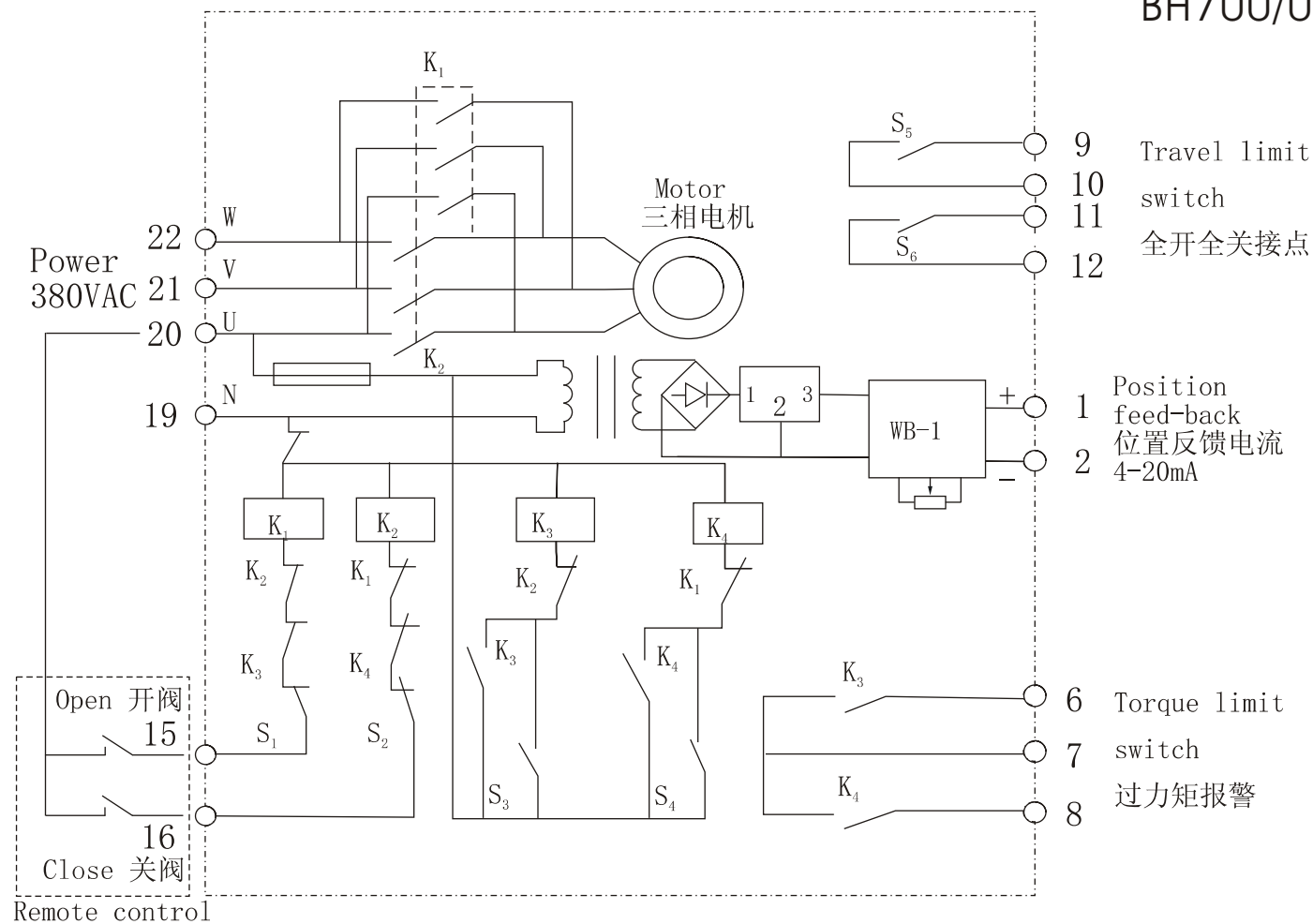
BH600/003



Single phase remote control type wiring(without self-holding)

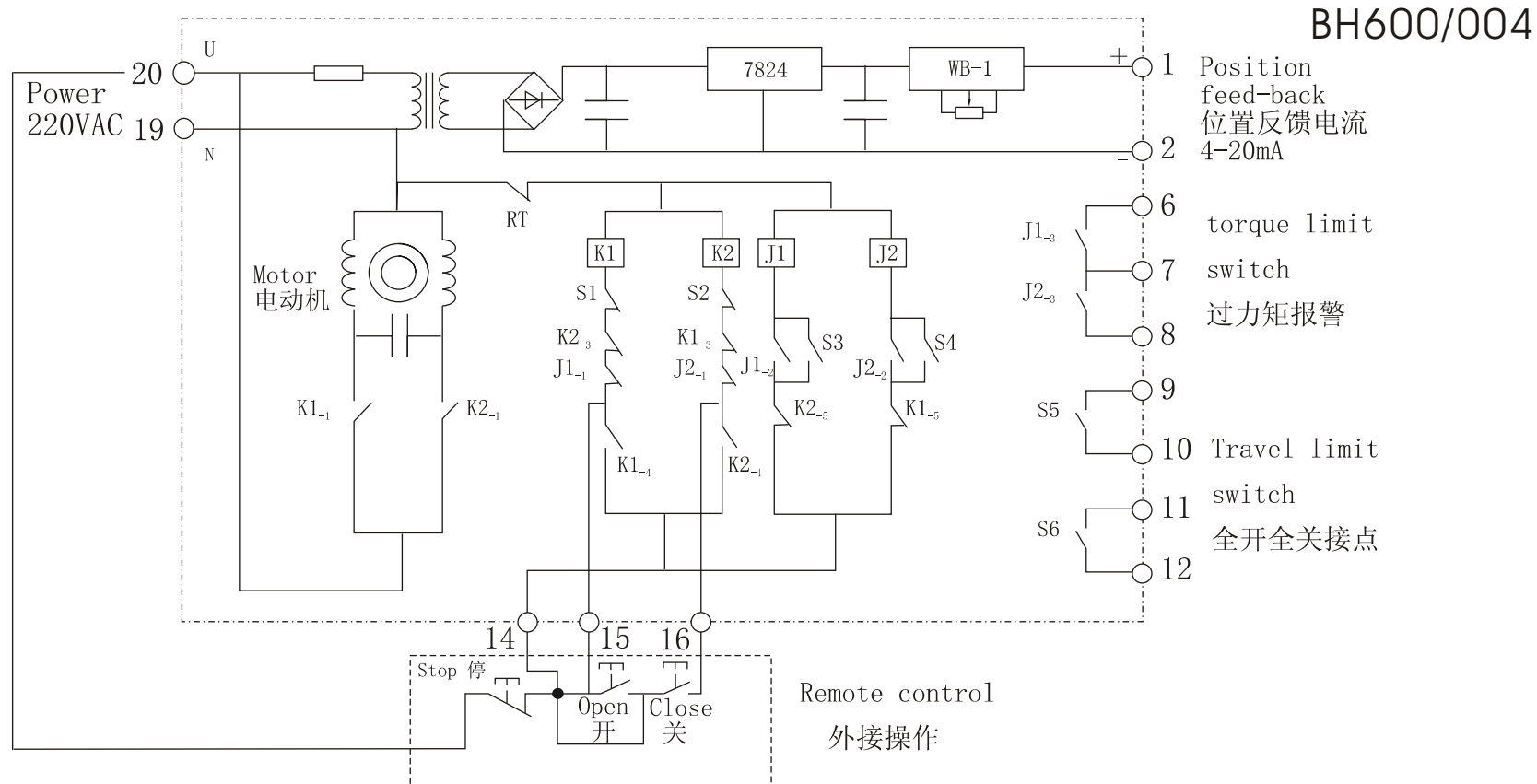
单相整体式远控型电动执行机构接线图(不带电器自锁)

BH700/003



● MD 系列相关的接线图

● Wiring diagram of MD range

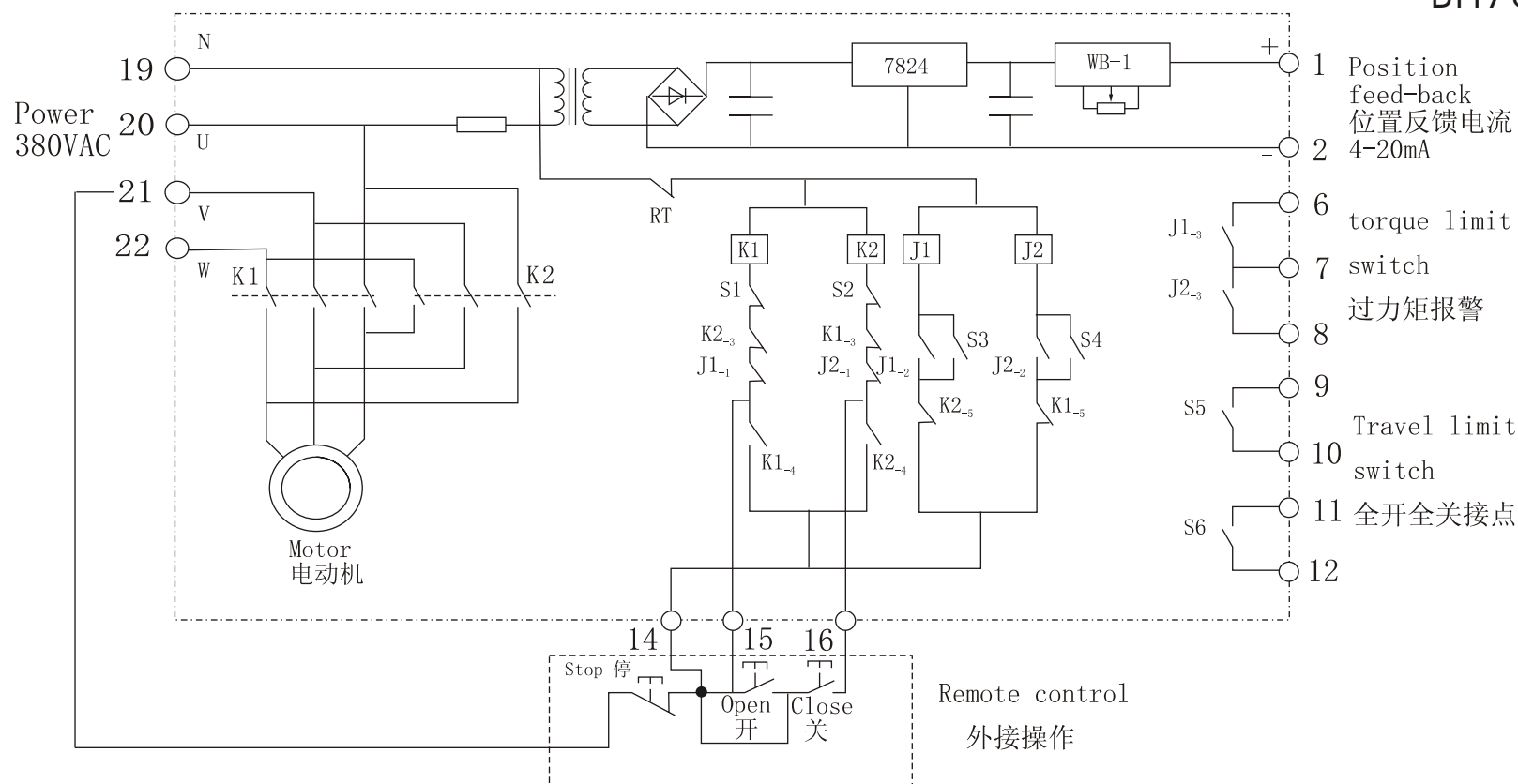


K1 open contact K1 开向接触器	K2 close contact K2 关向接触器	J1 open torque limit relay J1 开向力矩保护继电器	J2 close torque limit relay J2 关向力矩保护继电器	S1 open limit switch S1 开向限位开关
S2 close limit switch S2 关向限位开关	S3 open torque limit switch S3 开向力矩开关	S4 close torque limit switch S4 关向力矩开关	S5 open travel limit switch S5 附加开向位置开关	S5 close travel limit switch S5 附加关向位置开关

Single phase remote control type wiring(with self-holding)

单相整体式远控型电动执行机构接线图(带电器自锁)

BH700/004



- | | | | | |
|------------------------------------|--|--|---|---|
| K1 open contact
K1 开向接触器 | K2 close contact
K2 关向接触器 | J1 open torque limit relay
J1 开向力矩保护继电器 | J2 close torque limit relay
J2 关向力矩保护继电器 | S1 open limit switch
S1 开向限位开关 |
| S2 close limit switch
S2 关向限位开关 | S3 open torque limit switch
S3 开向力矩开关 | S4 close torque limit switch
S4 关向力矩开关 | S5 open travel limit switch
S5 附加开向位置开关 | S5 close travel limit switch
S5 附加关向位置开关 |

three phase remote control type wiring(with self-holding)

三相整体式远控型电动执行机构接线图(带电器自锁)

5: 执行机构调整

5.1: 调节型执行机构的调整

- 电动执行机构在出厂前已经调试完毕，一般情况，不需要用户重新调整。
- 如果执行机构输出臂的位置与阀门位置不对应，请拆下输出臂，改变位置重新装配。

重新调整电动执行机构

- 更换反馈电位器应该重新设定 0%。
- 更换电路板应该重新设定 100% 和灵敏度。
- 更换电动机后应该检查执行机构的旋转方向。

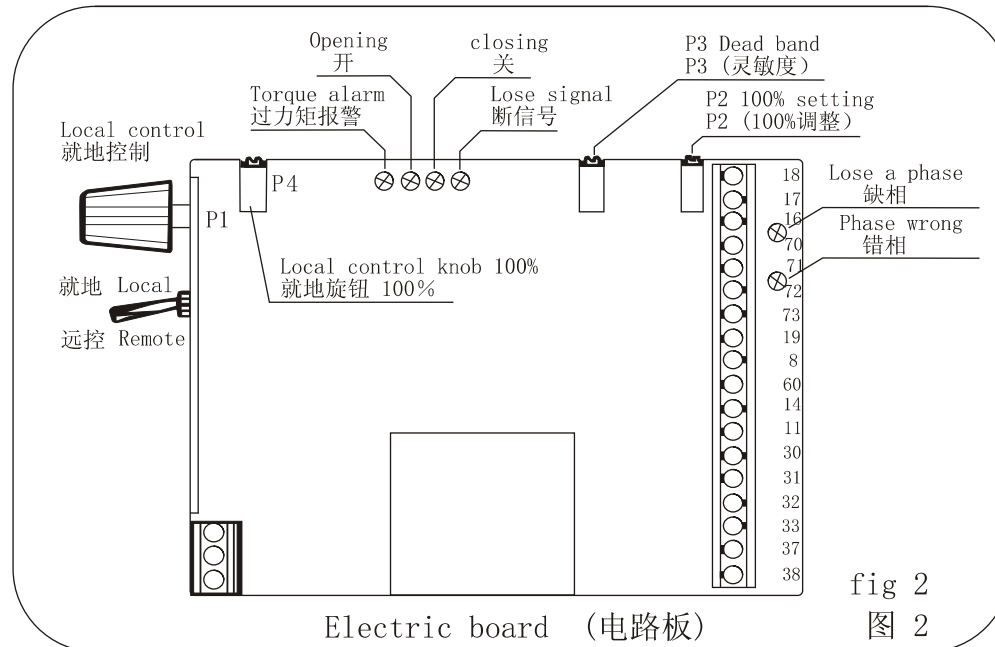
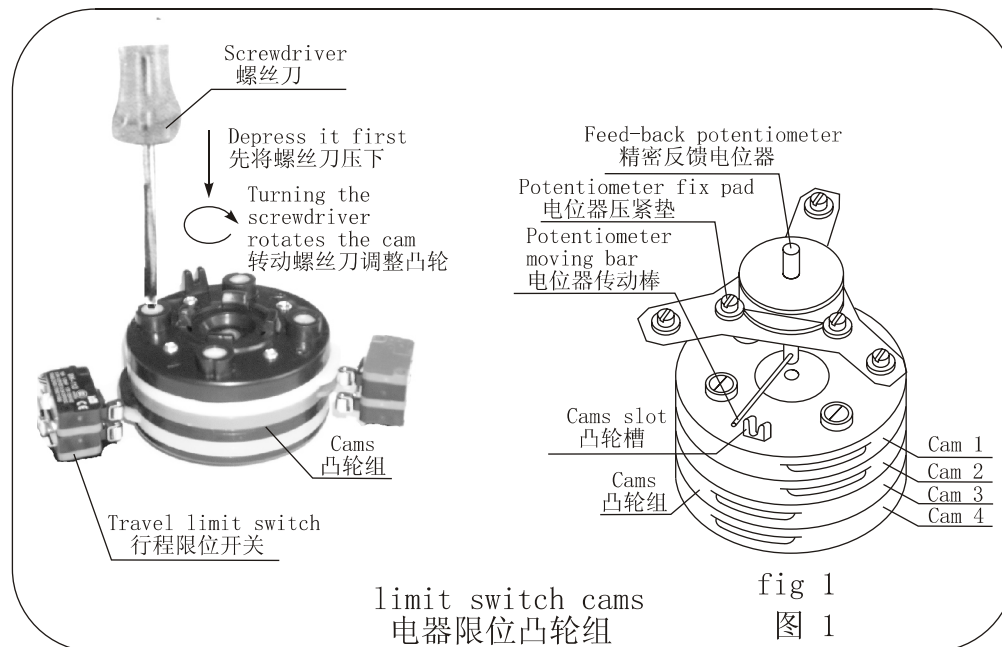
5: Adjustment of actuator

5.1: Adjustment of integral -type modulating actuators

- The adjustment of integral-type actuators have been done in our factory. Generally, It is not necessary to re-adjust.
- If the arm of actuator is not a good position with the valve, please taking the arm apart from actuator, changing the position and re-assembly it.

Re-adjustment of actuator

- Changing the potentiometer should re-setting 0%.
- Changing the electric board should re-setting 100% and dead band.
- Changing the motor should check rotation direction of the actuator.



旋转方向

- 接线后，请先检查执行机构的旋转方向是否正确,调试过程如下：使用手轮将电动执行机构转动到全程的中间位置，断开端子 39-34-35-36 的外接线，将电路板上的“就地—远控”开关拨到“就地”位置，将就地控制旋钮P1也转动到中间位置（参考图2）。

接通电源，使用手动操作旋钮 P1 操作执行机构朝不同的方向运动。

当电动执行机构朝“开”向转动时黄指示灯点亮。
当电动执行机构朝“关”向转动时绿色指示灯点亮。

如果出现其它情况，请立即关闭电源，检查电路接线。

如果电路板上的红色力矩指示灯（见图2)点亮，表示过力矩状态有效，如果旋转方向错误，则过力矩保护无效。

如果电路板上的红色断信号指示灯（见图2)点亮，表示4-20mA控制信号故障，请检查输入信号。

● 设置灵敏度

灵敏度在出厂前已经设定好，如果用户需要获得更好的调节品质，可以使用电路板上的 P3 改变灵敏度（提高灵敏度可以顺时针调节P3），灵敏度过高，执行机构容易产生振荡。

注意：灵敏度调节过高，执行机构会只朝一个方向转动。

Direction of rotation

- After connection, please inspect whether the directing of rotation is correct. The adjustment procedures is as following: Turn the handwheel to make the actuator at mid-travel. Cut off the wires between terminal 39-34-35-36. Set change-over switch of the electric board in `local` position, turn the control knob P1 at the mid-travel in advance. Refer to fig2.

Supply the power voltage, then with the operation manual control knob P1, made the actuator rotated for different direction.

When the actuator turn for `open` diredtion,the yellow LED on.
When the actuator turn for `closed` diredtion,the green LED on.

In any other case, cut off the power supply immediately and check the wiring between the motor and the terminal.

A red LED is twinkling when torque limit switch is tripped. This protection state is in-effective in the case of a wrong direction of rotation

Another red LED is twinkling when lose of signal4-20mA
third red LED is twinkling when lose one phase power.
fourth red LED is twinkling when phase of power wrong

● Setting of dead band

This setting has been done in our factory, but it is possible to obtain a finer accuracy by regulating potentiometer P3 (dead band will decrease when P3 is turn CW). If setting is too narrow, actuator is hunting.

Note: of dead band is excessively narrow, actuator may operate in one direction only.

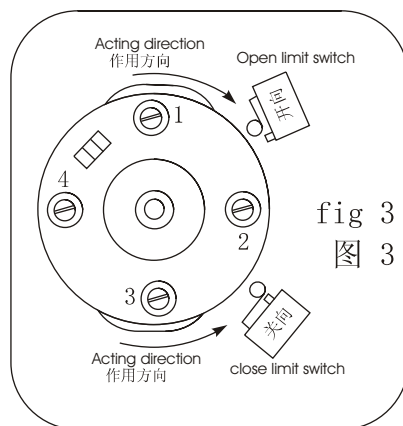


fig 3
图 3

● 行程限位的设定

行程限位在出厂前已经设定完毕。

首先，关闭电源，打开控制箱的盖子，可以看见反馈电位器及凸轮组件（参考图1）。

松开电位器固定板的螺丝，可以看到下面的凸轮组件，上面装有4只凸轮，使用不同颜色区分，下面的两只凸轮4及凸轮3（绿色及黑色）用于行程限位。

转动手轮使电动执行机构动作到全关位置，使用螺丝刀压下凸轮4，并旋转凸轮直到关限位开关动作，抬起螺丝刀，限位凸轮被锁定在此位置。使用同样的方法设定全开位置。

在完成以上调整后，使用手轮将执行机构转动到中间位置：固定电位器压板时请注意将电位器的驱动棒放入凸轮槽内。

凸轮1及凸轮2用于用户的中途限位，可以根据用户的要求调整到所需位置。

● 设定位置0%

在完成以上调整后将电路板上的转换开关置于“就地控制”，接通电源。顺时针转动手动操作旋钮P1到端点位置，电动执行机构将动作到全关位置。

如果执行机构开始朝关方向转动，并且在到达限位开关以前停止，请松开反馈电位器的压板，小心地转动电位器直到凸轮碰到行程开关，同时绿色指示灯熄灭。拧紧电位器压板。

● End of travel setting

This setting has been done in our factory.

First at all, switch off the power supply. To take the cover of the control box, then it can be seen that the cams and potentiometer mechanism.(refer to Fig 1)

Loosen the potentiometer fixing pad, the cams is below. The cams is equipped with 4 cams. Having different colours. The under-cam 4 and 3 (blue and black) for controlling the beginning and the end of travel limits.

Turn the handwheel to operate the actuator until in the full close position, by means of a screw-driver press and rotate the cam 4 to the position in which it can trip the limit switch for close position, lift the screw-driver, the cams are locked in this position at once. Proceed on the same way for the open position.

After adjustment has completed, operate the actuator by handwheel to mid-travel: fix the potentiometer plate. Now we should put the driving rod of potentiometer into the slot of the cams.

The cams 1 and 2 for half way of limits, it is can adjusted according, to the need of the users.

● Setting of 0%

Above adjustment has completed set changeover switch on the electric board in local control and put the power supply on. Turn manual control knob P1 clockwise to the end position, actuator will operate to close direction.

If the actuator start to rotate for the close direction and stops before reaching the closed limit switch. Please loose the fixing pad of potentiometer and turn carefully the potentiometer till the actuator reaches close travel limit switch an GREEN LED is off. Re-tighten pad.

如果电动执行机构朝全关方向动作，并且在碰到行程开关前没有停止（换言之，凸轮已经压下全关行程开关，由于开关的作用停止了动作，但是关向的绿色指示灯仍然点亮）。在此情况下，松开反馈电位器的压板，小心地调整电位器使绿色指示灯熄灭。重新压紧电位器。

- 设定 100%

转动就地操作旋钮 P1 使执行机构动作到 100% 的全开位置，并且在碰到行程限位开关后停止动作。

如果执行机构开始朝开方向转动，并且在到达限位开关以前停止（黄色指示灯熄灭），顺时针旋转电路板上的 P2 电位器（见图2），使执行机构动作到行程限位开关。如果执行机构碰到限位开关后停止动作，但是黄色指示灯仍然点亮，反方向调整电位器 P2 使黄色指示灯熄灭。

做完以上调整设定后，请将电路板上的转换开关拨到“远方控制”位置。

连接输入控制信号，执行机构接受 4mA 时位置在 0%，接受 20mA 信号时位置在 100%，其它位置与输入信号成比例关系。

反作用的调整（逆时针全关）

- 根据以下的操作步骤可以将电动执行机构改为反作用（逆时针关阀）

比照标准接线图及电路板图（图3）改变以下接线。

If the actuator start to rotate for the close direction and does not stops before reaching the closed limit switch(that is, close limit switch is tripped, and actuator does not rotate, but GREEN LED is on). In this case loose the fixing pad of potentiometer and turn carefully the potentiometer to the other direction till GREEN LED is off. Re-tighten pad.

- Setting of 100%

Turn the manual control knob P1 to the end of 100% position the actuator starts to rotate for the open direction and stops in reaching open travel limit switch 100% mechanical position.

If actuator starts to rotate for the open direction and stops before reaching open travel limit switch(YELLOW LED is off). Turn potentiometer P2 counter clockwise until the actuator reaches open travel limit switch. If the actuator starts to rotate for the open direction and does not stop before reaching open travel limit switch, in this case, turn potentiometer P2 counterclockwise until YELLOW LED is off.

After that setting, turn the changer-over switch in `remote` position.

Connecting the input signal, actuator is in the position at 4mA to 0% and 20mA to 100%. Actuator is operation proportionally to all intermediate signal.

Anticlockwise for the close direction.

- According to the changing method shown as follow, the actuator can execute anticlockwise for th close direction.

Compare whit the standard wiring and Fig3 (rotating for the clockwise direction 4mA) the following change have to be made on terminals of the electronic board:

- Exchange 16 and 18 terminals wiring (feedback potentiometer reversal)
- Exchange 11 and 14 terminals wiring (travel limit switch reversal)
- Exchange terminal board 2 and 3 terminals wiring (motor turning reversal)
- Re-adjusting the zero position of the actuator 0%

● Remote pulses command

When using the Remote pulses command, the input signal (4-20mA) will not control the actuator.

- Short-circuit terminals 39-34 = remote pulses command switch on
- Short-circuit terminals 35-34 = close command switch on
- Short-circuit terminals 36-34 = open command switch on

5.2: Adjustment of remote control type actuators

- The adjustment of remote control type actuators have been done in our factory. Generally, it is not necessary to re-adjust.
- Turn the actuator to the mid-travel position by handwheel (to observe the position).

According to wiring diagram, connect the actuator with the power supply.

Special Attention:

Inspection of supply phase (only for three phase supply)

- Switch on the actuator push button open, the actuator start rotate, seeing Fig3 push the open limit switch, if the actuator stop, phase order is correct, if not stop, switch off supply immediately, changing between of two phase of power.

- Exchange 16 and 18 (about potentiometer)
- Exchange 11 and 14 (about travel limit switch)
- Exchange 2 and 3 terminal of motor
- Re-setting the potentiometer for 0%

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- Switch on the actuator push button open, the actuator start rotate, seeing Fig3 push the open limit switch, if the actuator stop, phase order is correct, if not stop, switch off supply immediately, changing between of two phase of power.

● 调整执行机构

使用手轮将电动执行机构转动到全关0%位置（距离机械限位大约2°的距离）。调整凸轮4使其碰到关向行程限位开关（听到开关动作声）松开反馈电位器压板，仔细调整电位器使输出指示电流在4mA（如果偏差很小，也可以使用WB-1上的0%电位器调整）。压紧反馈电位器。用手轮将执行机构转动到全开100%位置（距离机械限位大约2°距离），调整凸轮3使其碰到开向行程限位开关（听到开关动作声），使用WB-1上的100%电位器将输出的反馈电流调整到20mA。

6: 产品维护及故障处理

问 题	原 因	应对措施
执行机构不动作	电源	检查电源，并且与铭牌参数核对
	电机热保护动作	检查电机是否过热，如果电机过热后经过冷却，电路会恢复正常。
	接线松动	检查所有接线端子上的接线是否松动，检查电路板上的连线是否有脱落。
执行机构不跟随控制信号动作	红色LED点亮：过力矩开关动作	如果执行机构已经碰到其机械限位，使用手轮调整执行机构的机械限位，并且重新调整电器限位。
	接线错误	检查端子 70 及 71 上的输入信号。
	执行机构在远方接点控制方式	执行机构在远方接点控制方式时 4-20mA 控制信号无效。
	执行机构在就地控制方式	检查电路板上的切换开关是否切换到远方控制方式。

● Adjustment of actuator

Turn the actuator to closed position by handwheel(about 2° to the mechanical limit). Adjust the cam item 4 close direction until it can trip the closed travel limit switch. Loosen the fixing pad of potentiometer, carefully turn the potentiometer to make the indication of the milliammeter 4mA (if the error is small, a micro-adjustment may be done by setting the 0% of WB-1). Re-tighten the pad. Turn the actuator rotated to 100% position by handwheel(about 2° to the mechanical). Adjust the cam item 3 to open direction until it can trip the open travel limit switch. To make the output signal at 20mA by setting WB-1 100%.

6: Maintenance and troubleshooting

PROBLEM	CAUSE	CORRECTIVE ACTION
No operation	power	Check the power supply voltage, compare with nameplate.
	Tripping of motor thermal protective device	Check if the motor is hot. The actuator will again be available after the motor has cooled off.
	the wire is loosen	Check the wiring in the terminal and electric board
The actuator dose not follow the commands	The red LED is lit: torque limit switch tripped	If the actuator is on mechanical stop, disengage it with the handwheel and again set the stroke.
	Bad wiring	Check input signal connection between the terminals 70 and 71.
	Remote pulsed control mode	In this mode input signal(4-20mA) can not control the actuator.
	Local control mode	Check the electric board change-over switch should put on remote position.

问 题	原 因	应对措施
执行机构没有停在正确位置或振荡。	灵敏度设定不正确	重新调整灵敏度
执行机构没有停在关向限位开关前面 (控制信号4mA)	关向限位开关设定不正确	重新调整关限位开关，执行机构的限位开关必须与阀门的全关位置对应。
	位置0% 调整不正确 电机经过重新接线，旋转方向与出厂时相反，（用户更换了电机）	重新调整执行器的反馈电位器 用户更换电机时，应该注意电机的线号，如果与出厂方向不一致，请将电机端子的2和3线互换。
执行机构没有停在开向限位开关前面 (控制信号20mA)	开向限位开关设定不正确	重新调整开限位开关，执行机构的限位开关必须与阀门的全开位置对应。
	位置100% 调整不正确 电机经过重新接线，旋转方向与出厂时相反，（用户更换了电机）	重新调整电路板上的100%调节电位器 用户更换电机时，应该注意电机的线号，如果与出厂方向不一致，请将电机端子的2和3线互换。

PROBLEM	CAUSE	CORRECTIVE ACTION
The actuator does not stop on the right position and is hunting.	The dead band setting is not correct.	Re-setting the dead band.
The actuator does not stop on the closing limit switch (input 4mA)	Closing limit switch is misadjusted	Adjust the closing limit switch. The closing limit switch must be actuated with the valve closed.
	Position 0% is misadjusted	Adjust actuator potentiometer.
	Motor has been unwired and rotates in the reverse direction (motor replacement)	When replacing a motor, wire markings must be observed. In case of doubt, check rotational direction, change over wires 2 and 3 of the motor terminal strip.
The actuator does not stop on the opening limit switch (input 20mA)	opening limit switch is misadjusted	Adjust the opening limit switch. The opening limit switch must be actuated with the valve open.
	Position 100% is misadjusted	Adjust 100% potentiometer on the electric board.
	Motor has been unwired and rotates in the reverse direction (motor replacement)	When replacing a motor, wire markings must be observed. In case of doubt, check rotational direction, change over wires 2 and 3 of the motor terminal strip.



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