HQB 系列

核电厂 1E 级部分回转阀门电动装置

SERIES HQB
CLASS 1E ELECTRIC VALVE ACTUATORS USED IN NUECLEAR PLANT

使 用 说 明 书

OPERATION INSTRUCTION

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1 概　　述　　GENERAL DESCRIPTION

HQB 系列阀门电动装置是为满足核电站使用要求专门设计的阀门电驱动装置，适用于阀瓣做旋转运动的阀门，如球阀、蝶阀等。产品遵循并符合以下标准：

1）IEEE382-1996《IEEE Standard for Qualification of Actuators for Power Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants》，等效于 EJ/T531-2001《核电厂安全级阀门驱动装置的鉴定》。

2）EJ/T1022.11-1996《压水堆核电厂阀门电动装置》。

3）NB/T20010.11-2010《压水堆核电厂阀门　第 11 部分：电动装置》

4）GB/T24923-2010《普通型阀门电动装置技术条件》。

本装置根据核电厂工作环境，分成三种类型：

H1 型：用于安壳内，有事故、有辐照、抗地震的环境。（也能满足 EJ/T1022.11-96、NB/T20010.11-2010 标准中 K1 类环境）

H2 型：a)用于安全壳内，有辐照、抗地震，无事故的环境； b)用于安全壳外，受事故影响，有辐照、抗地震的环境。（也能满足 EJ/T1022.11-96、NB/T20010.11-2010 标准中 K2 类环境）

H3 型：用于安全壳外，无事故影响、无辐照，需抗地震的环境。（也能满足 EJ/T1022.11-96、NB/T20010.11-2010 中 K3 类环境）

Series HQB electric valve actuators are designed to meet the demand of nuclear power stations and are suitable for the operation of ball valves, butterfly valves etc. These actuators are conformed to the following standards:

1) IEEE382-1996 **IEEE** Standard **for Qualification of Actuators for Power Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants**(idt.EJ/T531-2001 **Qualification of Actuators for Power Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants)**

2) EJ/T1022.11-1996 **Electric Valve Actuators Used in Pressurized-Water Reactors**

3) NB/T20010.11-2010 **Electric Valve Used in Pressurized-Water Reactors eleven : Electric Actuators**

4) GB/T24923-2010 **Specifications of Normal Type Electric Valve Actuators**

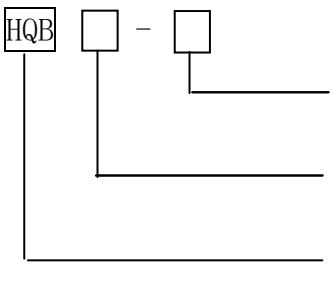
These actuators are divided into three types according to plant service environment:

Type H1: used inside containment, subject to event, radiation and seismic environments (satisfied to Category K1 environmental conditions in **EJ/T1022.11-96**、NB/T20010.11-2010)

Type H2: (a) used inside containment, subject to radiation and seismic environments but without event environment; (b) used outside containment, subject to effect of event, radiation and seismic environments (satisfied to Category K2 environmental conditions in **EJ/T1022.11-96**、NB/T20010.11-2010)

Type H3: used outside containment, without effect of event, radiation and seismic environments (satisfied to Category K3 environmental conditions in **EJ/T1022.11-96**、NB/T20010.11-2010)

2 型号表示方法　REPRESENTATION OF TYPE



输出轴额定转速： r/min （用阿拉伯数字表示）Rated output speed: r/min (indicated with Arabic numerals)

输出轴额定转矩 ×10N·m（用阿拉伯数字表示）Rated output torque ×10N·m (indicated with Arabic numerals)

产品型号：分 H1、H2、H3 三种类型，Q 表示部分回转，B 为开发序列

Type of product: divided into three types of H1, H2 and H3. Q means

part-turn, and B is the serial number of development sequence.

3 工作环境和主要技术数据 SERVICE ENVIRONMENTS AND MAIN TECHNICAL DATA

1. 动力线电源:三相 380V+5% -10%,50Hz+5% -5%　　Power lines: three-phase 380V+5% -10%,50Hz+5% -5%

控制线：单相 220V+15% -15%, 50Hz+5% -5%　　Control lines：single-phase 220V+15% -15%, 50Hz+5% -5%

其它电压和频率需特殊订货。Other ratings of voltage and frequency need special order.

2. 工作定额：短时 15 分钟，　　负荷操作次数：40 年内 2000 次。

Rating: short time duty, 15 min　　Loaded operation cycles: 2000 in 40 years

3. 正常使用条件: Normal Service Conditions:　　表 1　Table 1

环境条件　service environment	H1	H2	H3
温度　Temperature　（C° ）	-20～70	-20～70	-20～60
压力　Pressure　（MPa）	0～0.6	0～0.6	0～0.6
相对湿度　Relative Humidity　（%）	≤100	≤100	≤95
辐照累积剂量 Accumulated Radiation Dose（Gy）	1.9×10^6	1.9×10^6	0
地震加速度，在 X,Y,Z 三个方向 Seismic acceleration，in three direction of X,Y,Z（g）	6	6	6
地震频率范围 Seismic spectrum （Hz）	2～35	2～35	2～35

4.事故使用条件：Event Conditions：　　表 2　Table 2

事 故 Event Conditions	失水事故　LOCA
温 度 Temperature （C° ）	185
压 力 Pressure　（MPa）	0.56
相对湿度 Relative Humidity（%）	100

失水事故 LOCA 工况时，安全壳内喷淋，重量百分比为 1.5%的硼酸与氢氧化钠溶液，室温下 PH 值为 10.5。

For LOCA condition, chemical spray solutions inside containment consist of 1.5% by weight of boric acid and sodium hydroxide to PH 10.5 at room temperature.

5. 防护等级 Protection: IP68；电机绝缘等级 motor insulation：H1、H2：H；H3：F.

6. 规格和主要技术数据见表 3。（重量以铭牌为准）For specifications and main technical data, see Table 3. (Weight of product is based on the nameplate)　　表 3　Table 3

型号 Type	电机 Motor			转速 Speed		最大控制转矩 Max.cntl torque N·m	最小控制转矩 Min.cntl torque N·m	阀杆直径 Dia of stem mm	手动速比 Hand oper ratio	重量 WT kg
	功率 Power kW	额定电流 Current A	堵转电流 Locked A	1rpm	2rpm					
				额定转矩 Nominal torque N·m						
HQB 12.5	0.03	0.25	1.75	125		>125	62.5	22	63	34
	0.05	0.45	3.15		125					
HQB25	0.05	0.45	3.15	250		>250	125	28		
	0.09	0.68	4.76		250					
HQB50	0.09	0.68	4.76	500		>500	250	42	47	49
	0.18	1.22	8.54		500					
HQB100	0.18	1.22	8.54	1000		>1000	500	50		53
	0.25	1.4	9.8		1000					
HQB200	0.25	1.4	9.8	2000		>2000	1000	60	53	100
	0.55	2.4	16.8		2000					
HQB300	0.37	1.8	12.6	3000		>3000	1500	60		
HQB400	0.55	2.4	16.8	4000		>4000	2000	80		106

说明：电机的起动电流和最大电流约为表格所示的额定值的 7 倍，运行过程中电流偏大是正常现象。

Note:The motor starting current and maximum current is about 7 times the rated value, the operation of the current is too large is a normal phenomenon.

4 结　构　　STRUCTURES

HQB 系列电动装置主要由专用电机、减速器、行程控制器、转矩控制器、开度指示器、手电动切换机构和手轮组成。（见图 1-1 和 1-2）减速器由齿轮副和蜗轮副组成。行程控制器采用凸轮机构，凸轮与输出轴同步。转矩控制器利用蜗杆窜动带动曲拐和摇杆压迫微动开关从而发信。开度指示器用于现场指示阀门开启程度和远传阀位开度信号。手电动切换机构为半自动形式，即手动操作时须先扳动切换手柄再转动手轮，电动时手柄自动复位，切不可手动扳回。输出轴中装有花键套，取出转过一微小角度以调整阀门全关位置。花键套在输出轴中不定位，用户可使用紧定螺钉或阀杆上的轴肩来定位。

Series HQB electric actuators are made up of electric motor, gear reducer, travel limit, torque limit, position indicator, auto/hand shift and handwheel (see Fig. 1 and Fig. 2). Gear reducer consists of gear pair and wormgear pair. Travel limit adopts cam mechanism and is synchronous with output shaft. Torque limit makes use of worm shaft drunkenness driving bellcrank and rocker to press microswitch and transmit signals. Position indicator is used for local valve position indicating and remote valve position signal transmitting. Auto/hand shift is semiautomatic. When hand manual operating, pull the shift lever to hand position and then operate the actuator by handwheel. When electrically operating, the shit lever will turn back to original position automatically. Do not push the shift lever back by hand. There is spline housing inside the output shaft. Users may pull the spline housing out and rotate a slight angle to reach complete seating of valve. The spline housing is not fixed inside the output shaft; it may be fixed by users with shaft shoulder of valve stem or with holding screw

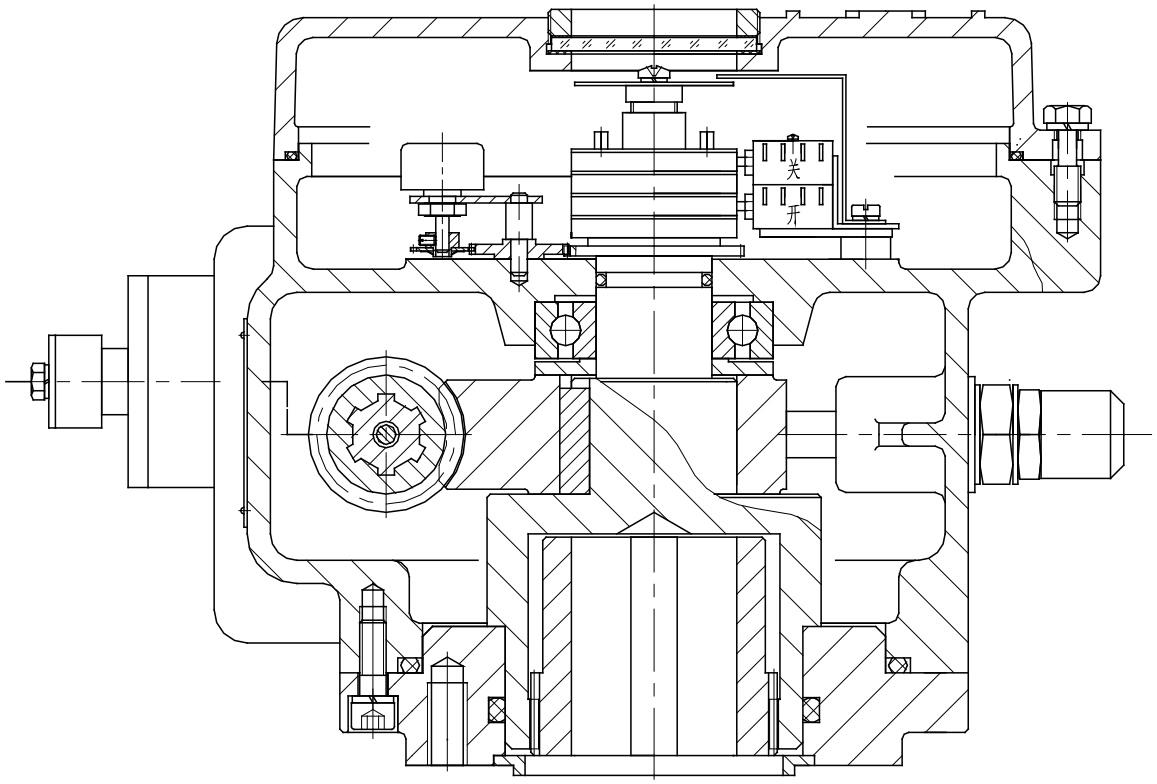


图 1-1　结构简图之一

Fig. 1-1 Structure scheme A

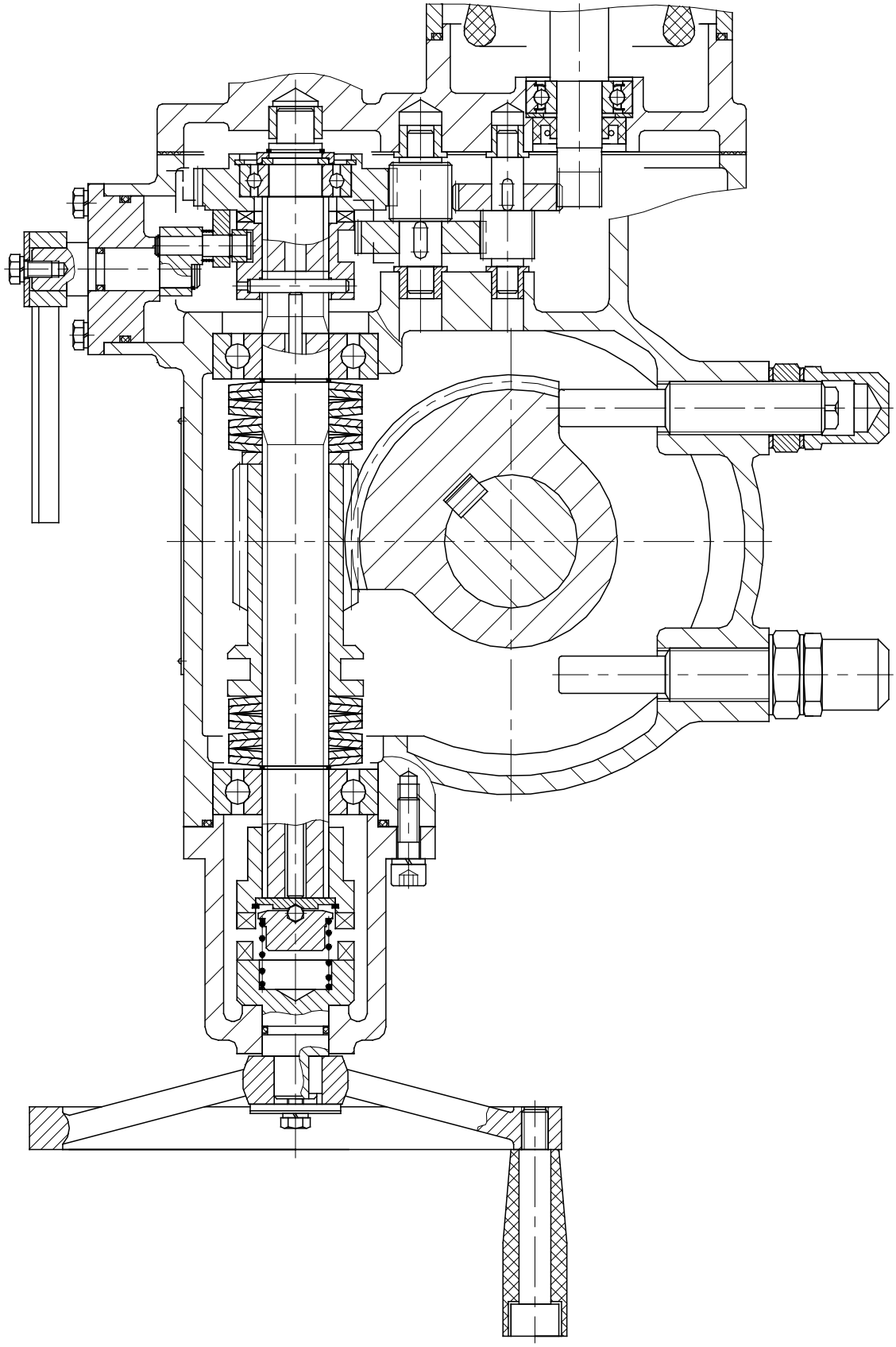


图 1-2　结构简图之二

Fig. 1-2 Structure scheme B

5. 外形和连接尺寸　PROFILE AND CONNECTING DIMENSIONS

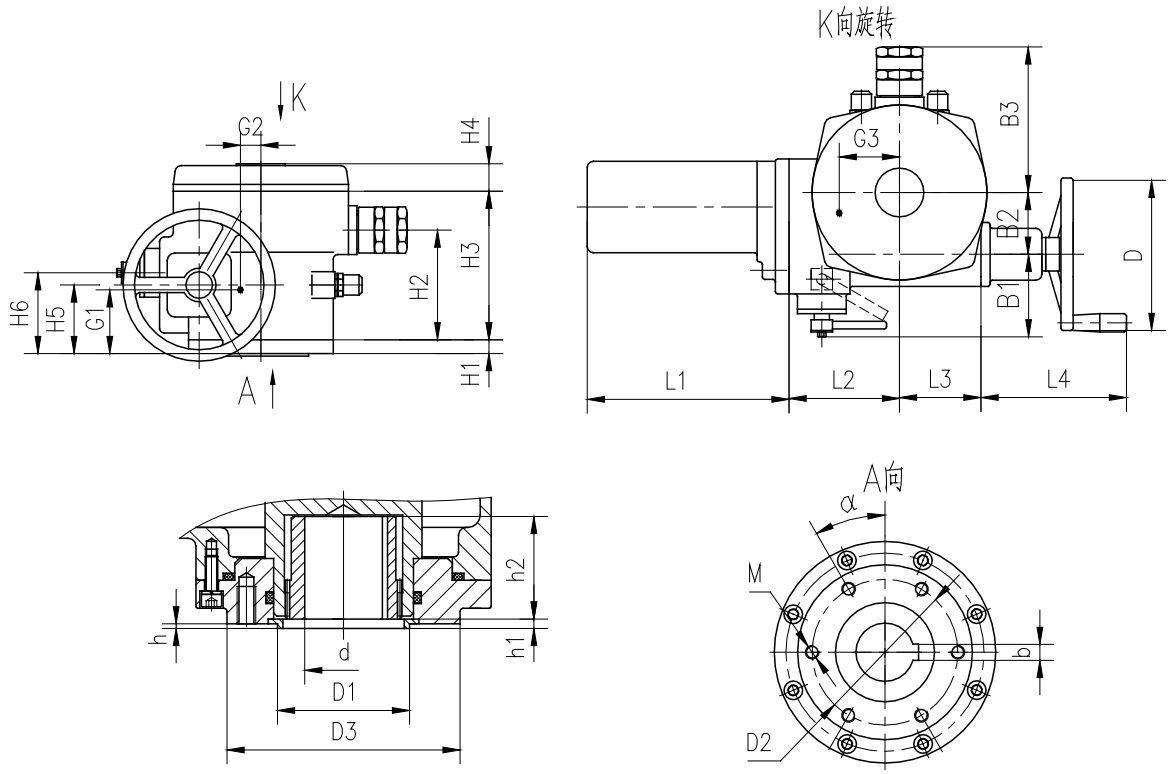


图 2 外形、重心位置和连接尺寸图 Fig. 2 Profile, center of gravity and connection

外形尺寸表　Over Size　　表 4　Table 4

型号 type	L1	L2	L3	L4	D	B1	B2	B3	H1	H2	H3	H4	H5	H6
HQB12.5	135	146	84	177	145	101	63	191	18	105	130	45	72	90
HQB25	135(145)	146	84	177	145	101	63	191	18	105	130	45	72	90
HQB50	145(165)	145	107	191	200	108	81	191	23	130	155	45	95	111
HQB100	165(196)	145	107	191	200	108	81	191	28	130	155	45	100	116
HQB200 300	196(221)	200	123	200	400	75	132	211	29	174	199	45	133	--
HQB400	221	200	123	200	400	75	132	211	29	174	199	45	133	--

重心位置及连接尺寸表　Centre of Gravity and Connection Dimensions　　表 5　Table 5

型号 type	G1	G2	G3	d(H9)	D1(f8)	D2	D3	b	M	α °	h	h1	h2
HQB12.5	73	35	68	22	0	70	90	6	6-M8	30	0	3	47
HQB25	73	35	70	28	0	70	90	8	6-M8	30	0	3	47
HQB50	90	37	72	42	70	102	125	12	4-M12	45	3	6.5	66
HQB100	90	37	78	50	85	125	150	14	6-M12	30	3	6.5	66
HQB200 300	110	50	84	60	100	140	175	18	6-M16	30	4	8	97
HQB400	110	50	90	80	130	165	210	22	6-M20	30	4	8	97

1）尺寸 L1 为电机长度，表中带括号的 L1 用于输出转速 2r/min 的规格。

2）HQB200～HQB400 其手电动切换手柄如图中虚线所示的位置。3）图中键槽位置通常为阀门全关时的位置。

4）电缆接头一个,见图 4，穿线孔直径 d 由电缆外径决定，对外接头 M50×1.5-7H，接头六角对边 55。

5）特殊规格、特规连接尺寸以合同和技术协议为准，说明书不再更改。

1) Size L1 is the length of electric motor. Sizes of L1 in parentheses in Table 4 are for specifications of 2 r/min.

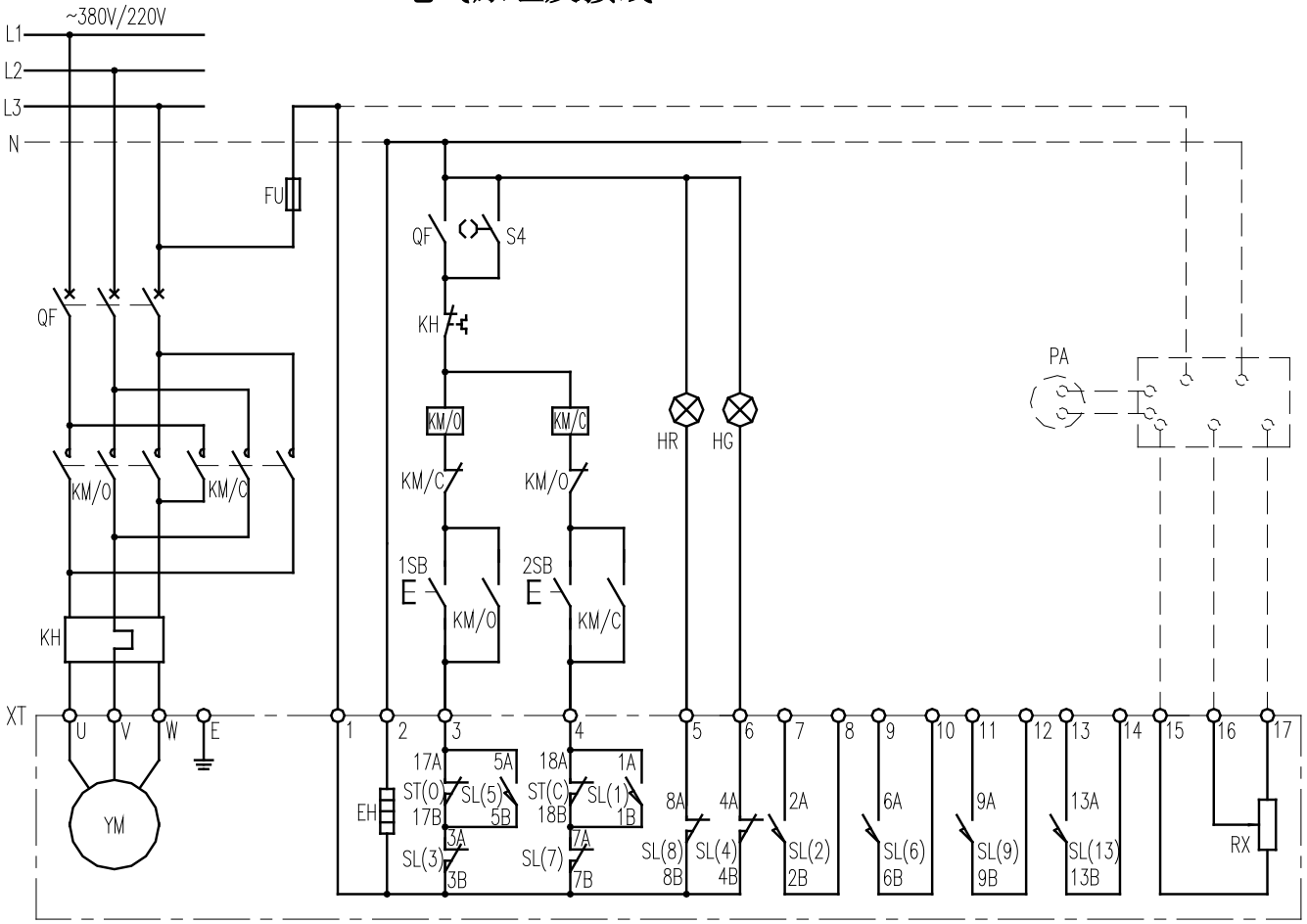
2) The location of auto/hand shift on HQB200～HQB400 is indicated by dash line in Fig. 2.

3) Position of key bed in figures is generally based on valve seating completely.

4) Bore diameter of cable attachment (see Fig. 4) depends on outer diameter of cable. Outer interface of attachment is M50×1.5-7H, and hexagonal side of attachment is 55.

5)Special specification, special connecting dimensions are based on the contract and technical agreement.So the instruction manual will not be changed.

6 电气原理及接线 SCHEMATIC CIRCUIT DIAGRAM AND WIRING DIAGRAM



行程开关接点表 limit switch development

开关 switch	符号 symbol	触点 cont. No.	阀门开度 proportion of travel 全关 close	中间 middle	全开 open	接点号 terminal
行程开关 limit switch	SL	(1)				1A-1B
		(2)				2A-2B
		(3)				3A-3B
		(4)				4A-4B
		(9)				9A-9B
		(10)				10A-10B
		(11)				11A-11B
		(12)				12A-12B
		(5)				5A-5B
		(6)				6A-6B
		(7)				7A-7B
		(8)				8A-8B
		(13)				13A-13B
		(14)				14A-14B
		(15)				15A-15B
		(16)				16A-16B
力矩开关 torque switch	ST	(O)				17A-17B
		(C)				18A-18B

——— 接点闭合 contact closed

电气元件表 electric elements

代号 code	名称 name	代号 code	名称 name
YM	电动机 motor	PA	电流表 galvanometer
KH	热继电器 thermal relay	RX	电位器 potentiometer
KM/O KM/C	交流接触器 A.C.contactor	EH(5.1k20w)	空间加热器electric heater
FU	熔断器 fuse	ST(O)	开向力矩开关 torque switch (open)
QF	断路器 circuit breaker	ST(C)	关向力矩开关 torque switch (close)
1SB 2SB	按钮 switch button	SL(1)~(4)、(9)~(12)	开向行程开关 limit switch (open)
HR HG	指示灯 indicating lamp	SL(5)~(8)、(13)~(16)	开向行程开关 limit switch (close)
S4	延时开关 delay switch		

说明：点划线框内的元件均在电动装置上。

Note:Components in dash dottedLine are built in.

图 3. 电气原理图 Fig.3 schematic diagram

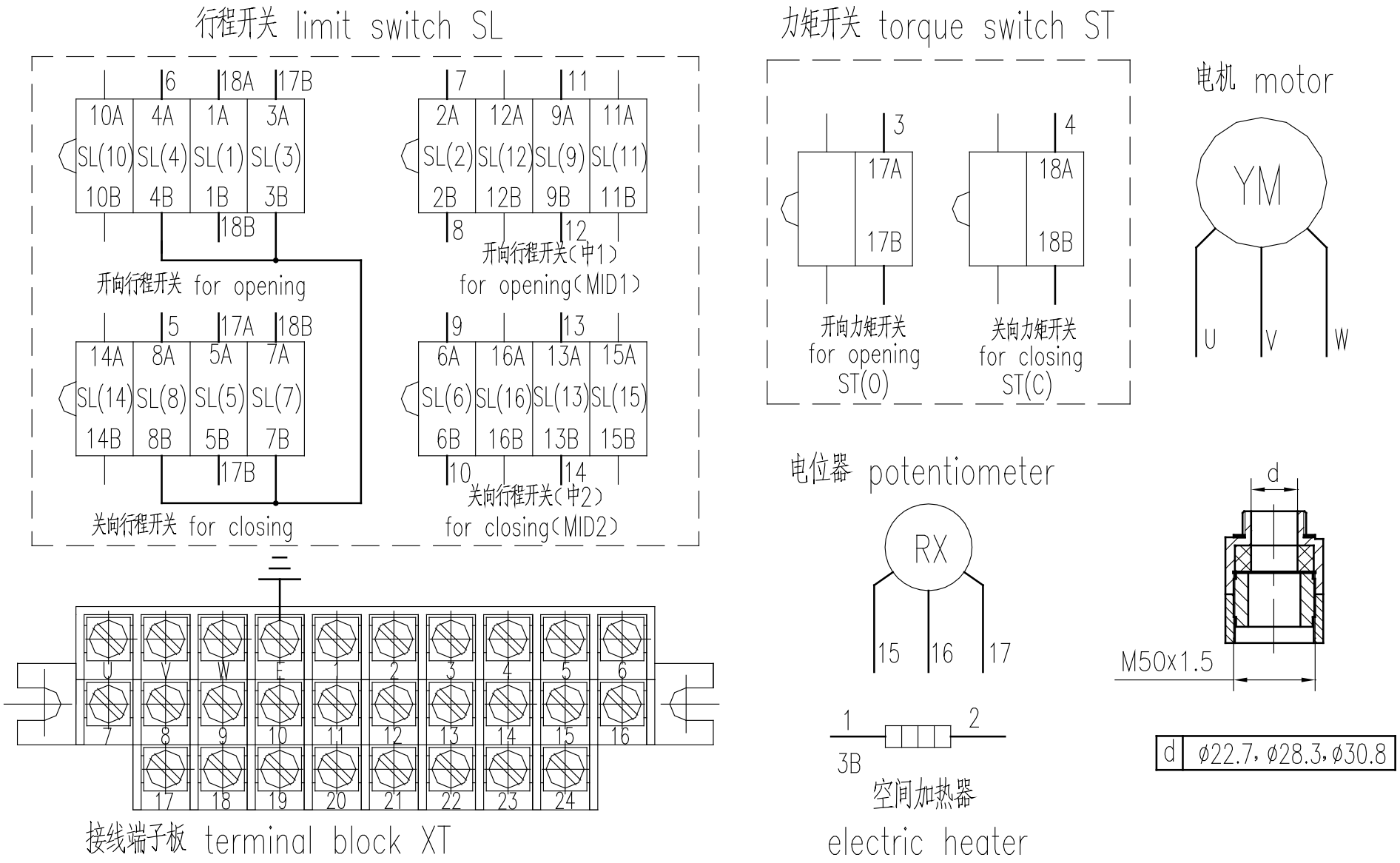


图 4. 电气接线图

Fig.4 wiring diagram

7 调　　整 ADJUSTMENT

1.行程控制机构调整

行程控制机构见图 5，机构设有“开”、“关”、“中 1”和“中 2”四个控制单元。“中 1”和“中 2”可以用于中间位置，也可用于开向或关向的极限位置。（在本电气原理中，中 1 用于全开位置，中 2 用于全关位置）调整的目的是使阀门达到所需的位置时，凸轮能准确地触动微动开关，从而发出控制信号。调整步骤如下：

1. Adjustment of travel limit

The travel limit is as shown in Fig. 5. Travel limit is provided with four control units of “OPEN”, “CLOSE”, “MED 1” and “MED 2”. “MED1” and “MED 2” can be used for middle positions, and can also be used for limited position in opening direction or closing direction. (In this schematic circuit diagram, “MED 1” is used for full opening, and “MED 2” is used for complete seating.) The purpose of adjustment is to make the valve reach the required positions. The adjusting steps are as following:

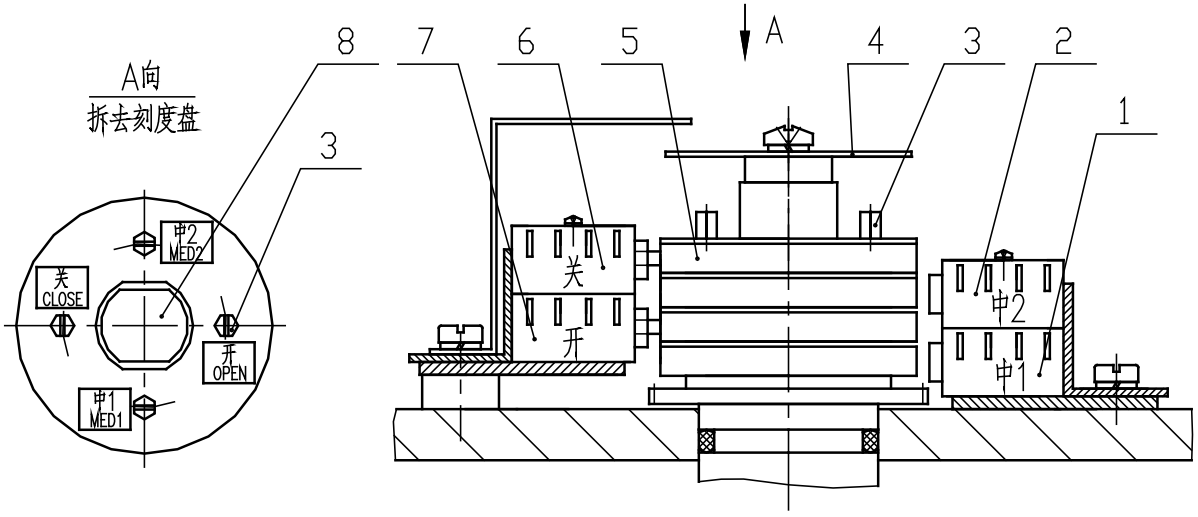


图 5 行程控制机构　　Fig.5 travel limit mechanism

1.“中 1”微动开关 Microswitch(MED1)	2.“中 2”微动开关 Microswitch(MED2)	3. 调整轴 adj.axle	4. 刻度盘 Scale Dial
5. 凸轮 Cam	6. 关向微动开关 Microswitch(CLOSE)	7. 开向微动开关 Microswitch(OPEN)	8. 紧圈 strainer

1.1 转动手轮，使阀门达到全关位置。

1.2 拆下刻度盘，转动关向调整轴，使关向凸轮刚好触动关向微动开关（听到“卡达”声）。如果用起子转动调整轴时，转不动或很费劲，则必须适度拧松紧圈（需先松开紧圈上的紧定螺钉）但不能太松，否则调好的位置将会变动。

1.3 打开阀门至约 50%的开启位置，电动关闭阀门，检查阀门关闭时停止的位置是否符合要求，如不符合，按上述方法微量调整凸轮，直至符合为止。

1.4 把阀门打开到全开位置，转动开向调整轴，使开向凸轮刚好触动开向微动开关（听到“卡达”声）。

1.5 关闭阀门至约 50%的关闭位置，电动打开阀门，检查阀门是否开到位，如不符合要求，按上述方法微量调整凸轮，直至符合为止。

1.6 中间位置的调整：中 1 和中 2 两个中间位置，用户可用于开向或关向的中间位置（也可是全开或全关位置），调整方法与上面相同。

以上调整完成后，为防止凸轮位置变动，可将紧圈拧紧些。最后装上刻度盘，通电重复检查1～2次。

1.1 Rotate the handwheel to make the valve complete seating.

1.2 Remove the scale dial and rotate the adjusting axis for closing to make the cam just touch the microswitch (a click is heard). If it is hard to rotate the adjusting axis with a screwdriver, it is necessary to loose the strainer properly (It is needed to loose the holding screw on strainer first). But the strainer could not be too loose, or the adjusted position will be changed.

1.3 Open the valve to 50% of travel, then close the valve electrically to check if the stop position meets the demand. If it does not, set the cam little by little according to above method till it does.

1.4 Operate the valve to full opening and rotate the adjusting axis for opening to make the cam just touch the microswitch (a click is heard).

1.5 Close the valve to 50% of travel, and then open the valve electrically to check if the stop position meets the demand. If it does not, set the cam little by little according to above method till it does.

1.6 Adjustment of middle positions: users may use the two positions of “MED 1” and “MED 2” for the middle position in opening direction or in closing direction. The adjustment is as the same of the above method.

After the above-mentioned adjustment finished, preventing the cam position from changing, the strainer may be tightened a little. Finally mount the scale dial and operate the valve electrically to check once or twice.

2 转矩控制机构的调整 adjustment of torque mechanism

转矩控制机构见图 6，本装置在出厂前，启闭方向的转矩值均整定在额定控制点上，一般不需要再作调整，若现场需重新调整，方法如下：

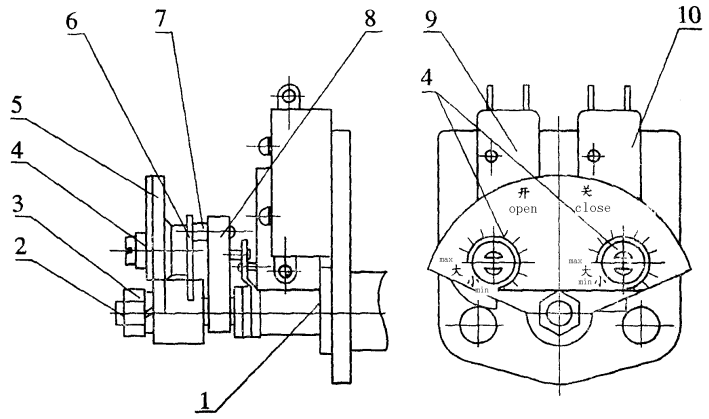


图 6 转矩控制机构 Fig.6 torque mechanism

1.动作片 Action strip
2 .齿 轴 Gear spindle
3.螺 母 Nut
4.调整钉 Adjustment crew
5.扇形板 Sector plate
6.凸轮 Cam
7.拨钉 Swing pin
8.拨动器 Swing strip
9.关向微动开关 Microswitch for closing
10. 开向微动开关 Microswitch for opening

2.1 关闭位置采用转矩控制方式时的调整

2.1.1 转动关阀转矩调整钉 4，使箭头指向“小”字处。

2.1.2 电动操作电装，作关方向转动，若阀杆尚未转动或阀门未关严关到位，而转矩控制器关向微动开关被压下动作，则说明输出转矩值偏小，可微调调整钉（向“大”方向转动一格），再电动操作，逐步增大输出转矩值，直到阀门关严为止。

2.2 关闭位置采用机械限位时，转矩机构的调整，见图 7

2.2.1 手动操作电装，使阀门处于关闭位置（精确位置）。

2.2.2 调节关向调节螺钉 4，使螺钉刚好碰到蜗轮上凸台后，拧紧螺母 5 及盖形螺母 7。

2.2.3 转矩控制器调整方法参见上述第 1 条，逐步增大输出转矩值直到阀门能转到位为止。

2.2.4 补充说明：转矩控制器调试好后，若还需对阀门位置作少量调节，可以微调机械限位调节螺钉，这时转矩控制器可不再另作调整。

2.3 开向位置采用转矩控制或机械限位时，调整方法参见上述第 1、2 条，不同的是应调整转矩控制器的开向调整钉及机械限位的开向调节螺钉。

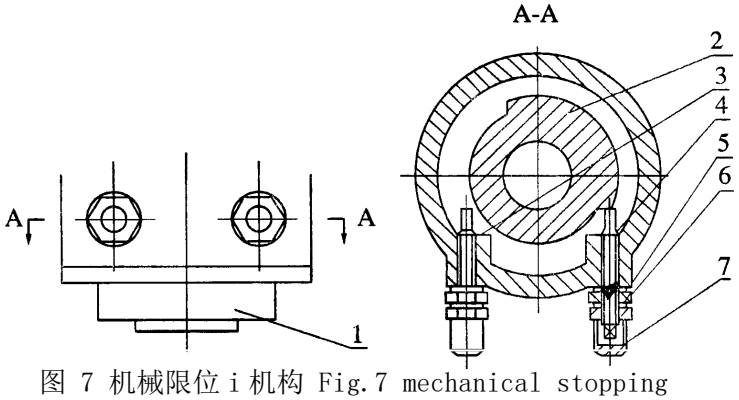


图 7 机械限位 i 机构 Fig.7 mechanical stopping

1.连接法兰 Connecting flange
2.蜗 轮 Worm wheel
3.开向调节螺钉 Setting screw for opening
4.关向调节螺钉 Setting screw for closing
5.螺 母 Nut
6.密封垫 Sealing pad
7.盖形螺母 Gland nut

Torque limit is shown in Fig.6. Torque limit of this device has been preset according to rated torque value before leaving factory and does not need resetting usually. If field resetting is required, it will be carried out as following:

2.1 Adjustment for closing stopped by torque limit.

2.1.1 Rotate adjusting screw 4 for closing torque and make the arrow point to “min”;

2.1.2 Then operate the valve closing by electric drive. If microswitch of torque limit is pressed to act and the valve stem does not rotate or the valve does not close to seat, it means that the torque value preset is too small. The setting screw may be adjusted (move a scale towards max), operate the valve by electric drive once again. Increase the output torque value gradually in this way until the valve is seated.

2.2 Adjustment for closing by mechanical stopping (Fig. 7)

2.2.1 Operate the valve by handwheel until it is seated (precise position).

2.2.2 Adjust the setting screw 4 for closing and make it just touch the project part of output shaft. Then tighten nut 5 and gland nut 7.

2.2.3 Increase the output torque value gradually in the same way as described in 1 until the valve is seated.

2.2.4Addition: After the torque limit is set up, if the position of valve needs a little resetting, setting screw may be reset and torque limit does not need resetting.

2.3 Adjustment for opening stopped by torque limit or mechanical stopping is the same of 1 and 2 for closing. Instead of adjusting screw and setting screw for closin

3 开度机构的调整 Adjustment of position indicator

开度刻度盘调整，见图8。当行程控制机构调整完成后，把阀门关闭到“全关”位置，目视检查刻度盘上的“0 关”刻度是否与指针对正，如没有对正，松开刻度盘上的螺钉，转动刻度盘，使指针与“0 关”刻度对正，然后旋紧刻度盘上的螺钉。

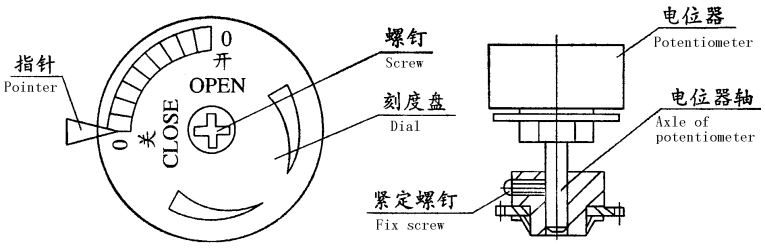


图 8 开度机构Fig.8 position indicator

The adjustment of position indicator is as shown in Fig. 8. When the adjustment of travel limit is finished, operate the valve to complete closing. Check visually if “0 - close” on the scale dial is aiming at the pointer. If it is not, please loose the screw on the dial and rotate the dial to make the pointer aims at the scale of “0 - close”, then tighten the screw on the dial.

8 故障及其排除方法

序	故 障	原 因	排除方法
1	电动机不能启动	1. 电源不通 2. 操作回路不通 3. 行程或力矩控制器开关动作	1. 接通电源 2. 排除回路故障 3. 解除动作开关
2	输出轴旋向与规定要求相反	电机电源相序不对	三相线中任意对调二相
3	电机过热	1. 连续试车时间过长 2. 电装与阀门选配不当 3. 电机二相运转	1. 停止试车，待电机冷却 2. 复核配套情况 3. 检查供电回路
4	运行中电机停转	1. 负载过大，力矩控制器失灵 2. 阀门故障	1.提高力矩控制器的设定值 2. 检查阀门
5	阀门到位电机不停转，阀位指示灯不亮	1. 行程或力矩控制器失灵 2. 行程控制器调整不当	1. 检查行程及力矩控制器 2. 重新调整行程控制器
6	远方开度发信失控	远方开度电位器故障	清洗或更新电位器

TROUBLES AND TROUBLESHOOTING

No	Troubles	Causes	Troubleshooting
1	Motor does not run.	1. Power supply is not on. 2.Operation loop is disordered. 3. Travel limit or torque limit acts.	1. Turn on power supply. 2. Eliminate the disorder. 3. Make the switch not act.
2	Rotation of output shaft is reverse to specification.	Phase sequence of motor is not in order.	Exchange any two lines of three-phase.
3	Motor is overheated	1. Too long a time for trial running 2. Actuator does not fit valve. 3. Motor runs with two-phase.	1. Stop trial running to cool the motor. 2. Check the mating. 3. Check power supply loop.
4	Motor stops during running	1. Too large a load, or malfunction of torque limit. 2. Fault of valve.	1. Increase set value of torque limit. 2. Check the valve.
5	Motor does not stop or position indicating lamp does not light when valve reached required position.	1. Malfunction of travel limit or torque limit. 2. Improper adjustment of travel limit.	1.Check travel limit or torque limit. 2. Reset travel limit.
6	Signaltransmitting of remote position indication is out of control.	Fault of remote position indicating potentiometer.	Clean or replace the potentiometer.

9 注意事项 CAUTIONS

1、安装前应将电动装置存放在清洁干燥的室内。

2、安装时应把电气箱盖和导线进出口密封好，以防潮气进入电气箱内，造成电气元件及零件锈蚀。

3、不得在阴雨天于户外打开电气箱盖、电机等密封部位，打开电气箱盖时，必须先切断电源。拆开重装时，密封部位需盖严紧固。

4、手动操作前应将手电动切换手柄按箭头方向推（或拉），若推不下去时需边推边转手轮。切换后即可手动操作（可适当用加力杆）。手轮旋向通常与输出轴一致，顺时针为关，逆时针为开。电动时手柄自动复位，切不可手动扳回。

5、首次电动操作时，先手动操作使阀门处于中间位置，然后电动检查输出轴的旋向与阀门开关是否一致，若相反应即停机切断电源，将电动机的三相电源任意两相对调。

6、由于专用电机为短时工作制，调试时，连续试车时间不可太长。

7、箱体内采用专用抗辐照润滑脂，使用期为 4 年，故到期要更换。

8、拆卸重装时，应注意检查密封件，发现损伤应及时更换（密封件为抗辐照专用橡胶），密封部位必须盖严紧固。

9、对于不经常使用的阀门，应定期检查保养运行操作，建议每月运行一次，时间不超过 10 分钟。

10、起吊时，不得吊装手轮。

11、与阀门连接时应采用强度 8.8 级的螺钉。推荐拧紧力矩当 M8 为 23N·m，M10 为 45N·m，M12 为 78N·m，M16 为 200N·m，M20 为 380N·m。

12、关于反向电装的说明

反向电装即电装的手轮和输出轴顺时针转动为开阀，逆时针转动为关阀，（手轮上有旋向指示标记）这时本说明书应作如下变动：

12.1 图 2 的说明 6）应为“图中键槽位置为阀门全开时的位置”。

12.2 图 6 中的扇形板上的“开”和“关”位置颠倒，序 9 应为开向微动开关，序 10 应为关向微动开关。

12.3 图 7 中序 3 应为关向调节螺钉，序 4 应为开向调节螺钉，调整说明中 2.2“调节关向调节螺钉 4”应改为“调节关向调节螺钉 3”。

12.4 图 8 中刻度盘上的“开”和“关”位置颠倒。

12.5 图 4 电气原理图中的电位器引出脚的接线顺序 15、16、17 应改为 17、16、15。

1. Before installation, the actuator shall be kept in clean and dry room.
2. When installing, the cover of the electric compartment and the inlet of the cable shall be well sealed to prevent the entrance of the moisture and resulting in electric elements and parts rusty and corroded.
3. Do not open seal positions such as cover of electric compartment or cover of electric motor etc. outdoors when it is overcast and rainy. Before open cover of electric compartment, do cut off power supply. And when reassembling, seal positions must be tightened and sealed.
4. Before hand operating, push or pull the auto/hand shift lever along the arrow direction. If it can not be pushed down or pulled up, please pull or push while turning the handwheel (the hand extending lever may be adopted). The rotation of the handwheel is generally in accordance with the rotation of the output shaft. Clockwise rotation makes valve closing and counterclockwise rotation makes valve opening. When electric operating, the auto/hand shift lever will return its original position. Do not pull the lever back.
5. when the actuator is electrically operating for the first time, operate the valve to middle position by hand operation at first, and then operate electrically to check if rotation of output shaft is consistent with rotation of valve. If it is reverse, stop running at once and then exchange any two lines of the three-phase.
6. Owing to the short time duty of the special electric motor, the continuous trial running can not be too long a time.
7. The housing is filled with radiation-proof grease for special purpose. The useful-life of the grease is 4 years and it is necessary to replace when it is expired.
8. When the actuator is reassembled, do check the sealing parts. If there is any damage, it shall be replaced (sealing parts are made of radiation-proof rubber) in time. The sealing locations shall be tightened and sealed.
9. For the valves not often running, maintenance and maintaining operation shall be carried out periodically. Once a month and one time no more than 10 minutes is recommended.
10. When lifting, do not lift the actuator with its handwheel.
11. When the actuator is connecting with the valve, use screws of strength level 8.8. Tight torque of 23N•m for M8; 45N•m for M10; 78N•m for M12; 200N•m for M16; and 380N•m for M20 is recommended.
12. Instruction for reverse actuators

As reverse actuators, handwheel and output shaft of such actuator rotate clockwise, the valve will open, vice versa. For such actuators, the operation manual shall be adapted as following.

12.1 Note 6) in Fig.2 shall be changed into “the position of key way is situated in the condition that the valve is full open.

12.2 In Fig.6, “Open” and “Close” on sector plate shall be exchanged. No.9 shall be changed into microswitch for opening and No.10 shall be changed into microswitch for closing.

12.3 In Fig.7, No.3 shall be changed into setting screw for closing and No.4 shall be changed into setting screw for opening. In item 2.2.2 of chapter 7 shall be changed into“Adjust the setting screw 3 for closing…”.

12.4 In Fig.8, “Open” and “Close” on scale plate shall be exchanged.

12.5 Sequence of leads 15,16,17 of potentiometer in Fig.4 wiring diagram shall change into 17,16,15.

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