

Series HKC Electric Actuator

Selection and Use Instructions

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1. Summarizing

The new Series HKC electric actuator offers many special performances. The all actuator operational parameter setting is effected using the non-intrusively, hand held, infra-red setting tool. The torque, valve position, position limit setting and alarm information about actuator are displayed on the liquid crystal display with Chinese, numbers and graphics, it can provides many conveniences to user during operating actuator. Available highly class of the watertight enclosure in actuator even if remove the terminal box cover in the field as long time while operating actuator. The actuator can structures the distributed control system with the fieldbus card for remote control , data transmission and maintenance. The Series HKC actuators are large-scale applied to the petrol industry, the power station, the metallurgy and the water treatment industries etc for the high reliability and flexibility.

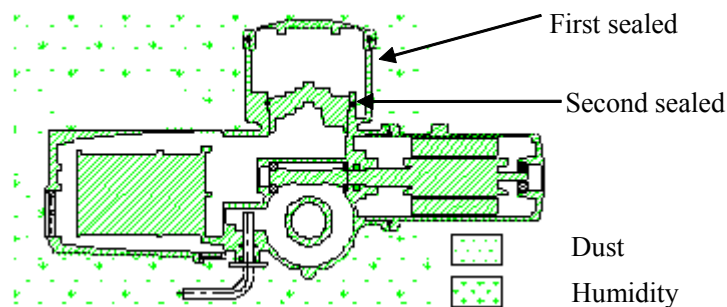


Fig 3-1 Double sealed

2. Actuator specification

2.1 Input signals:

4mA~20mA;1VDC~5VDC;
2mA~10mA;0.5VDC~2.5VDC;
24VDC pulse or voltage signal;

2.2 Power supply:

380VAC/50Hz
220VAC/50Hz

2.3 Valve controlling error $\leq \pm 2.5\%$

2.4 Travel controlling mechanism repeatability error $\leq 3\%$

2.5 Dead-band: 0.1~9.9% of the total travel

2.6 Watertight enclosure: IP68

2.7 Anti explosive mark: Exd II CT4

2.8 Ambient temperature: $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$

2.9 Ambient humidity: $\leq 95\%$

3. Actuator features

3.1 Actuator working theory (see to Fig. 3-1)

The working theory of actuator is that the motor drives the worm and the gear to rotate, and then the gear drives the output shaft to rotate by the clutch. While the electric/hand level switch to hand position, the clutch is divorced from the gear and coupled with the handwheel and then the output shaft can be drove by the handwheel. Electric operation always has the higher priority than manual operation, when motor is energized that the operation state automatic switch to electric operation mode unless electric/hand lever is purposely locked into 'manual operation'.

The valve position measure by a position sensor that is drove by the feedback shaft.

3.2 Function features

3.2.1 Double-sealed

All HKC actuators are housed double-sealed watertight enclosure to completely protect the internal equipment against the dust and the humidity even if the terminal box cover is removed as long time in the field. Refer to Fig. 3-1. The type of waterproof actuator can running 48 hours while the actuator immerge into water deep 3 meters, but does not mistake the actuator can running with long time that immersed into water. This feature just only provides a short time protection while happening the accident. In addition, user has the responsibility to ensure the sealed of the cable entry.

3.2.2 Non-intrusive design

The HKC electric actuator Non-intrusive design represents two parts. First, the operation knob employs magnetic induction mode switch to instead of the shaft penetrating the shell of the knob (see to Fig. 3-2,3). Second, the actuator operational parameter setting is effected by using the non-intrusively, hand held, infra-red setting tool. The non-intrusive design feature provides many excellences, such as avoid opening the electric cover in the field, debugging actuator in the rain or hazardous locations and quickly check the actuator state etc.

Refer to Fig.3-2,3.

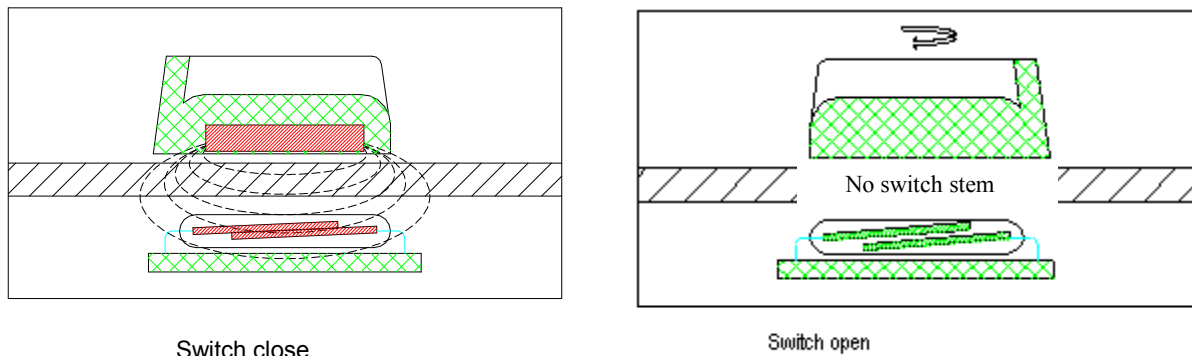


Fig. 3-2,3 Non-intrusive designs

3.2.3 Protection features

3.2.3.1 Torque protection

A sensor serve as overload protection for the entire valve travel, and you can setting a different torque volume between 40~120% of rated torque.

3.2.3.2 Limit protection

Set this function is availability, the actuator should stop automatically while the valve position reach the limit position

3.2.3.3 Automatic phase rotation correction:

Actuator monitor the phases and run in the correct direction regardless of the sequence of power supply connection that is realized through a phase rotation correction Boolean logical calculation. Without this function that will damage the valve in unconsciously.

3.2.3.4 Instantaneous reversal protection

The motor control logic introduces a delay in switching the motor as a response to instant reversal of control signals, preventing contact damage to the contactors and wear the gear and the worm.

3.2.3.5 Phase failure protection

Actuator real time monitor all three phases of the power supply during operation to prevent lose phase action.

3.2.3.6 Valve stick motion

Electronic latching inhibits the actuator torque protection function within 5 seconds and allows the motor to generate torque in excess of rated torque to enable operation of jammed valves while starting operation signal is enabled, should the actuator stall when attempting to unseat a valve stuck in its seat, the motor will be de-energised to preventing damage.

3.2.3.7 Motor thermal protection

Two thermostats are embedded in the windings for provide thermal-protection by de-energised motor in the event of motor over the maximum temperature.

3.2.3.8 Electric protection

The input and output signal channel of circuits are designed as photoelectric isolate mode.

3.2.4 Torque and valve position measure

A pair of taper gear are dived by the actuator output shaft, one gear drive the valve position sensor to generate the pulse signal, count the pulse signal and calculate the corresponding valve position. The valve position sensor precision is 11.5° of the output shaft travel angle. The output shaft can rotate 2400 circles that is more than the formerly actuator position limit.

Use the magnetic flux and current of the motor for continually measures the controlling torque are to avoid the mechanical wearing and ensure function stability.

3.2.5 Intermittent timing operation

It means that actuator operate a period of time, then stop a period of time, and then operate a period of time again, and so on. The motion time and stopping time parameter can be setted by the infra-red setting tool. This feature effectively increases the valve stroke time and suit the situation that need to prevent hydraulic shock (water hammer) and flow surge in pipelines.

3.2.6 Fieldbus network control

HKC actuator provide full compatibility with proprietary remote supervisory control system as well as all current network communication protocols, including Modbus, Profibus and Foundation Fieldbus.

3.2.7 Actuator commissioning and maintenance

All HKC actuators' functions can be rapidly commissioning and interrogate without removing electrical covers (even in wet or hazardous situations) by the infra-red setting tool that is dispatched with each order. The function can be setting by the infra-red setting tool as following.

- direction to close option
- open limit and close limit protection option
- setting open and close torque
- local control option
- setting four state indication relays
- setting ESD function
- setting interlocks function
- setting analogue control signal

The actuator setting procedure refer to 《Series HKC actuator installation and debugging instructions》.

3.2.8 Actuator display

The actuator has a liquid crystal display. The LCD screen is divided into four parts use to menu zone, alarm zone, indication zone and battery zone. The menu zone display the setting menu and interrogate menu. The indication zone display the valve position with the way of the percentage digital and the graphics, the valve position display precision is 1%. The LCD backlight

will light as long as main power was supplied.

The actuator has two indicated lamps, the red lamp means the full open position, the green lamp means the full close position.

The battery supports the LCD display and the valve position measure while the system main power failure. In this situation, the actuator did not receive the data from infra-red setting tool as well as the backlight and indicted lamp are not lighted.

There are four state indicted relays in the actuator and refer to section 6.3.

3.2.9 Actuator operation mode

There are two operation modes of actuator, each actuator has a handwheel to manual operation. The electric/hand level used to switch actuator operation mode. Electric operation always has the higher priority than manual operation, when motor is energized that the operation state automatic switch to electric operation mode unless hand/auto lever is purposely locked into 'manual operation'.

The type of HKC03~HKC100 actuator provide the standard handwheel or the side mounting handwheel according to the order, the side mounting handwheel drive the actuator output shaft by the gearbox in order to save strength.

The type of HKC150 actuator and the above type provide the side mounting handwheel, the side mounting handwheel drive the actuator output shaft by the gearbox in order to save strength. The gearbox of handwheel reduce rated can select.

3.2.10 Advanced design

- a. The Series HKC actuators are housed in a double-sealed enclosure and provide complete protection to the internal equipment even if the terminal cover are removed during site wiring.
- b. The Series HKC electric actuator utilizes magnetic induction mode switching without any shafts penetrating the shell.
- c. The actuator display window can change the orientation to suit the actuator mount mode. All HKC actuator functions can be rapidly commissioning without removing electrical covers (even in wet or hazardous situations) by the infra-red setting tool that is dispatched with each order.
- d. The low inertia and high torque motor generates peak torque rapidly after starting but with very little overrun when it de-energized.
- e. All of Series HKC provides the solid state circuit to measure the torque without any mechanical elements such as the spring switch or the level.
- f. HKC series actuators are filled with high-quality gear oil, the most important part of machine such as worm and gear operates in an oil bath to reduce wearing and extend life.
- g. The counter of valve position can precision control the actuator travel even if the actuator power up again.
- h. Direct drive the handwheel to provide reliable emergency manual operation in the event of a power supply failure.
- i. Electric operation always has the higher priority than manual operation, when motor is energized that the operation state automatic switch to electric operation mode unless hand/auto lever is purposely locked into 'manual operation'
- j. The lubricated thrust base is designed to conveniently disassemble the actuator from the valve but not need to change the current valve position.
- k. The drive bush and the valve stem are processed to engage each other.
- l. In order to easy change actuator output speed, the worm can be changed.
- m. The actuator supports the fieldbus, such as MODBUS, CAN, PROFIBUS and FF.

3.2.11 Actuator explosion proof design

The actuator has highly class watertight enclosure which is designed according to GB3836.1-2000, the anti-explosive mark is Exd II CT4, that means actuator can running in II A 、 II B 、 T1~T4 class explosion environment , The environmental condition is the atmospheric pressure: 86kPa ~106kPa and the temperature: -40~+70C°.

3.2.11.1 Excellent sealed design

The interface of the shell and the engagement part is designed to enough big as well as use the good quality 'O' type sealed ring in order to reach the high sealed requirement.

3.2.11.2 The cable conduit entry

The cable conduit entry is designed with the standard of GB3836.2 and appendix D . The thread length of conduit entry and the sealed ring satisfy the requirement of anti-explosion.

3.2.11.3 The type of explosive proof actuator cable entry

The battery house and the electric house, the electric house and the motor house cable connect with the secondary sealed to ensure anti-explosion performance .

3.2.11.4 The type of explosive proof actuator display window

The interface of the transparence window and the electric cover use the type 'O' sealed ring and sealed glue (this place dose not disassembly or else will be damage explosive proof structure performance), this design structure is according to item 5.4 、 5.5 and 8.1 of GB3836.2. In order to display the character in normal state, the actuator provide four setting places to the LCD screen:

- a. actuator level mounting (handwheel towards up); the display screen normal place.
- b. actuator level mounting (handwheel towards down); the display screen normal place but the display mode is setting reverse mode.
- c. actuator side mounting (handwheel towards left); the display screen mounting place near the side of flange.
- d. actuator side mounting (handwheel towards right); the display screen mounting place near the side of flange but the display mode is setting reverse mode.

The client should provide the correct mounting mode of actuator while in order, if not, we can provide the field engineering service.

3.2.12 Electronic latching

The electronic latching means inhibits the actuator torque protection function within 5 seconds and allows the motor to generate torque in excess of rated torque to enable operation of jammed valves while starting operation signal is enabled, should the actuator stall when attempting to unseat a valve stuck in its seat, the motor will be de-energised to preventing damage.

3.2.13 Data save

If main power failed, the internal battery of the actuator should supply power for the valve position measurement circuit 、 LCD screen and four state indicated relays. The valve position data should save into E²PROM whether the power failures or replacing the battery. **We recommend replacing battery when the power on.**

3.2.14 Application range

HKC actuators are suitable for intermittent control in automatic control loops that the system rate of change is 600 starts per hour. For the long travel, it should providing the average torque required by the valve in mid stroke does not exceed the rated torque of the selected actuator. The HKC actuator continual operation time is 15 minutes and motion proportion is 33.3%. If the applications need high start frequency, please select the HKM series actuator.

The basic HKC actuator is Multi-turn electric actuator, it suitably drives the linear motion valve such as gate valve. If clients need bigger output torque can select D gearbox. If the actuator applies to the rotary motion valve, it should match with W rotary gearbox. The type of D and W gearbox are one level reduce rate gearbox, the reduce rate are 40:1、60:1、70:1, the multilevel reduce rate is more than 80:1. The data of Series HKC actuator coupling with gearbox see table 4-4, more detail of gearbox information please contact us.

4: Actuator Data

The data sheet includes table 4-1, table 4-2 and table 4-3, table 4-1 in condition of the actuator power supply 380VAC, table 4-2 in condition of the actuator power supply 220VAC, table 4-3 is the actuator coupling interface data. *

Table 4 -1 HKC actuator data (380VAC/50Hz)

Actuator speed		18	24	36	48	72	96	144	192
HKC03	**Rated torque Nm	34	34	34	34	34	34	34	34
	Motor power kW	0.05	0.05	0.07	0.10	0.13	0.17		
	Stick current A	1.4	1.8	2.3	3	3.6	3.6		
	Rated current A	0.45	0.6	0.75	1	1	1.3		
HKC08	**Rated torque Nm	81	81	81	81	81	47		
	Motor power kW	0.12	0.14	0.19	0.23	0.24	0.24		
	Stick current A	2.7	3.7	4.7	6.4	6.4	6.4		
	Rated current A	0.85	1.1	1.5	2.1	2.1	2.1		
HKC14	**Rated torque Nm	108	136	102					
	Motor power kW	0.15	0.23	0.23					
	Stick current A	3.7	6.4	6.4					
	Rated current A	1.1	2.1	2.1					
HKC20	**Rated torque Nm	203	203	203	203	176	142	102	
	Motor power kW	0.30	0.35	0.47	0.58	0.70	0.70	0.70	
	Stick current A	6.8	9.25	10.25	13.4	16	16	16	
	Rated current A	2.3	2.8	3.6	4.6	5.5	5.5	5.5	
HKC30	**Rated torque Nm	350	300	250					
	Motor power kW	0.55	0.55	0.58					
	Stick current A	4.3	4.3	4.6					
	Rated current A	12.5	12.5	13.4					
HKC40	**Rated torque Nm	400	400	298	244				
	Motor power kW	0.58	0.68	0.68	0.68				
	Stick current A	13.4	16	16	16				
	Rated current A	4.6	5.5	5.5	5.5				
HKC60	**Rated torque Nm	610	610	542	474	474	366	257 *	
	Motor power kW	0.90	1.05	1.27	1.35	1.90	1.80	1.80	
	Stick current A	18	25	28	29	41	37	37	
	Rated current A	6	7	9	8.2	12.5	12	12	
HKC100	**Rated torque Nm	1020	1020	845	680	680	542	406	
	Motor power kW	2.10	2.10	2.10	3.7	3.7	3.7	3.7	
	Stick current A	45	45	45	61	61	61	61	
	Rated current A	11	11	11	16.5	16.5	16.5	16.5	
HKC150	**Rated torque Nm	1490	1490	1290	1020	1020	745	645	542
	Motor power kW	2.75	2.75	4.80	4.80	4.80	4.80	4.80	4.80
	Stick current A	61	61	95	95	95	95	95	95
	Rated current A	15	15	25	25	25	25	25	25
HKC200	**Rated torque Nm	2030	2030	1700	1355	1355	1020	865	730
	Motor power kW	4.5	4.5	4.5	7.5	7.5	7.5	7.5	7.5
	Stick current A	78	78	78	138	138	138	138	138
	Rated current A	21	21	21	35	35	35	35	35
HKC201	**Rated torque Nm							1355	1355
	Motor power kW							10.2	10.2
	Stick current A							218	218
	Rated current A							88	88
HKC300	**Rated torque Nm		3000						
	Motor power kW		4.8						

Stick current A		78						
Rated current A		22						

“ * ” : should consider carefully before use these type of Series HKC actuators that have a sign “ * ” in above data sheet, because of rated speed so rapidly to wear machine.

“ * * ” : the torque rated is the normal value, user can setting the maximum torque protection value which is 1.2 times of the rated value.

Table 4 - 2 HKC actuator data (220VAC/50Hz)

Actuator speed		18	24	36	48	72	96	144	192
HKC03	*Rated torque Nm	20	20	17	15				34
	Motor power kW	0.08	0.08	0.08	0.08				
	Stick current A	7.3	7.3	7.3	7.3				
	Rated current A	1.8	1.8	1.8	1.8				
HKC08	*Rated torque Nm	27	24	20	17				
	Motor power kW	0.1	0.1	0.1	0.1				
	Stick current A	7.9	7.9	7.9	7.9				
	Rated current A	1.9	1.9	1.9	1.9				
HKC14	*Rated torque Nm	32	28	22					
	Motor power kW	0.12	0.12	0.12					
	Stick current A	8.5	8.5	8.5					
	Rated current A	2	2	2					
HKC20	*Rated torque Nm	81	81	81	63	63			
	Motor power kW	0.23	0.25	0.25	0.28	0.28			
	Stick current A	11.6	13	14.1	14.1	16.5			
	Rated current A	2.8	3.2	3.4	3.4	3.6			
HKC40	*Rated torque Nm	142	142	127	108				
	Motor power kW	0.35	0.37	0.37	0.37				
	Stick current A	17.2	18.1	18.1	17.2				
	Rated current A	3.75	3.9	3.9	3.75				
HKC60	*Rated torque Nm	252	232	184	147	109			
	Motor power kW	0.8	0.8	0.75	0.8	0.8			
	Stick current A	36	36	32	36	36			
	Rated current A	7.8	7.8	7	7.8	7.8			

“ * ” : the torque rated is the normal value, user can setting the maximum torque protection value which is 1.2 times of the rated value.

Table 4-3 Drive bush data

Actuator type	HKC03 HKC08 HKC14	HKC20 HKC40	HKC60	HKC100	HKC150	HKC200	HKC201	HKC300
Type A (thrust)								
Rated thrust KN	44	100	150	220	220	334	—	445
Max bore								
Outside bore mm	32	51	67	73	83	83	—	83
Inside bore mm	26	38	51	57	73	73	—	73
Type B (non-thrust)								
B1 mm	42	60	80	—	—	—	—	—
B3 mm	20	30	40	50	50	50	50	—
B4 mm	20	30	44	50	60	60	60	—
Hand-wheel reduce ratio **								
Standard	Directly	Directly	Directly	Directly	60:1	60:1	60:1	60:1
Extra option	—	—	—	15:1	180:1 15:1	180:1 15:1	180:1 15:1	180:1 15:1
Flange size	F10	F14	F16	F25	F25	F30*	F25	F30
	33	55	80	235	258	258	235	258

* :In case of HKC200 coupling with B3、B4, may be chooses flange of F25.

** : User choose the reduce ratio of handwheel according to the valve travel time and number of operator.

Table 5-1 HKC actuator/H(D/W) gearbox combination data

Data Combination	Rated Torque (N.m)	90° Stroke Time(s)	Actuator RPM (rpm)	Gear box Ratio	Max Bore (mm)	Data Combination	Rated Torque (N.m)	90° Stroke Time(s)	Actuator RPM (rpm)	Gearbox Ratio	Max Bore (mm)
HKC03/H 4	540	33	18	40:1	64	HKC20/H 6	4246	58	18	70:1	102
	540	25	24	40:1	64		4246	44	24	70:1	102
	500	17	36	40:1	64		4270	29	36	70:1	102
	430	13	48	40:1	64		4210	22	48	70:1	102
	430	8	72	40:1	64		3699	15	72	70:1	102
	430	6	96	40:1	64		2980	11	96	70:1	102
	710	58	18	70:1	64		2140	7	144	70:1	102
	710	44	24	70:1	64	HKC20/H 6R	7696	116	18	140:1	102
	712	29	36	70:1	64		7696	88	24	140:1	102
	717	22	48	70:1	64		7744	58	36	140:1	102
	717	15	72	70:1	64		7744	44	48	140:1	102
	695	11	96	70:1	64		6714	29	72	140:1	102
							5417	22	96	140:1	102
HKC03/H 4R	980	66	18	80:1	64		3862	15	144	140:1	102
	980	50	24	80:1	64	HKC20/H 7R	13363	150	18	180:1	127
	985	34	36	80:1	64		13363	113	24	180:1	127
	982	25	48	80:1	64		13443	75	36	180:1	127
	982	17	72	80:1	64		13443	56	48	180:1	127
	970	13	96	80:1	64		11658	38	72	180:1	127
HKC08/H 4	1286	33	18	40:1	64		9414	28	96	180:1	127
	1286	25	24	40:1	64	HKC40/H 6	6728	19	144	180:1	127
	1288	17	36	40:1	64		8393	58	18	70:1	102
	1290	13	48	40:1	64		8393	44	24	70:1	102
	971	8	72	40:1	64		6273	29	36	70:1	102
	754	6	96	40:1	64		5232	22	48	70:1	102
	1691	58	18	70:1	64	HKC40/H 7	12060	50	18	60:1	127
	1691	44	24	70:1	64		12060	38	24	60:1	127
	1691	29	36	70:1	64		7950	25	36	60:1	127
	1691	22	48	70:1	64		6746	19	48	60:1	127
	1691	15	72	70:1	64		7344	38	18	70:1	102
	994	11	96	70:1	64	HKC30/H 6	6295	25	24	70:1	102
HKC08/H 4R	2350	34	36	80:1	64		5260	19	36	70:1	102
	2350	25	48	80:1	64						
	1173	17	72	80:1	64	HKC40/H 8R	26386	150	18	180:1	153
	1366	13	96	80:1	64		26386	113	24	180:1	153
HKC08/H5R	2334	66	18	80:1	76		19700	75	36	180:1	153
	2334	50	24	80:1	76		16118	56	48	180:1	153
	2350	34	36	80:1	76	HKC60/H 7	10889	19	48	60:1	127
	2355	25	48	80:1	76		10889	13	72	60:1	127
	1773	17	72	80:1	76		8423	9	96	60:1	127
	1366	13	96	80:1	76		5920	6	144	60:1	127
HKC14/H 4	1730	25	24	40:1	64	HKC100/H 8	19480	25	36	60:1	153
	1510	17	36	40:1	64		15580	19	48	60:1	153
HKC14/H 5	1730	25	24	40:1	76		15580	13	72	60:1	153
	1510	17	36	40:1	76		12470	9	96	60:1	153
	2858	25	24	70:1	76		9350	6	144	60:1	153
	2136	17	36	70:1	76	HKC100/H 8R	23850	19	96	120:1	153
							17890	13	144	120:1	153
HKC20/H 5	3350	33	18	40:1	76	HKC60/H 9R	43307	150	18	180:1	178
	3670	25	24	40:1	76		43307	113	24	180:1	178
	3263	17	36	40:1	76		38444	75	36	180:1	178
	3251	13	48	40:1	76		33610	56	48	180:1	178
	2819	8	72	40:1	76		33620	38	72	180:1	178
	2279	6	96	40:1	76		26000	28	96	180:1	178
	3238	58	18	70:1	76	HKC100/H 10R					
	3238	44	24	70:1	76		48100	56	48	180:1	203.1
	3263	29	36	70:1	76		48100	38	72	180:1	203.2
	3251	22	48	70:1	76		38480	28	96	180:1	203.2
	2819	15	72	70:1	76		28860	19	144	180:1	203.2
	2279	11	96	70:1	76						
	1621	7	144	70:1	76						

Note: *: H represent D or W, **: the travel time specify the 90° rotary motion time of W, ***: it means the multilevel gearbox of reduce ratio included and above 80:1

5: Actuator Performance

5.1 Torque and position

- position setting range: 3.5 to 2040 turns, with a minimum angular resolution to 11.5 ° of actuator output center column.
- torque switch setting: 40% to 120% rated torque.
- Electronic latching time: about 5 seconds

5.2 Cable entry and connecting terminals

- The sizes of middle cable entries is and M40×1.5 and the side of two is M25×1.5
- The sizes of four power terminals are M5 and the number is 4 of 380VAC(3 of 220VAC)
- The sizes of control terminals are M4 and the number is 47.

5.3 Drive bush base data

There are two type of the HKC actuator drive bush base, HKC03 ~ HKC60 choose the dividing base, HKC100 ~ HKC300 choose the combination base. The coupling of actuator and valve has two modes that are the thrust and the non-thrust. The type of thrust drive bush is A and the type of non-thrust drive bush is B1、B2、B3.

5.3.1 Type A drive bush

The type 'A' is the thrust type drive bush that couples a fully sealed and lubricated thrust bearing to guarantee which have not any load effects on the actuator inner structure.

5.3.2 Type B drive bush

The driving shaft bored and key are designed according to ISO 5210 standard. And the type B non-thrust bush has three basic form as follows B1, B3 and B4.

5.3.3 Type B1 drive bush

Type B1 supplies a big bore and key to coupling the valve.

5.3.4 Type B3 drive bush

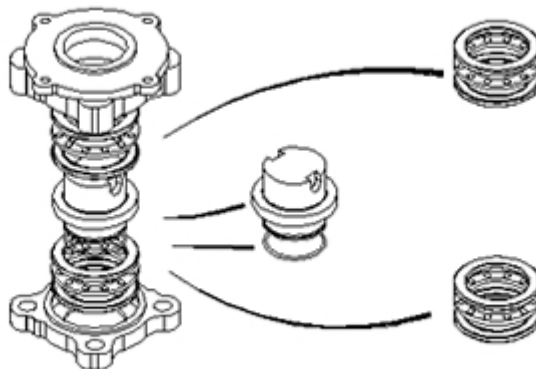
Type B3 supplies a small bore and key to coupling the valve.

5.3.5 Type B4 drive bush

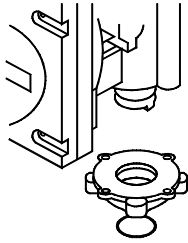
The size of type B4 is the same as type B3 but not supplies the bore and key to the user, it needed to be machined to suit the input shaft of the gearbox or valve that it will drive.

If drive the outside stem that should select the type A drive bush. In condition HKC03 ~ HKC60 of actuator couple with the valve by the drive bush type of B3 or B4, if the valve stem move along with the axis direction. The coupling interface as following.

a. The thrust type



b. The non-thrust type



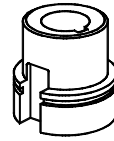
Assembly diagram



Type B1

Used in

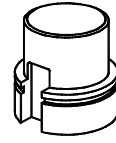
HKC03~HKC60



Type B3

Used in

HKC03~HKC60



Type B4

Used in

HKC03~HKC60

5.4 Mechanical vibration

The Series HKC actuator normal vibrational frequency is 10HZ to 200HZ and the acceleration of gravity is 0.5.

5.5 Shell watertight enclosure and explosion proof standard

Type waterproof :IP68, according to standard 《GB4208-93》

Type explosion proof: Exd II CT4, according to standard 《GB3836-2000》

5.6 Battery life time : About 1 year ,if you store the actuator correctly.

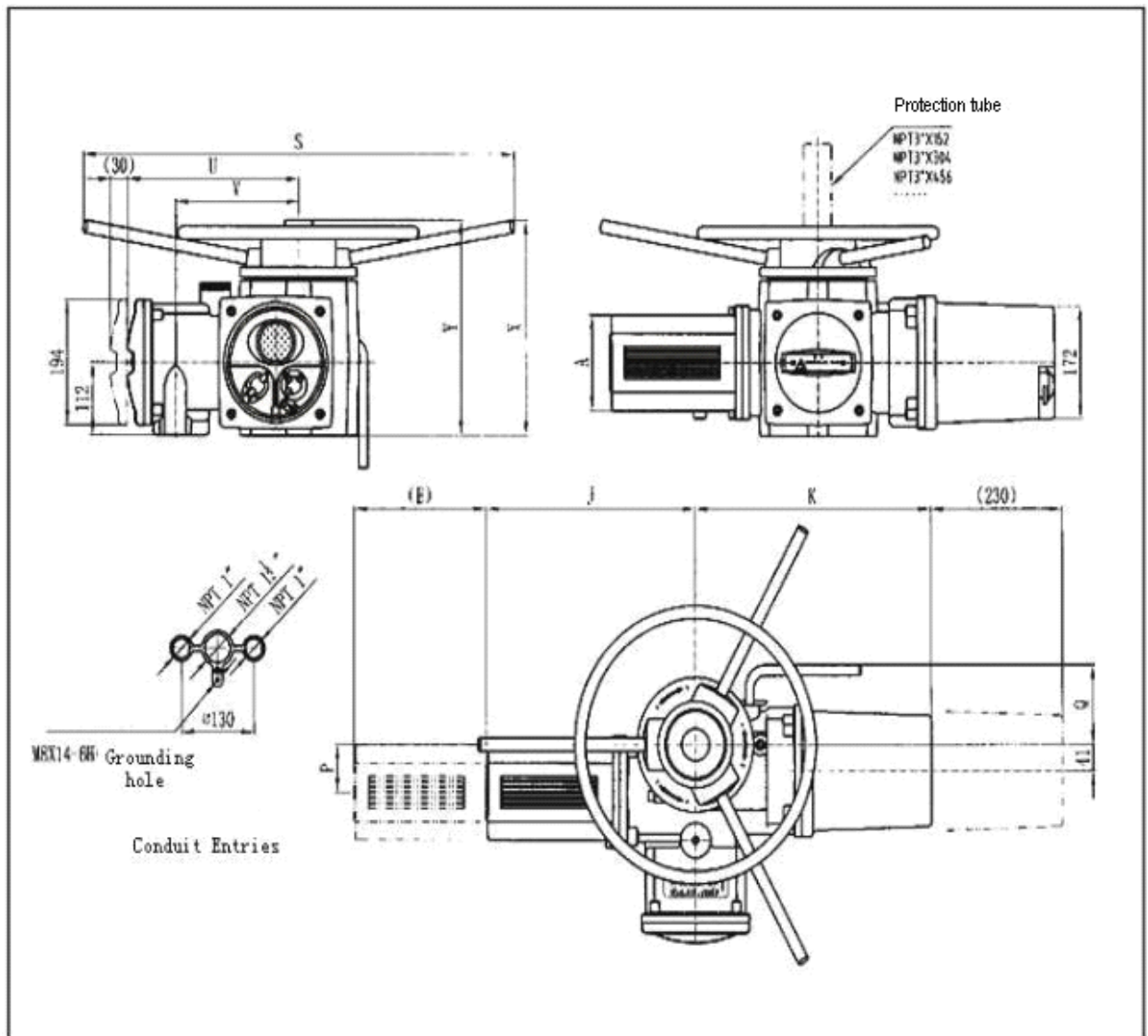
5.7 Mounting data

5.7.1 Interface connection table for HKC

Actuator type		HKC03/ 08/14	HKC20/ 30/40	HKC60	HKC100	HKC150	HKC200	HKC201	HKC300
Thrust Type A (mm)	Max acceptance diameter Basset	32	51	67	73	83	83	-	83
	Max acceptance diameter Hidden	26	38	51	57	73	73	-	73
Non- thrust Type B (mm)	"B1"	42	60	80	-	-	-	-	-
	"B3"	20	30	40	50	50	50	50	-
	"B4"	20	30	44	50	60	60	60	-
Flange		F10	F14	F16	F25	F25	F30*	F25	F30
Net-weight (kg)		33	55	80	235	258	258	238	258

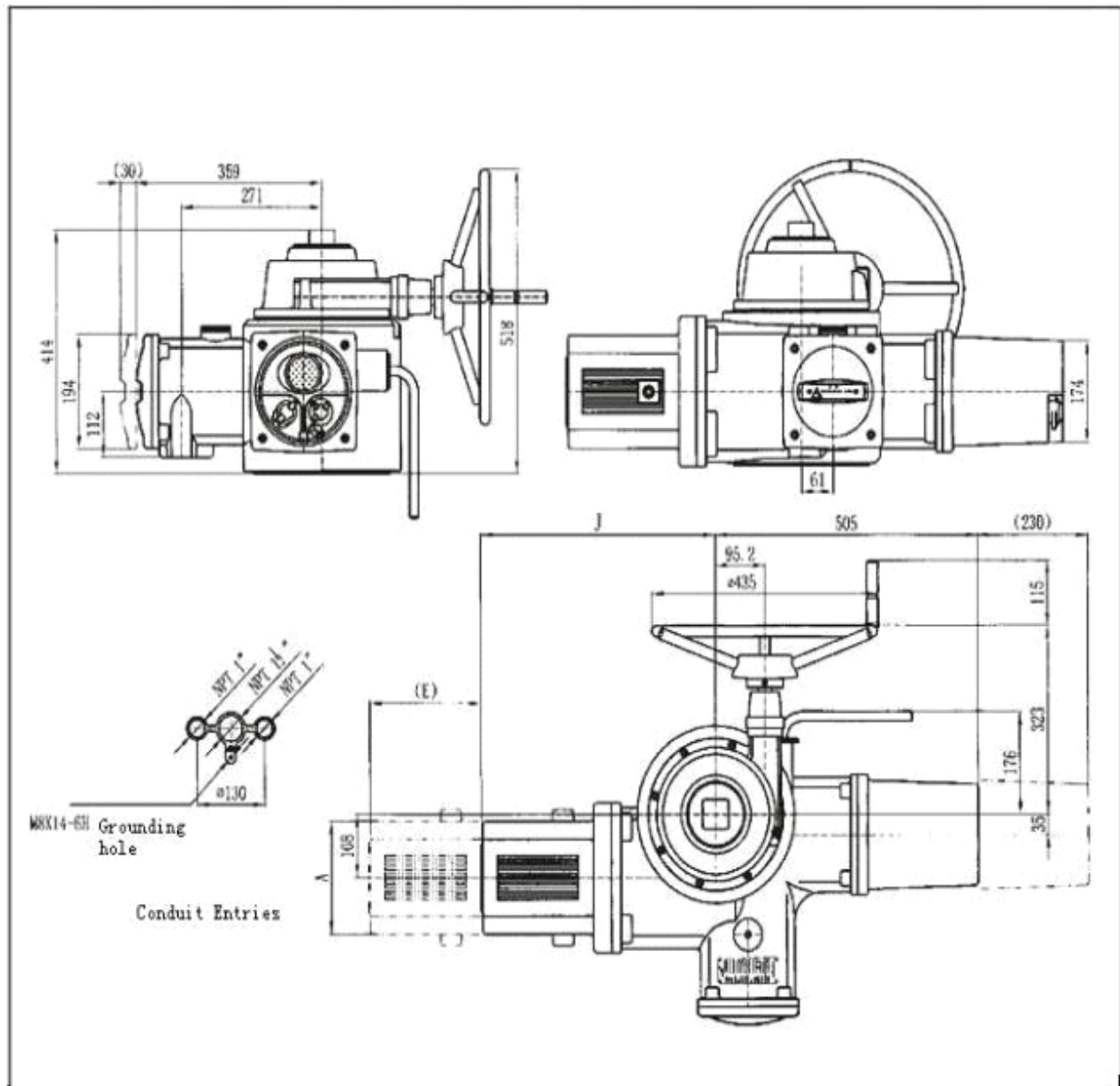
* Connection by B3,B4 for HKC200 can choose F25 flange.

5.7.2 HKC03~HKC100 actuator dimension data



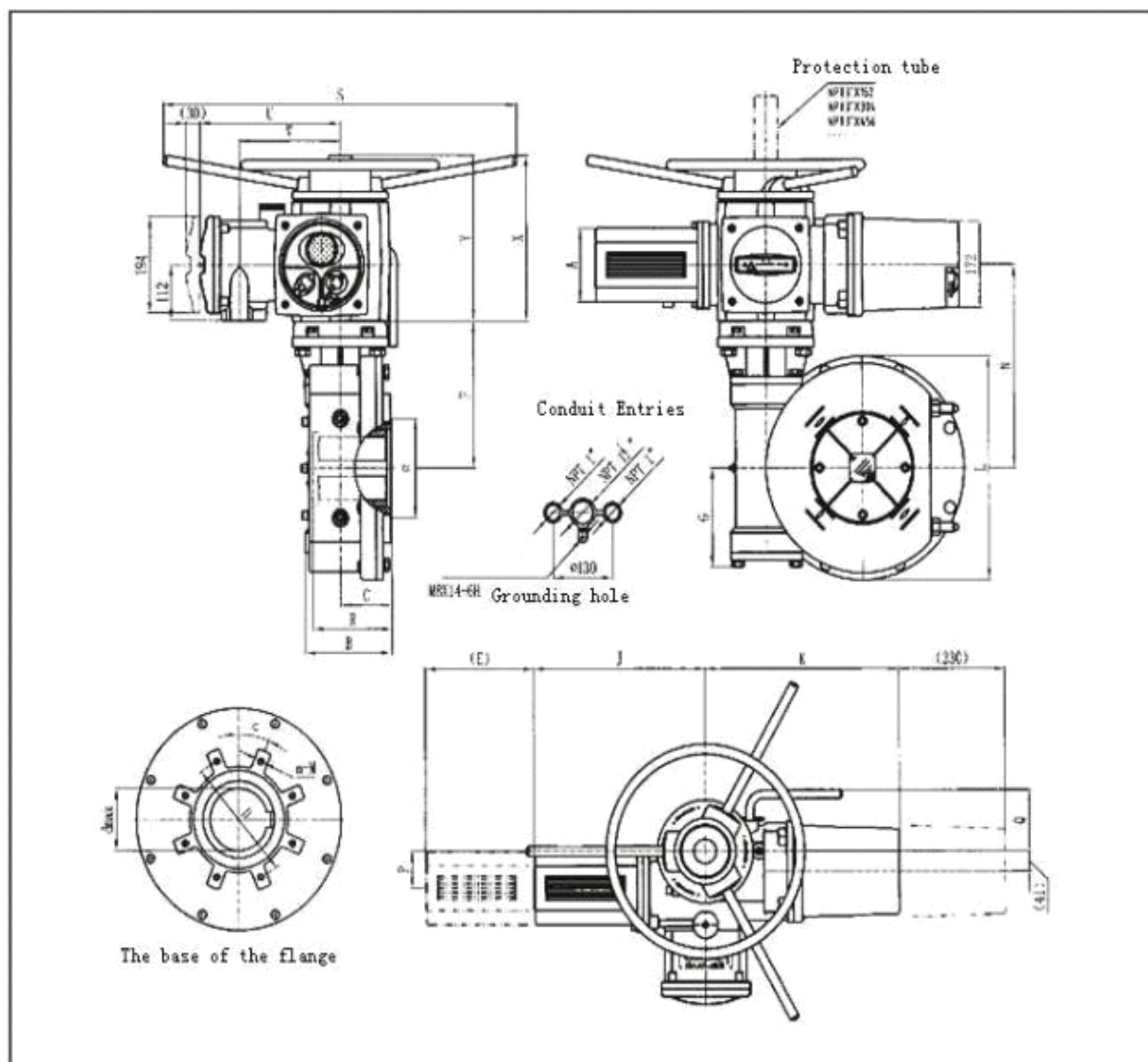
Parameter Standard	A	E	J	K	Q	P	S	U	V	Y	X
HKC03 HKC08 HKC14	102	198	264	373	110	41	Φ 300	260	167	222	264
HKC20 HKC30 HKC40	134	210	297	390	110	60	Φ 666	286	198.5	305	288
HKC60	148	270	376	424	125	75	Φ 784	310	222	334	335
HKC100	198	280	452	505	176	108	Φ 820	358	269	392	415

5.7.3 HKC150/HKC200/HKC201/HKC300
actuator dimension data



Parameter Standard	A	E	J	Flange standard
HKC150	178	335	520	F25
HKC200				F25
				F30
HKC201	222	360	545	F25
HKC300	178	335	521	F30

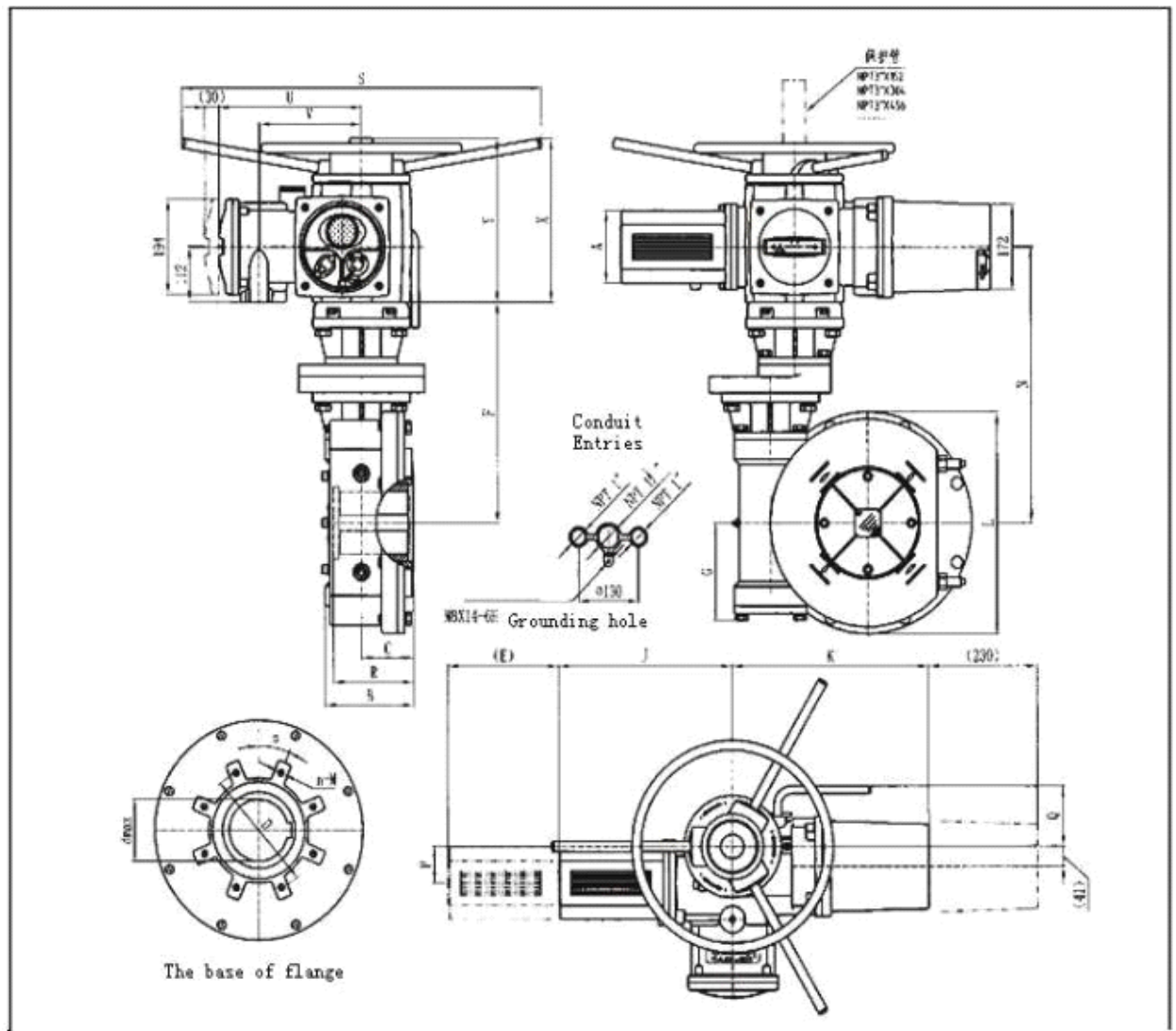
5.7.4 Series HKC actuator combined with D/W one grade gear-box



Parameter Standard	A	E	-	J	K	Q	P	S	U	V	Y	X
HKC03-14/H4	102	198	-	264	373	110	41	Φ 300	260	167	222	264
HKC20-4-/H4 HKC20-40/H5 HKC20/H6 HKC20/H7	134	210	-	297	390	110	60	Φ 666	286	198.5	305	288
HKC60/H7	148	270	-	376	424	125	75	Φ 785	310	222	334	335
Parameter Standard	dmax	D	B	α	C	R	n-M	F	H	G	L	N
HKC03-14/H4	Φ 64	Φ 140	106	45°	50	93	4-M16	147	101.6	108	Φ 218	230
HKC20-40/H4												248
HKC20-40/H5	Φ 76	Φ 165	134	22.5°	65	120	4-M20	197	135.89	134	Φ 285	298
HKC20/H6	Φ 102	Φ 254	147		70	130	8-M16	186	177.8	144	Φ 375	303
HKC20/H7	Φ 127		181		87	160		276	209.55	196	Φ 450	377
HKC60/H7												289

The character "H" include series D or W gear-box in the above data table.

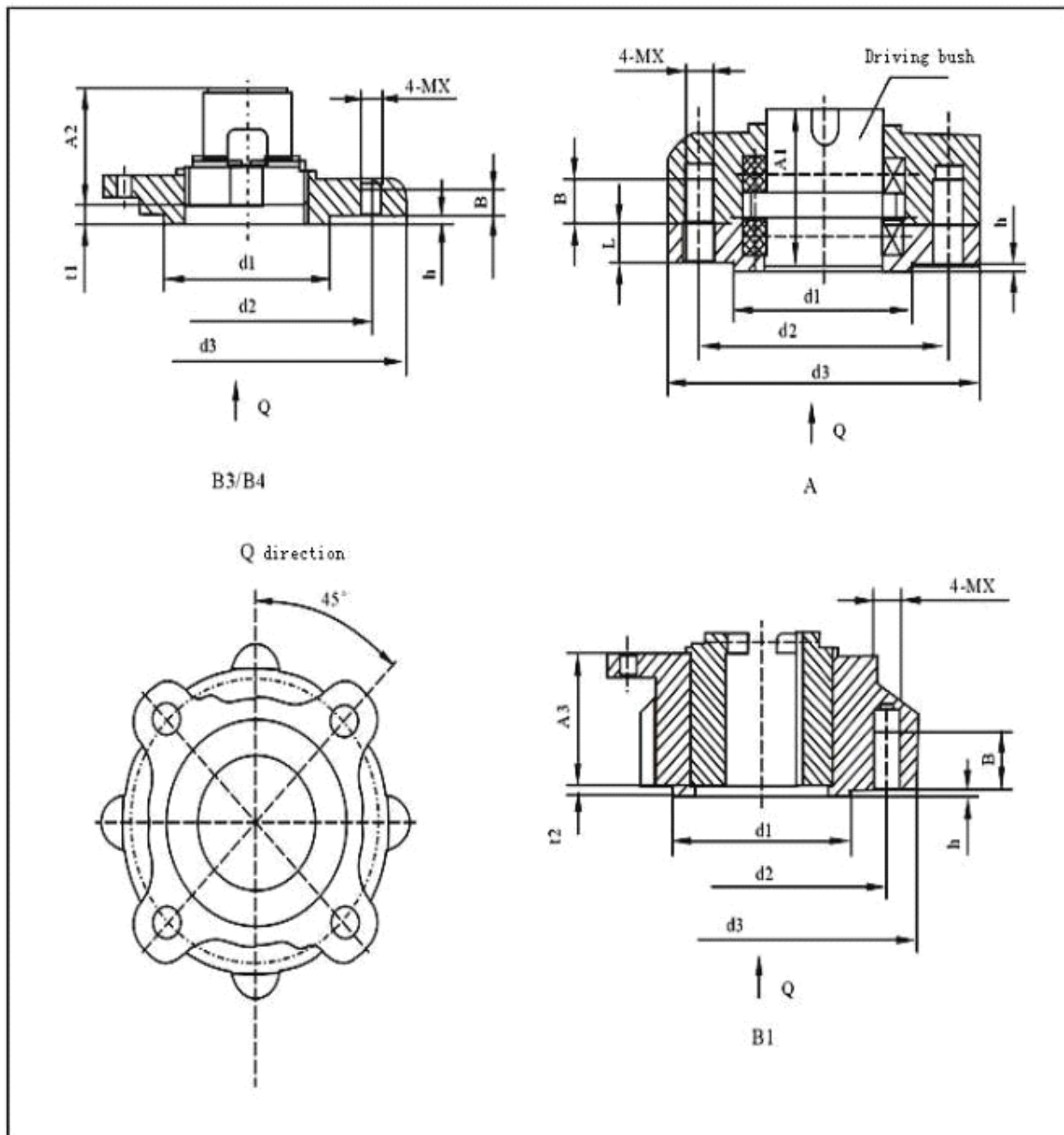
5.7.5 Series HKC actuator combined with DR/WR two grades gear-box



Parameter Standard	A	E	-	J	K	Q	P	S	U	V	Y	X
HKC03-14/H4R	102	198	-	264	373	110	41	Φ 300	260	167	222	264
HKC20-4-/H4 HKC20-40/H5 HKC20/H6 HKC20/H7	134	210	-	297	390	110	60	Φ 666	286	198.5	305	288
HKC60/H7	148	270	-	376	424	125	75	Φ 785	310	222	334	335
Parameter Standard	dmax	D	B	α	C	R	n-M	F	H	G	L	N
HKC03-14/H4	Φ 64	Φ 140	106	45°	50	93	4-M16	274	101.6	108	Φ 218	341
HKC20-40/H4		Φ 165	134		65	120	4-M20	324	135.89	134	Φ 285	425
HKC20-40/H5	Φ 76	Φ 254	147	22.5°	65	120	8-M16		466	177.8	144	Φ 375
HKC20/H6	Φ 127		181		70	130		209.55		196	Φ 450	578
HKC20/H7	Φ 153		194		87	160		496	246.38	226	Φ 520	597
HKC60/H7												608

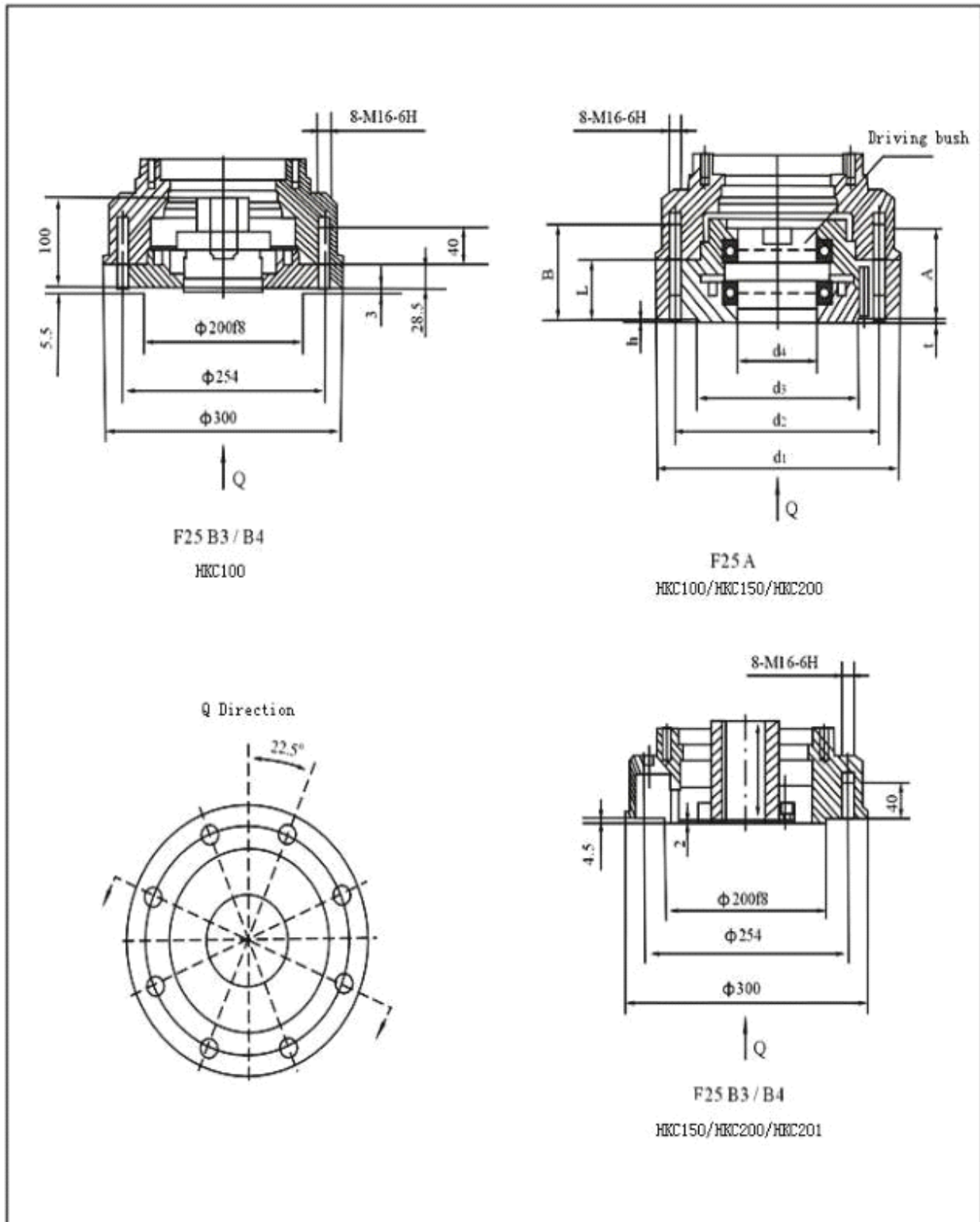
The above data table is only the part, if you want to get more, please contact us.

5.7.6 F10/F14/F16 Coupling Flange for HKC03~HKC60



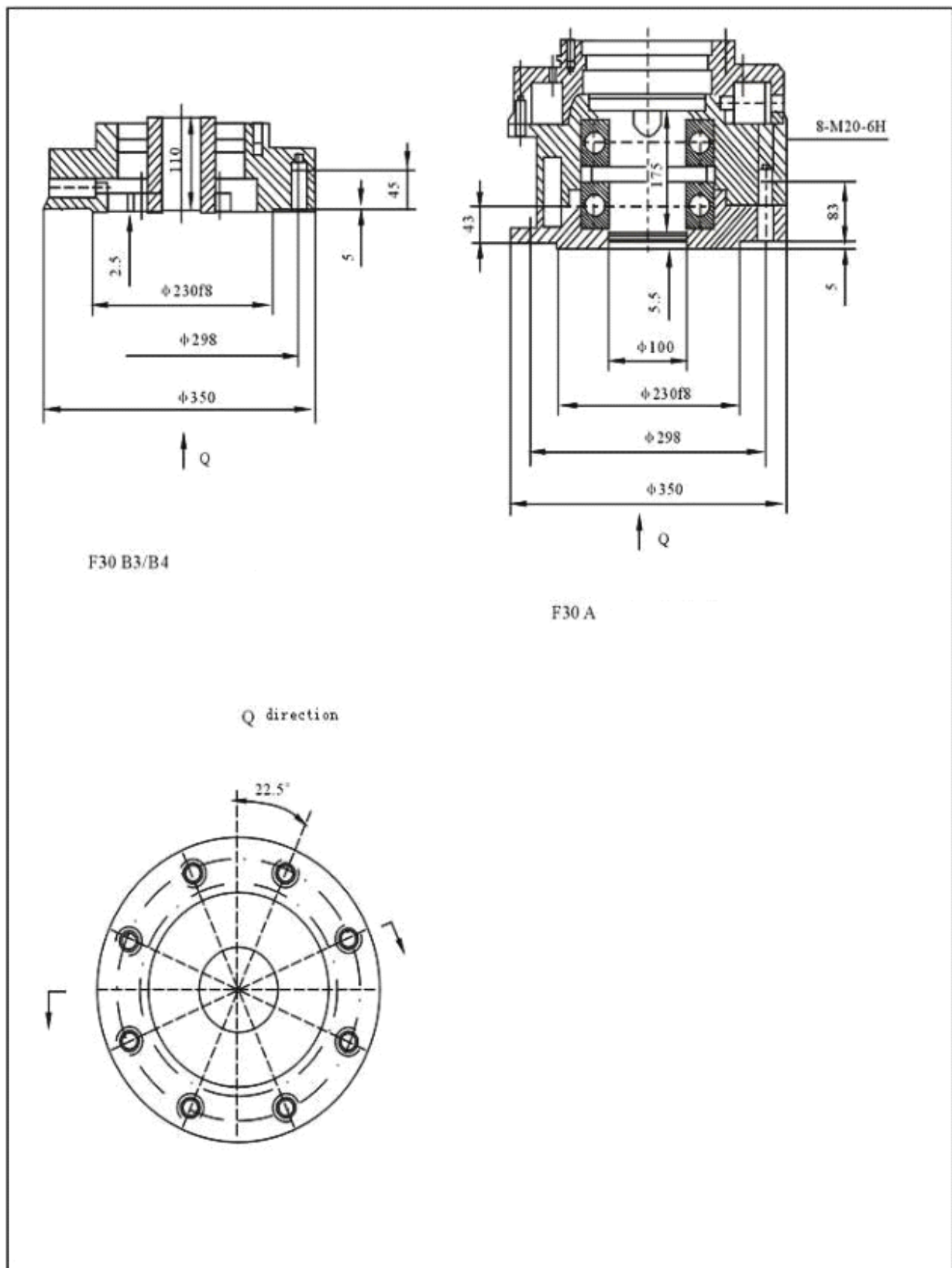
Standard	Flange	d1	d2	d3	A1	A2	A3	B	h	t1	t2	L	MX
HKC03	F10	Φ70f8	Φ102	Φ125	62.5	52	45	17	3	6.5	5	22	M10-6H
HKC08													
HKC14													
HKC20	F14	Φ100f8	Φ140	Φ175	78.5	72	65	22	4	7	5	19	M16-6H
HKC30													
HKC40													
HKC60	F16	Φ130f8	Φ165	Φ210	88.5	80	80	27	5	7	3.2	21	M20-6H

5.7.7 F25 Coupling Flange for HKC100/HKC150/HKC200/HKC201



Standard	Flange	d1	d2	d3	d4	A	B	L	h	t
HKC100	F25	$\Phi 200f8$	$\Phi 254$	$\Phi 300$	$\Phi 100$	100	106.5	66.5	3	4.5
HKC150					$\Phi 110$	120	143	103	5	5.5
HKC200										

5.7.8 F30 Coupling Flange for HKC200/HKC300



6: Actuator Control and wiring

The HKC actuator wiring code, please refer to diagram 7. The means of each terminal refer to the diagram 6-1.

6.1 Local controls

Non-intrusive selectors are provided on the actuator electrical control cover, one for local/stop/remote selection, pad-lockable in each position, and the other open/close control. Local control may be configured for maintained or push to run operation.

6.2 Remote manual controls

The power supply of remote control circuits can be provided as DC 24V by actuator internal supply or DC/AC 24V~60V, AC 120~220V by external supply.

Refer to the circuit diagram 6-2 to 6-4.

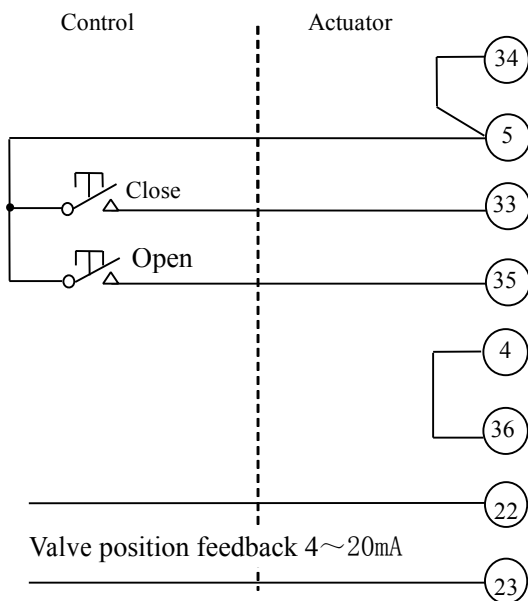
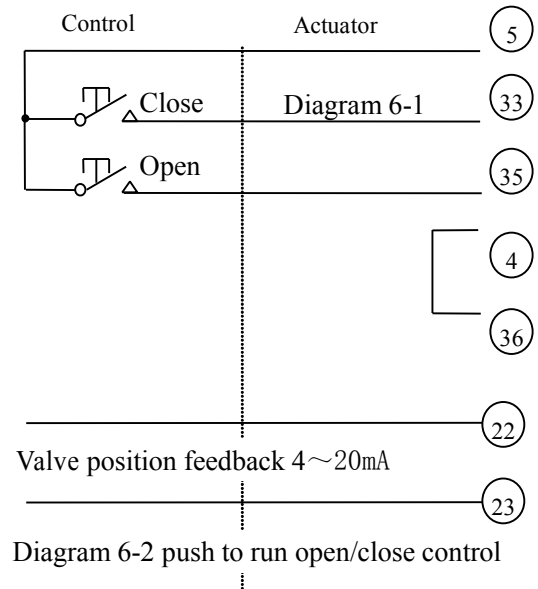


Diagram 6-3 maintain open/close control, support reversion, intermediate position impossible

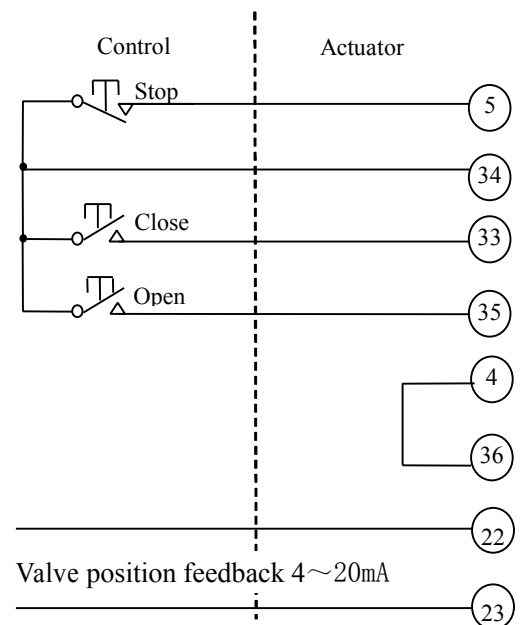


Diagram 6-4 maintain open/close/stop control

Table 6-1 terminals description

NO	NAME	OPERATION
	Grounding	
1	380VAC1	Input AC380V 50Hz
2	380VAC2	
3	380VAC3	
4	DC 0V	DC 24V “-” output
5	DC 24V	DC 24V “+” output
6	S1 relay port 1	Indication S1 relay port 1
7	S1 relay port 2	Indication S1 relay port 2
8	S2 relay port 1	Indication S2 relay port 1
9	S2 relay port 2	Indication S2 relay port 2
10	S3 relay port 1	Indication S3 relay port 1
11	S3 relay port 2	Indication S3 relay port 2
12	S4 relay port 1	Indication S4 relay port 1
13	S4 relay port 2	Indication S4 relay port 2
14	Battery relay port 1	Indication Battery power relay port 1
15	Battery relay port2	Indication Battery power relay port 2
16	Temperature relay port 1	Indication motor Temperature high relay port 1
17	Temperature relay port 2	Indication motor Temperature high relay port 2
18		
19	Remote relay port 1	Remote position indication relay normally common port
20	Remote relay port 2	Remote position indication relay normally close port
21	Remote relay port 3	Remote position indication relay normally open port
22	Valve position feedback signal +	Valve position current analogue signal feedback port +
23	Valve position feedback signal -	Valve position current analogue signal feedback port +
24	Torque feedback signal	Torque current analogue signal feedback port I
25	ESD	Emergent (ESD) active signal input port
26	Valve position input signal +	Valve position current analogue signal input port +
27	Valve position input signal -	Valve position current analogue signal input port -
28		
29	O1 relay port 1	Valve position fully open indication relay port 1
30	O1 relay port 2	Valve position fully open indication relay port 2
31	Interlock low voltage port	Interlock low voltage common-port
32	Interlock high voltage port	Interlock high voltage common-port
33	Remote close	Remote close input port
34	Stop/maintain	Stop/maintain input port
35	Remote open	Remote open input port
36	Remote low voltage port	ESD, remote open/close, stop/maintain low voltage common-port
37	Open interlock	Open interlock input port
38	Close interlock	Close interlock input port
39	Manual/automatic port	Manual/automatic signal input port
40	Remote high voltage port	ESD, remote open/close, stop/maintain high voltage common-port
41	Manual/auto low voltage port	Manual/automation low voltage common-port
42	Monitor relay port 1	Monitor relay normally common port
43	Monitor relay port 2	Monitor relay normally close port
44	Monitor relay port 3	Monitor relay normally open port
45	Manual/automatic high voltage port	Manual/automatic high voltage input port
46	C1 relay port 1	Valve position fully close indication relay port 1
47	C1 relay port 2	Valve position fully close indication relay port 2

6.3 State indication relay

Four state indication relay are provided, each one independently configurable by the HKC

setting tool to set one parameter of the following:

- valve position
Fully open, fully close or any intermediate positions
- status
Valve opening, closing, moving

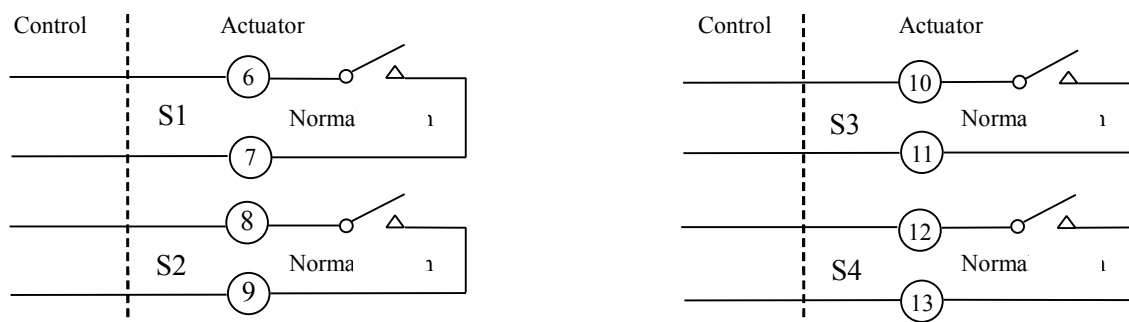


Diagram 6-5 state indication relays

- valve alarms
Motor tripped on torque going open, going close, valve jammed
 - actuators alarms
Battery low
- Each contact can be configured to either “normally open” or “normally close”. Contacts are rated at 5A/250VAC or 5A/30VAC.

Refer to diagram 6-5.

6.4 Monitor relay

An independent relay with a volt-free changeover contact used for monitoring actuator electrical availability. Contact rating 5A/250VAC or 5A/30VAC.

The relay will de-energise under a one, or combination, of the following conditions:

- loss of one or more of the power supply phases
- loss of control circuit supply
- motor thermostat tripped
- remote control selected

Refer to diagram 6-6.

6.5 Emergency shut down - ESD

An active ESD signal will override any local or remote control signal. The ESD input operates from a separate common to that used for open, close.

The following ESD options can be configured:

- ESD signal
Active high, active low
- ESD action
Close, open
- ESD override
Motor thermostat

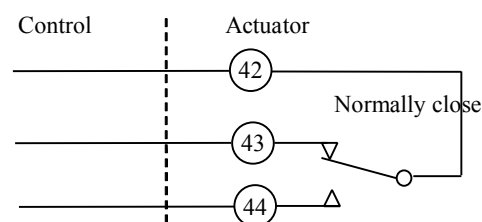


Diagram 6-6 monitor relay wiring diagram

6.6 Interlocks

External hardwired interlocks for opening, closing or both directions can be configured to inhibit local and remote operation until the external contacts are made. Interlock circuits may be added with any of the remote control circuits. The interlock inputs operate from a separate common allowing for isolation between the safety system and operation control system.

Refer to Diagram 6-7.

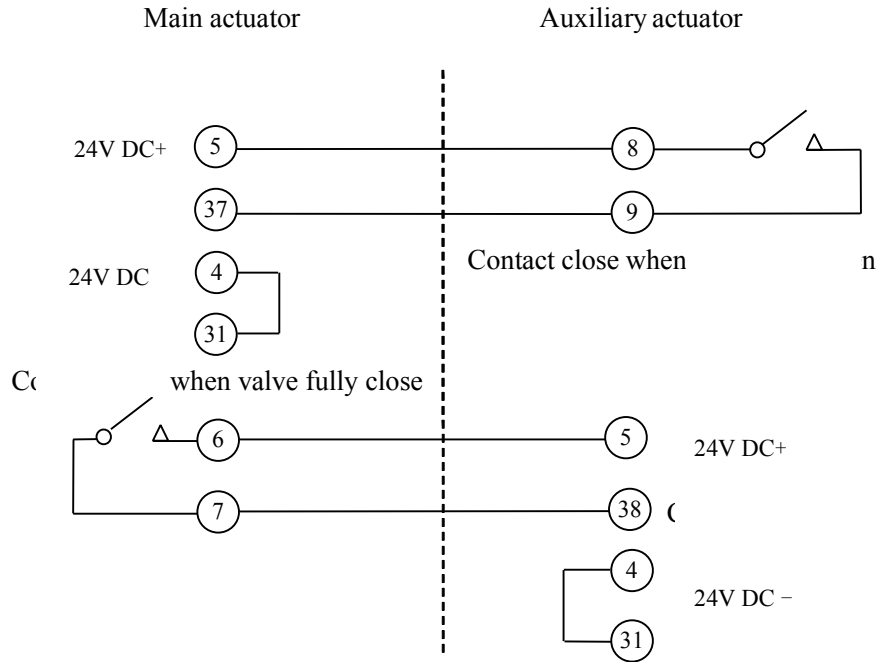


Diagram 6-7 interlock

6.8 HKC actuator extra functions option

Refer to Table 6-2.

Table 6-2 HKC actuator addition circuit and wiring diagram number

Item	Extra functions					Wiring diagram number
	1	2	3	4	5	
Base Circuit	Battery low, remote control select and thermostat tripped alarm relay	Valve position fully open and valve position fully close indication relay	Analogu e signal input	Valve position signal feedback	Torque signal output	
√	—	—	—	—	—	100-00
√	√	—	×	×	×	101-xx
√	—	√	×	×	×	102-xx
√	√	√	×	×	×	103-xx
√	×	×	√	—	—	1xx-01
√	×	×	—	√	—	1xx-02
√	×	×	√	√	—	1xx-03
√	×	×	—	—	√	1xx-04
√	×	×	√	—	√	1xx-05
√	×	×	—	√	√	1xx-06
√	×	×	√	√	√	1xx-07

NOTE: “—” means you do not select; “√” means you already select; “×” means you can select. Example: If you selected 1,3,4 functions, the wiring diagram number is 101-03.

6.9 Alarm relay

The extra alarm relay option provides five additional changeover relays. The extra alarm relay functions are show below:

- valve position fully open
- valve position fully close
- battery low
- remote control select
- thermostat tripped

6.10 Analogue signal input/output Module

The analogue signal input/output board provides a non-contacting internally fed 4 ~ 20mA analogue signal proportional to valve position. Available at terminals 22 and 23, the maximum external impedance that may be connected to the signal is 500 ohms at nominal supply voltage.

Analogue signal input impedance:

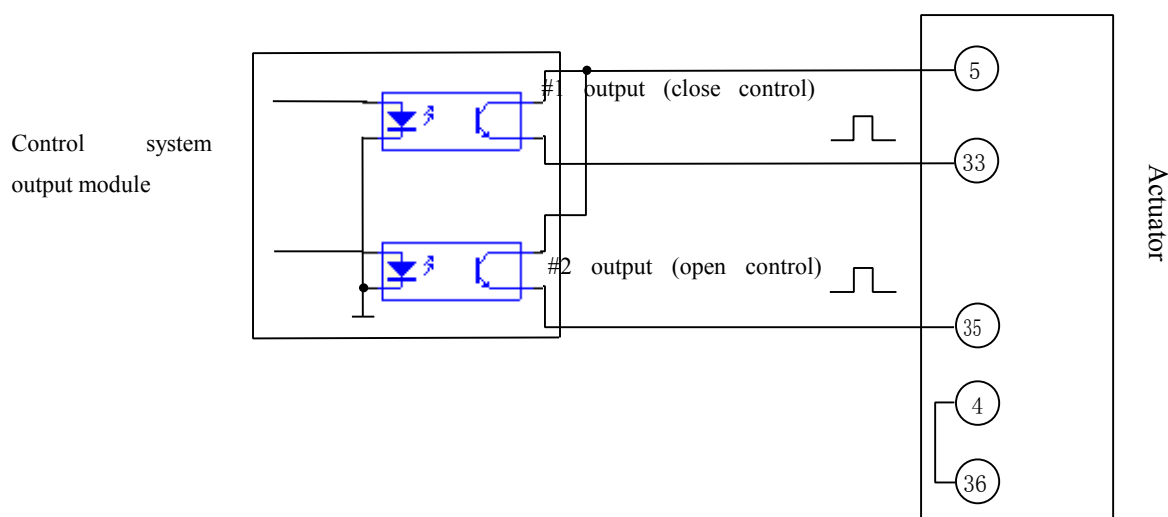
4mA ~ 20mA/250 ohm; 1VDC ~ 5VDC/1M ohm; 2mA ~ 10mA/250 ohm; 0.5VDC ~ 2.5VDC/1M ohm

6.11 Analogue signal control

The HKC actuator analogue signal proportional controllers enable the actuator to automatically position a valve in proportion to an analogue current or voltage. A signal derived from the actuator non-contacting position sensor is electronically compared with a signal proportional to the input signal. The difference between them triggers the open or close contactor in the direction that will cancel the error. Valve position is therefore automatically adjusted in proportion to analogue signal. Unnecessary frequent operation can be prevented by the adjustable deadband and the Motion inhibits Timer features.

- Position corresponding to low input signal: close limit or percentage open
- Position corresponding to high input signal: open limit or percentage open
- deadband: 0.1 ~ 9.9% of travel between open and closed limit positions
- motion inhibit time: 0.1 ~ 9.9 sec between actuator movements
- action on loss of input signal: stay-put, move to high or low signal position. Response on loss of signal will occur if signal falls below 50% of set "low" signal.

6.12 Pulse control



Pulses control sketch map

In the computer control system, the user may be used the pulse control the actuator. HKC actuator are fitted this control mode.

Please refer to diagram

- pulse width according to the output rpm N
- the interval of pulse must according to maximum 600 starts per hour and 33.3% working time.

$$\frac{18 \times 10^4}{32N} > \text{Pulse length} > \frac{6 \times 10^4}{32N} \text{ ms}$$

6.13 Modbus communication

Signal or dual MODBUS modules may be included in the HKC actuator to provide remote serial communication to the control functions and for status feedback data. The field network uses an RS485 data highway, either 2 or 4 wires, and can be duplicated where redundancy is required. The communication is half duplex and the protocol used is Modbus RTU with data rates up to 38 K baud. The actuator variables necessary to set up the system are programmable over the infra-red data link.

Modbus module advantages:

- cable cost reduction
- installation cost reduction
- simple to configure
- simple to use
- widespread open standard protocol
- many compatible devices available
- redundant configuration available

6.14 Profibus communication

Profibus connectivity is possible by fitting the DP interface module within the HKC actuator. This allows the HKC actuator to be integrated into a standard Profibus network. Full compatibility with the fieldbus standard EN 50170 is provided and the module carries Profibus certification for interoperability. The network allows full control of the actuator and feedback of status data to the host. The HKC actuator Profibus module has two communication ports to facilitate redundant fieldbus wiring where reliability is paramount, data rates up to 1.5 M baud are supported.

Profibus module advantage

- cable cost reduction
- installation cost reduction
- simple to configure and use
- devices independently approved
- widespread open standard protocol
- large number of compatible devices available
- redundant configuration available

6.15 Foundation Fieldbus communication

HKC actuator may be connected to a Foundation Fieldbus network by the inclusion of a HKC actuator FF module. The device complies with fieldbus standard IEC 61158-2, using a 2 wire electrical connection to the highway and has been certified for interoperability. The foundation highway exchanges data and control between devices and full actuator functionality is available. Each actuator has full link scheduler capability and function blocks for analogue and digital inputs and outputs as well as PID and the standard transducer block. Foundation Fieldbus networks are capable of operating without a host system as a supervisor, the field devices communicating directly between themselves.

Foundation fieldbus module advantages:

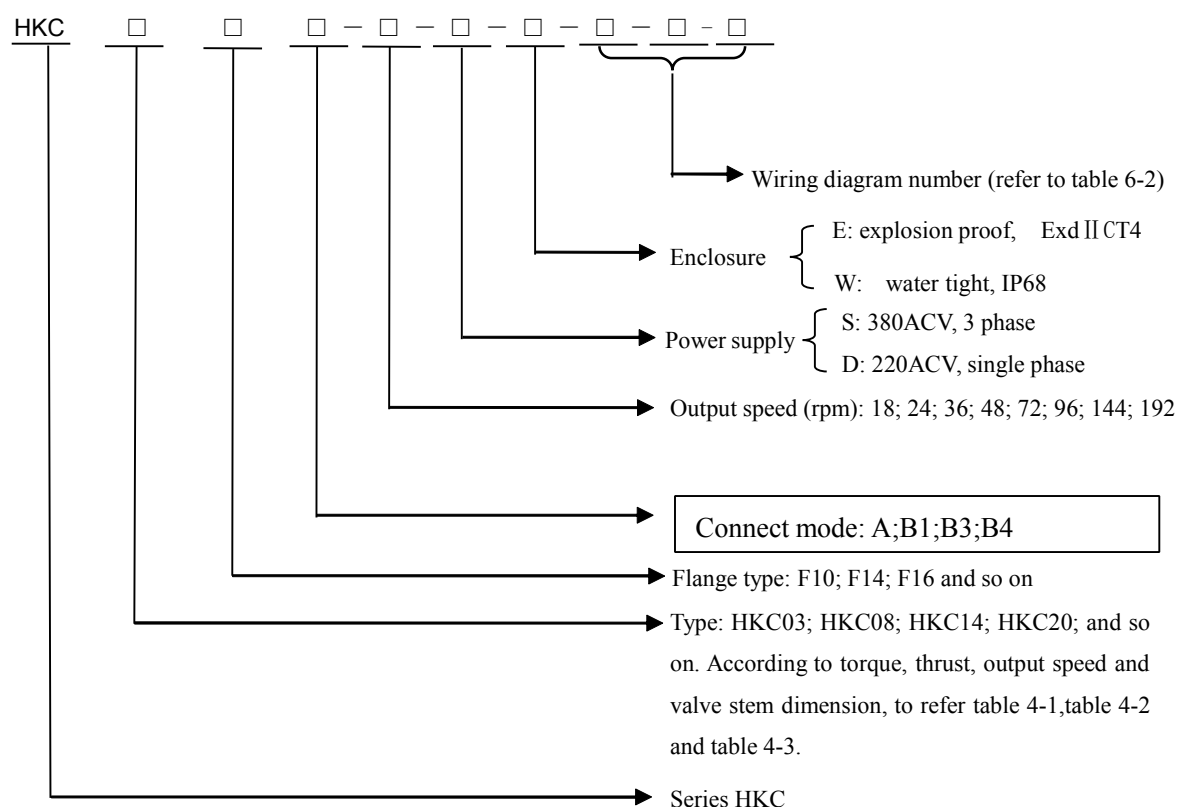
- open standard protocol

- cable cost reduction
- installation cost reduction
- simple to configure and use
- access to the transducer block provides comprehensive diagnostic data
- simple communications on plug and play basis

7: Order Introduces

Model designation must be noted the each item, for example the wiring diagram number means the actuators versions, and if you require order a gearbox, you need to fill upon its model number.

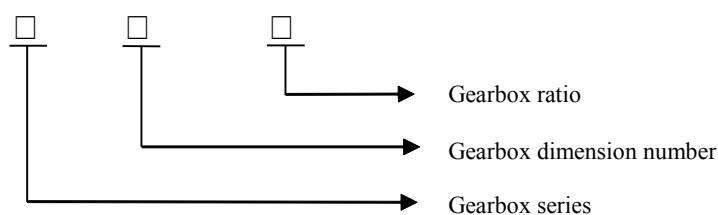
- Actuator model number



Example: HKC40F14A-24-1-W-101-03

Means: actuator modulating torque: 400N.M; flange type: F14; drive bush type: A; output speed: 24; Power supply: 380ACV; enclosure: IP68 water tight; appending analogue signal input, valve position signal feedback, battery low alarm relay, remote control select alarm relay and thermostat tripped alarm relay.

- Gearbox



Detail information can be found on the corresponding technical data sheets.

Example: W5- 40: 1

Means: W series; dimension number: 5;gearbox ratio: 40:1.

Even if the actuator and gearbox are provided all together, the model of the gearbox is not

marked on the identification plate of the actuator. There is an individual identification plate on the gearbox; on it marked with model of the gearbox and so on.

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