

(Read the instruction manual before usage)
SM-1



INSTRUCTION MANUAL

LQ1~LQ4 Electric Actuator For Valves (Non Explosion Proof)

ELECTRIC ACTUATOR

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General Description

- LQ valve actuators are the new generation product of our company and can be used for driving and controlling the butterfly valves ,ball valves,plug valves(part-turn valves with 90°movement). The actuators can be either remotely controlled or locally controlled.They are widely used in the fields such as oil,chemistry ,power generation,water treatment,paper making.
- The protection class is IP 67,and the explosion proof class is dIBT4 (with letters of "Ex")
- This operation manual is applied for Non explosion proof type.For special type actuators,the additional Manual will be provided.

Mechanical Characteristic

- **Housing:**Hard anodized Aluminum casting and external epoxy powder coated against severe industrial environment.
- **Gearing:**Precisely machined double worm gear c/w minimum back-lash, low noise, high output torque.
- **Self locking:**Provided by double worm gearing to keep position of valve unchanged against reverse torque from valve.
- **Motor:**Specially designed induction motor to generate high starting torque and high efficiency equipped with thermal protector to prevent damage from over heating,Insulation class F
- **External mechanical stopper:**Prevents over run of travel angle when limit switch fails.
- **Torque switches:**Protect actuator from damage caused by overload from the driven valve over the whole travel,1 each for open / close
- **Limit switches:**Directly engaged with driving shaft to set accurate position of valve,supplying a dry contact signal.
- **Terminal:**Spring loaded push type terminal for tight wiring connection under severe vibration.
- **Space Heater:**Anti-condensation
- **Manual override:**Auto / Manual switchable lever and handwheel engagement for emergency manual operation,Drive force automatically resorted by motor start, unless lever padlocked to prevent this occurring.
- **Handwheel:**Manual operated,turn ON/OFF valve directly when power off.

Electrical characteristics

- Reversing electric contactors, Phase Detector.
- DC24V Voltage for remote control.
- Convenient and flexible for wiring.
- Impenetrable design to improve the sealing of actuator for local button box.
- Five pieces passive contact signal indicate the working situation of actuators, conveniently monitor for DCS system
- Setting monitoring relay,supplying Comprehensive fault signal for DCS system.
- For turn button,can use common padlock locking according to requirments to preventing the false operation

Working environment and main technical Parameters

- **Working environment**
 - The products conform to JB/T8528-97 《technical conditions for non explosion proof electric actuators》 .
 - Power supply:220V,single phase or 380V,3 phase (Options Available)
 - Outdoor protection class:IP67
 - Temperature: -20~60℃.
 - Height above sea level:≤1000m
 - Humidity:≤90%(25℃)
 - No strong corrosion media at working environment.
 - Non explosion-proof products can't be used at mixed explosive gas environment
 - Short time work:10 min
 - No strong vibrance.

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●(AC220V,1PH)Technical Parameters

Item	Output Torque (N.m)	90° Running time (S)	Motor Power (W)	Motor Current (A)		circle number of handwheel	Weight (Kg)
				Rated	Locked Rotor		
LQ1-6	60	21	15	0.45	0.7	8.5	9
LQ1-10	100	26	20	0.5	0.8	10	
LQ2-20	200	28	40	0.6	1.0	12	12
LQ3-35	350	32	60	0.9	1.5	13	16
LQ3-50	500		90	1.3	2.4		19
LQ4-80	800	36	120	1.5	3.0	14.5	21
LQ4-110	1100		180	2.2	3.5		24
LQ4JS-200	2000	78	120	1.8	3.0	32	48
LQ4JS-250	2500		180	2.2	3.5		50

Note: With integral control module,total weight may increase 4kgs.

●(AC380V,3PH)Technical parameters

Item	Output Torque (N.m)	90° Running time (S)	Motor Power (W)	Motor Current (A)		circle number of handwheel	Weight (Kg)
				Rated	Locked Rotor		
LQ1-10	100	26	20	0.22	0.4	10	9
LQ2-20	200	28	40	0.25	0.6	12	12
LQ3-35	350	32	60	0.7	1.1	13	16
LQ3-50	500		90	0.8	1.7		19
LQ4-80	800	36	120	1.0	2.0	14.5	21
LQ4-110	1100		180	1.5	2.5		24
LQ4JS-200	2000	78	120	1.0	2.0	32	48
LQ4JS-250	2500		180	1.5	2.5		50

Note: With integral control module,total weight may increase 4kgs.

Main structure and functions

- Motor: 220V single phase motor or 380V, three Phase YDF type.
- Speed reducer: it is composed of two class of worm and worm gear.
- Travel control and position direction: from the output shaft to lead out the cam shaft to make 90° rotation, and the limit cam can also make 90° rotation to control the travel. The position indicating plate is co-axial with the cam shaft to make 90° rotation and indicate the valve position. And also can provide potentiometer for remote electric signal output which is not provided normally (The user should specify when order)
- Torque control unit: to control torque of the actuator. It is composed of cams of both close and open and microswitch. (LQ1 don't have this part)
- Manual override: It is semi-automation with the priority of electric operation. Pull the handle and then turn the handwheel to realize manual operation. In electrically operated, switching the handle will return to electric position automatically and realize electric operation.

Main structure Diagram of electric actuator:

LQ valve actuator is composed of motor, speed reducer, travel controller, torque controller, position indicator, handwheel, mechanical position limiter

Chart 1 is below

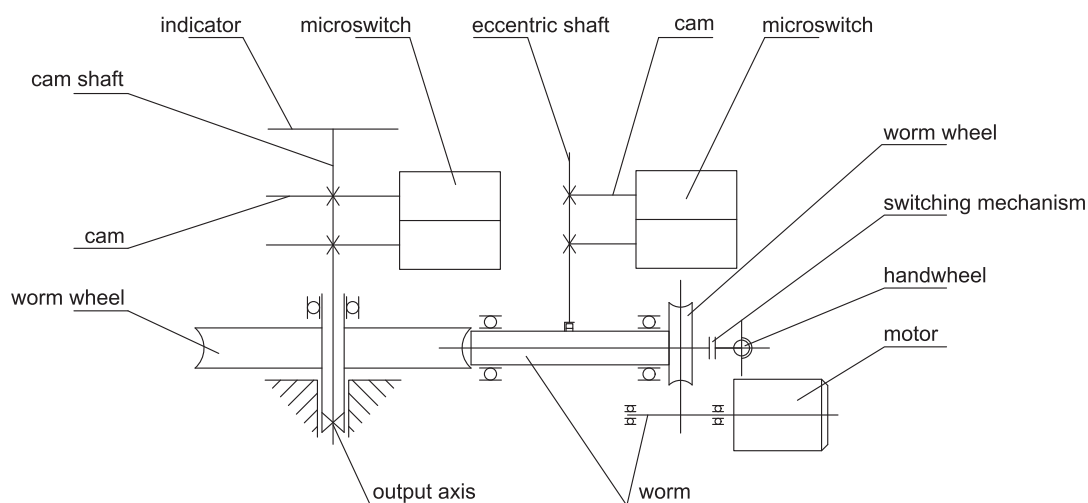


Chart 1

Outline dimensions and valve connection size

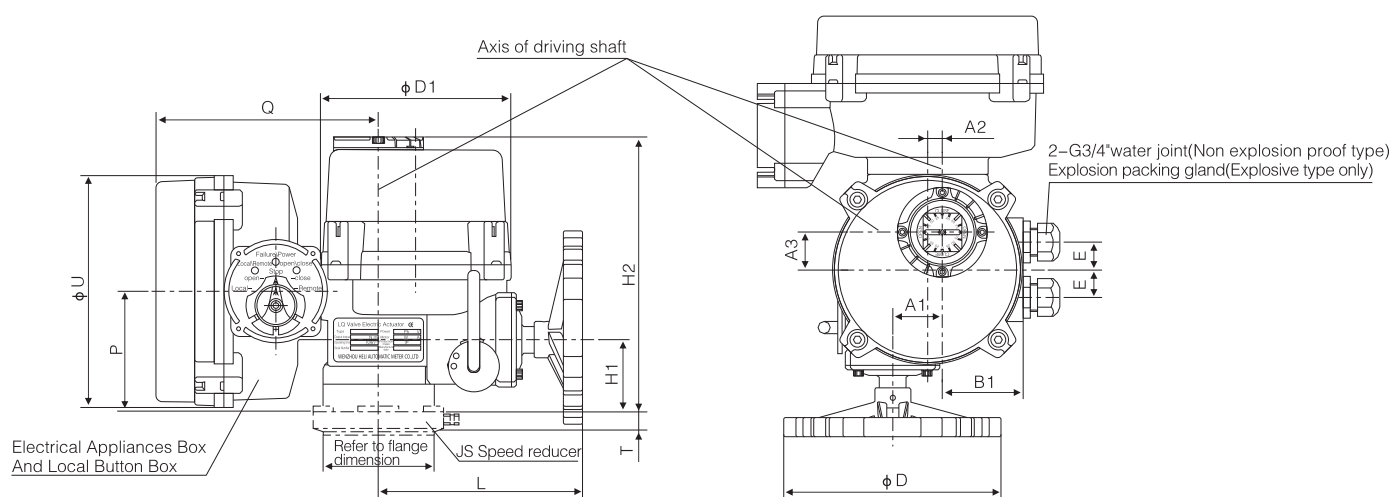
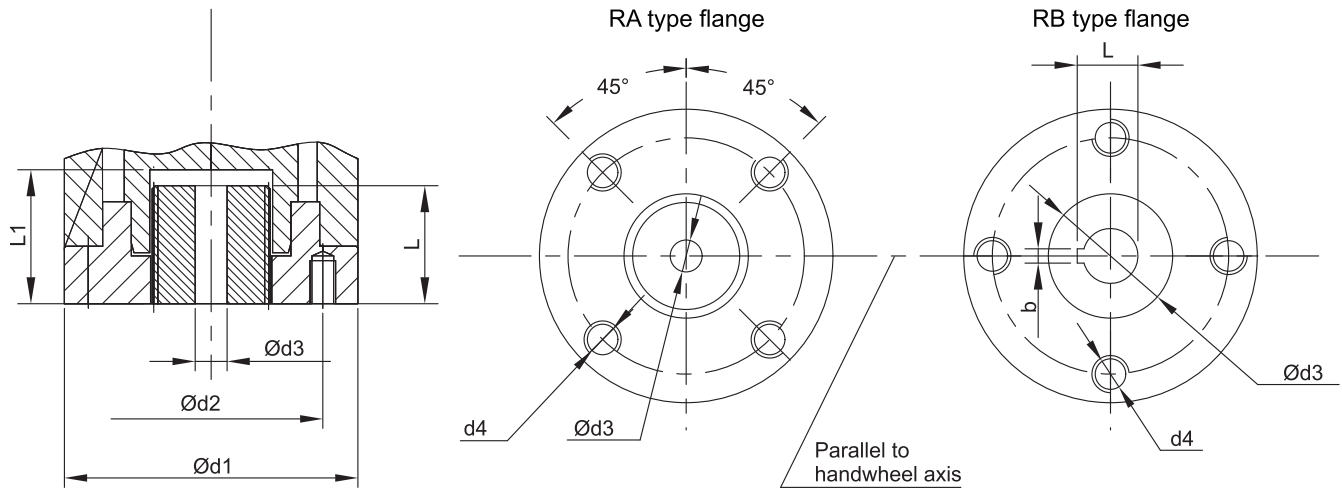


Chart 2

Type	A1	A2	A3	B1	D	D1	E	H1	H2	L	T	P	Q	U
LQ1	41	12	31	67	100	157	23	55	223	167	-	96	179	192
LQ2	57.5	23.5	27	80.5	180	206		67	261	197	-	112	207	
LQ3	60.5	25.5	35	85.5		222		70	315	208	-	121	207	
LQ4	70	35	40	96		262		81	352	230	-	132	222	
LQ4/JS											104			

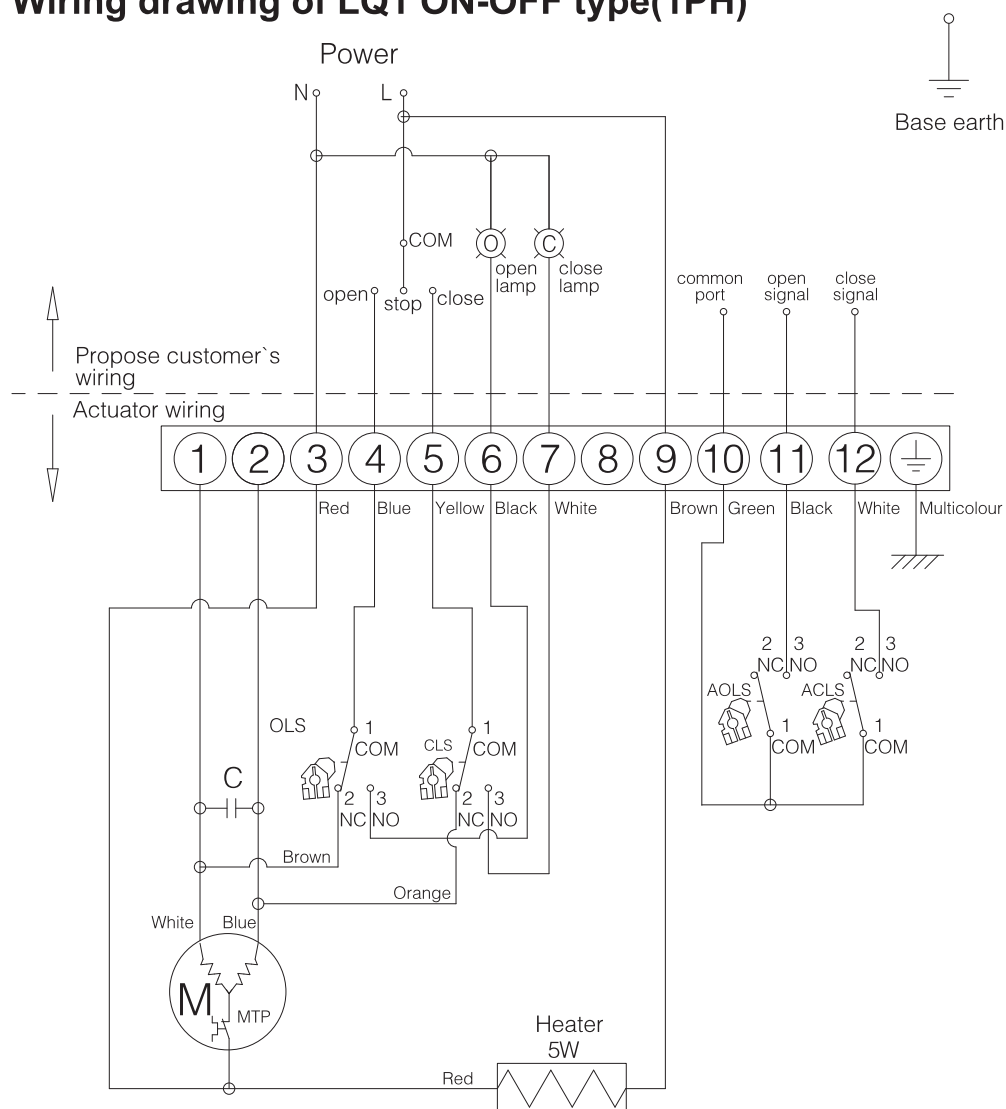
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Flange structure and connection size of valve



Code Type	Flange type		d1	d2	d3			b	L	L	L1	d4		
					Standard dimensions	Preliminary dimensions	Max. Permissible							
LQ1 LQ1.Ex	RA	F05	Ø92	Ø50	/	Ø8	Ø22	/	/	37	42	4-M6depth12		
		F07		Ø70								4-M8depth12		
	RB	2"		Ø57.15	Ø12.6			3	14			4-M6depth12		
		3"												
LQ2 LQ2.Ex	RA	F07	Ø132	Ø70	/	Ø10	Ø32	/	/	46	49	4-M8depth15		
		F10		Ø102								4-M10depth15		
	RB	4"		Ø69.85	Ø15.77			5	18.07			4-M10depth15		
		5"			Ø18.92				21.22					
		6"												
LQ3 LQ3.Ex	RA	F10	Ø146	Ø102	/	Ø10	Ø32	/	/	46	51	4-M10depth15		
		F12		Ø125								4-M12depth15		
	RB	8"		Ø88.9	Ø22.10			5	24.10			4-M12depth15		
		10"			Ø28.45				31.45					
LQ4 LQ4.Ex	RA	F12	Ø176	Ø125	/	0	Ø42	/	/	53	60	4-M12depth18		
		F14		Ø140								4-M16depth25		
	RB	12"		Ø107.95	Ø31.6			8	34.9			4-M12depth20		
		14"												
LQ4/JS LQ4/JS.Ex	RA	F14	Ø215	Ø140	/	0	Ø60	/	/	64	71	4-M16depth25		
		F16		Ø165								4-M20depth25		
	RB	16"		Ø158.75	Ø33.5			10	36.45			4-M18depth25		
		18"			Ø38				41.3					
		20"			Ø41.15									44.45

Wiring drawing of LQ1 ON-OFF type(1PH)



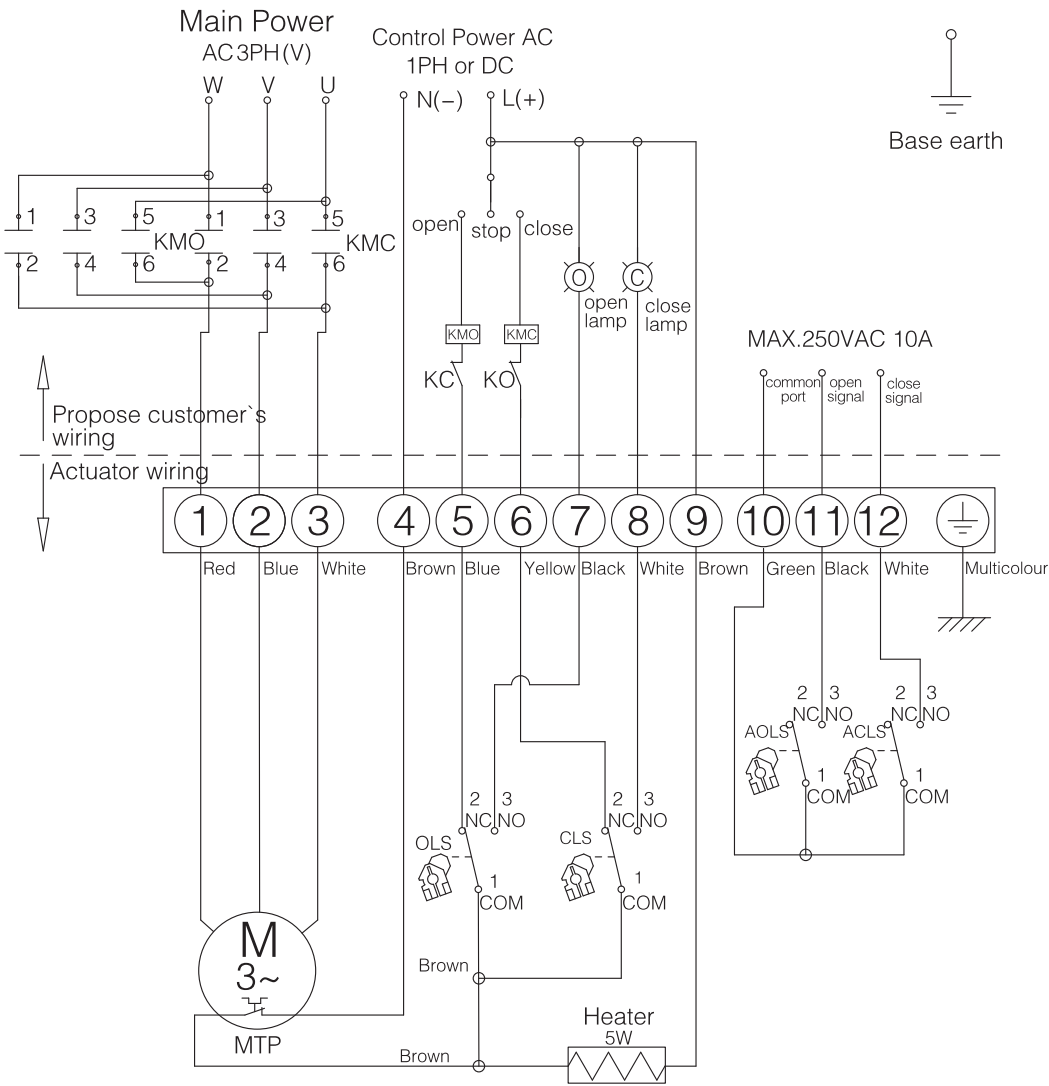
ALS: Auxiliary limit switch
 AOLS: Aux.Open Limit Switch
 ACLS: Aux.Close Limit Switch
 O: Open lamp
 C: Close lamp
 T: Over torque lamp
 CLS: Closing limit switch
 OLS: Opening limit switch
 CTS: closing torque switch
 OTS: opening torque switch
 KMC: Closing contactor coils
 KMO: Opening contactor coils
 M: Motor
 MTP: Motor Thermal Protector

The working state of the limit switch and torque switch

ON-OFF	Full Close	Middle Position	Full Open
CLS 1-2			
CLS 1-3			
OLS 1-2			
OLS 1-3			
ACLS 1-2			
ACLS 1-3			
AOLS 1-2			
AOLS 1-3			
CTS 1-3	Closing torque switch interrupts control when mechanical overload occurs during closing cycle		
OTS 1-3	Opening torque switch interrupts control when mechanical overload occurs during opening cycle		

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Wiring drawing of LQ1 ON-OFF type(3PH)

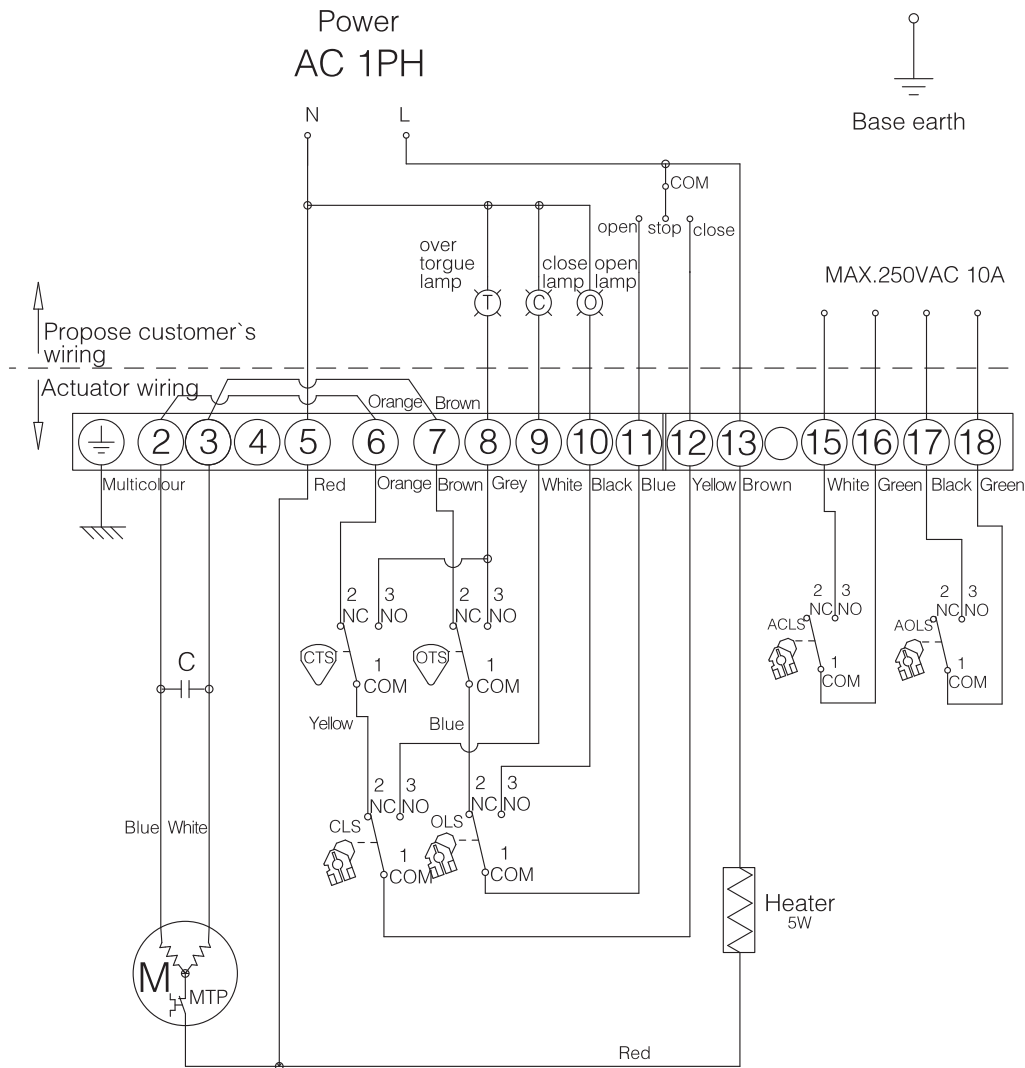


ALS: Auxiliary limit switch
AOLS: Aux.Open Limit Switch
ACLS: Aux.Close Limit Switch
O: Open lamp
C: Close lamp
T: Over torque lamp
CLS: Closing limit switch
OLS: Opening limit switch
CTS: closing torque switch
OTS: opening torque switch
KMC: Closing contactor coils
KMO: Opening contactor coils
M: Motor
MTP: Motor Thermal Protector

The working state of the limit switch and torque switch

ON-OFF	Full Close	Middle Position	Full Open
CLS 1-2			
CLS 1-3			
OLS 1-2			
OLS 1-3			
ACLS 1-2			
ACLS 1-3			
AOLS 1-2			
AOLS 1-3			
CTS 1-3	Closing torque switch interrupts control when mechanical overload occurs during closing cycle		
OTS 1-3	Opening torque switch interrupts control when mechanical overload occurs during opening cycle		

Wiring drawing of LQ2-LQ4 ON-OFF type(1PH)



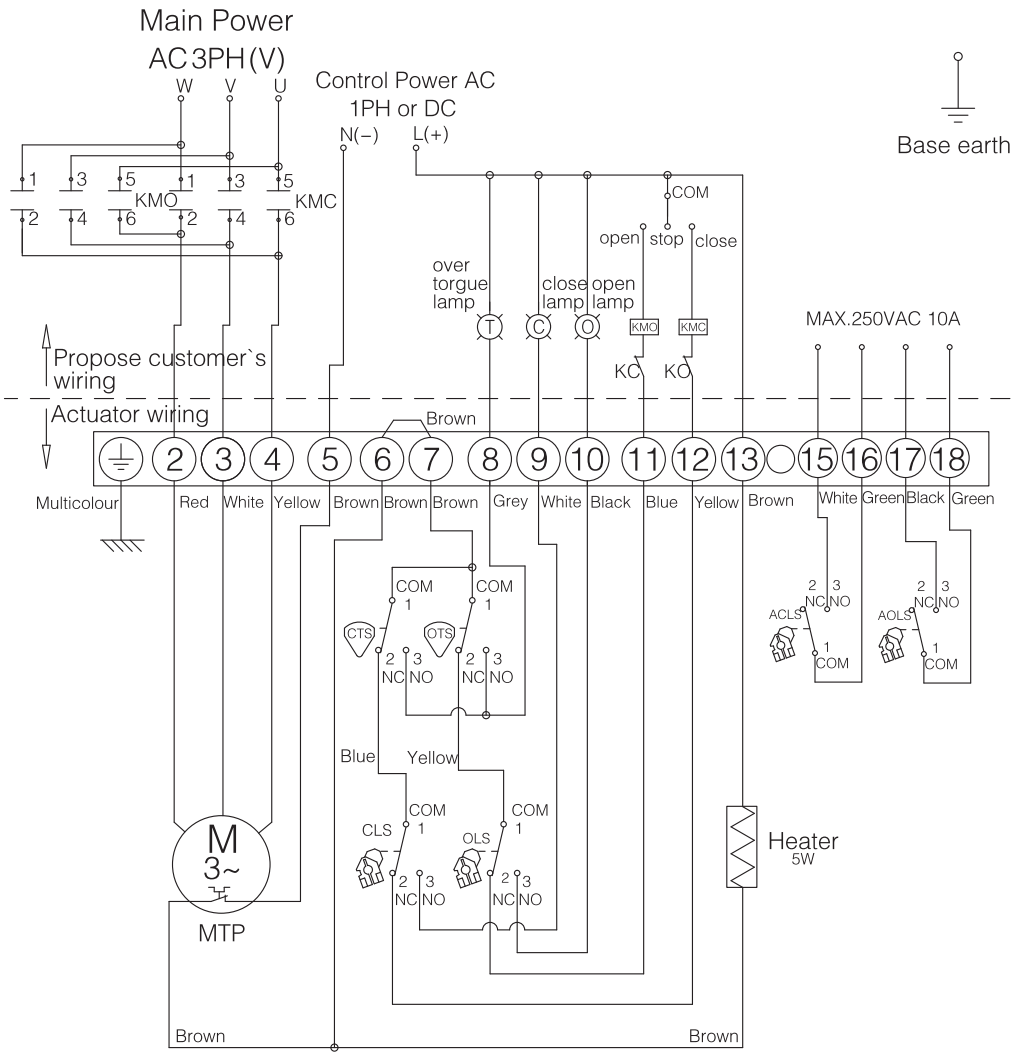
ALS: Auxiliary limit switch
AOLS: Aux.Open Limit Switch
ACLS: Aux.Close Limit Switch
O: Open lamp
C: Close lamp
T: Over torque lamp
CLS: Closing limit switch
OLS: Opening limit switch
CTS: closing torque switch
OTS: opening torque switch
KMC: Closing contactor coils
KMO: Opening contactor coils
M: Motor
MTP: Motor Thermal Protector

The working state of the limit switch and torque switch

ON-OFF	Full Close	Middle Position	Full Open
CLS 1-2			
CLS 1-3			
OLS 1-2			
OLS 1-3			
ACLS 1-2			
ACLS 1-3			
AOLS 1-2			
AOLS 1-3			
CTS 1-3	Closing torque switch interrupts control when mechanical overload occurs during closing cycle		
OTS 1-3	Opening torque switch interrupts control when mechanical overload occurs during opening cycle		

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Wiring drawing of LQ2-LQ4 ON-OFF type(3PH)



ALS: Auxiliary limit switch
AOLS: Aux.Open Limit Switch
ACLS: Aux.Close Limit Switch
O: Open lamp
C: Close lamp
T: Over torque lamp
CLS: Closing limit switch
OLS: Opening limit switch
CTS: closing torque switch
OTS: opening torque switch
KMC: Closing contactor coils
KMO: Opening contactor coils
M: Motor
MTP: Motor Thermal Protector

The working state of the limit switch and torque switch

ON-OFF	Full Close	Middle Position	Full Open
CLS 1-2			
CLS 1-3			
OLS 1-2			
OLS 1-3			
ACLS 1-2			
ACLS 1-3			
AOLS 1-2			
AOLS 1-3			
CTS 1-3	Closing torque switch interrupts control when mechanical overload occurs during closing cycle		
OTS 1-3	Opening torque switch interrupts control when mechanical overload occurs during opening cycle		

[illegible]

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Wiring drawing

●Remove the box cover:

Use "L" spanner, loose the four hex screws of the box (Please just release them), then remove the box cover from the box, You can find the wiring diagram in the bag of random file(integral type), the wiring diagram for ON-OFF type is inside of the box cover.

●Wiring:

In accordance with the schematic, power cables and control cables come through the electrical connector and connect with the terminal, do not forget to connect the base earth (one is in the wiring cavity; the othe is in the outer wall of the cover), cable jacket should be ensured that the sealing rubber plug in the cable connector hole, tighten the jacket, lock cable, and make sure the supply voltage must be consistent with the technical data on the nameplate !

After the wiring, box cover screws must be tightened to ensure a good seal.

●Cable connector seal:

In any work environment, even though the product are not used, the inside tube of the cable connector block must be sealed ,these valve actuators are subjected to inspection before shipment ,and if not timely installed, the device should be stored in a dry place, don't remove the tube block before you complete the wiring to prevent corrosion damage.

●Notes for ON-OFF type wiring:

- Please don't contact actuators more than two sets in a parallel circuit.aslo can't use the same connection point to contact them above two sets,otherwise,the actuatoar will be out of control ,or the motor will overheat.
- When use the 3PH Power,In order to avoid the actuators get out of control,you have to ensure the actuators stop at the middle postion of the Stroke angle before operation.

Push the "ON "(or "OFF")button,the actuators should begin to "open"(or "close"), Conversely,if it begin to "close"(or "open"),please cut off the power, also please change any two input phase lines.

Connection of electric actuator and valve

●Adaptor (Chart 3)

a.jugged adaptor(suitable for LQ1,LQ2,LQ3)

- Use the "L" spanner to unscrew the two screws of the adaptor,
- Make the adaptor according to the valve stem.
- put the processed adaptor into the output shaft according to the direction of the keyway.

b.cylindrical adaptor (suitable for LQ4,LQ4/JS)

- Use the "L" spanner to unscrew the two screws of the adaptor, and then Screw in the next screw hole,then remove the adaptor.
- Make the adaptor according to the valve stem.
- put the processed adaptor into the output shaft according to the direction of the keyway,then tighten the two screws.

●Flange connection

Flange connection should be consistent with the structure of electric devices, to ensure the correct connection between the electrical actuator and the valve through the adaptor.

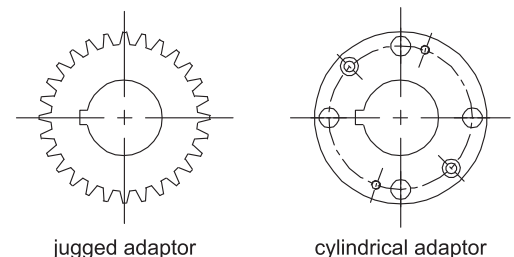


Chart 3

Adjustment

●Travel limit switch adjustment

Notes before working: When the electric actuator runs at the first time , you must confirm the direction of motor rotation is correct, if not correctly ,it may damage the electrical actuator (i.e., must ensure that the electrical power supply phase sequence is correct).

- Firstly, turn the hand wheel ,and operate the valve to the middle position of "open---close",by hand, then take the "open or close" operation to check whether the power is running on the correct direction.

----- Output shaft clockwise rotation (face the opening windows): the valve closed.

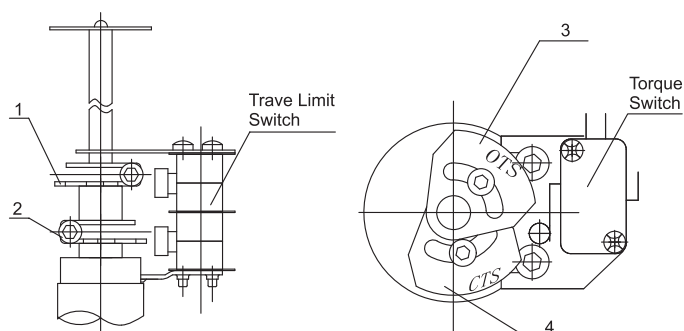
----- Output shaft counter-clockwise rotation (face the opening window): the valve open.

- If the valve is running in the opposite direction, the operating should be stopped immediately, and re-check the wiring again(need to change the phase sequence of the motor and power connections).

●Setting of the travel limit switch

After above operation,please ready to make the following adjustments:

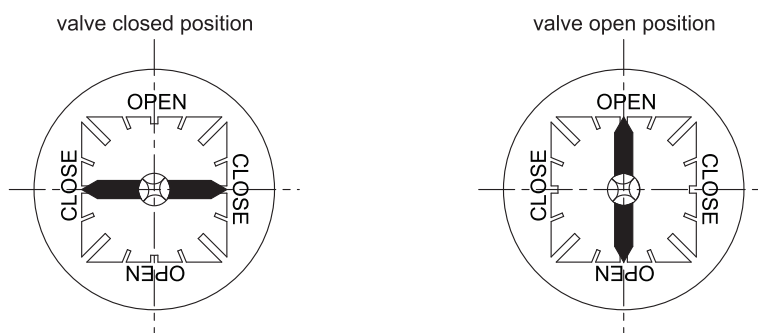
- Pull the manual override to the manual position, turn the hand wheel clockwise to make sure the valve of the fully closed position.
- Use "L" spanner, loosen the screws on the lower CAM (see below figure) .
- Adjust the CAM, let it contact with the lower limit switch,then tighten the screws.
- Power on, press the "ON" button, run to the opposite direction first, and then run to the "OFF" direction to check the valve "OFF" direction, repeat several times until meet the requirements.Conversely, fully open position adjustment as normal.Valve position can be adjusted several times in orde to reach the same opening and closing of the valve .



- No 1. The upper CAM –used to the open direction limit of the CAM
 No 2. The lower CAM –used to the close direction limit of the CAM.
 No 3. The upper CAM –used to the open direction over torque of the CAM
 No 4. The lower CAM –used to the close direction over torque of the CAM.

● Valve Position Indication

“OPEN” and “CLOSE” position of the indicator



●Mechanical Limit Bolt

- Two mechanical limit screws on the device have been tested and tightened when the factory ,if no special requirements, users do not have to loose them.
- In case of having to adjust limit screws, please confirm the valve position by the screws first, when dextrorotation is closed, the right is closed limit screw and the left is open limit screw (when the opening window upward, face the limit screw adjustment).
- After adjusting valve limit position, please tighten up the screws of fan-shaped switch first, then return back 0.5~1 circle to protect the limit switch and overtorque. Finally, tighten up limit screw, by now, the limit adjustment is completed.

●The opening and closing operation testing

After testing the open / close and mechanical limit, operate the valve three times about open-close, close-open (using the switch button on the operation controller, and check the close / open indicator light).

●Torque switch

Normally, no need to reset or adjust the torque switch, because the product has been set before shipping from the factory, and reached the rated torque of the electric device. In case of having to adjust the torque switch, please contact the manufacturer.

Warning: For torque switch setting, special precision instruments have to be used in order to protect the electrical device and the valve body. if no contact with the manufacturer prior, its quality will not be guaranteed.

Manual Override

● **Manual:** move the handle to the direction of “MANU” (if not linked, just turn the handle in a small angle ,which can be switched to manual), once the hand position is locked, turn the handle in two direction of close and open.

● **Electric:** power up, open the motor, turn into the electric position automatically (at the moment, handle recover automatically). That is, when pressing the button ON or OFF of the controller, electric status will realize automatically.

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Operation instruction of local control

Make sure Electric actuator wiring connection is correct!

- Make electric valve run to the middle position by hand wheel
- Power on, the light of "failuer/power" for local button light box indicate green.

Local button light box panel operation, (Chart 4)

- Local button light-box panel: Big black button is switch turn-knob, the red button is Switch knob. Switch turn-knob operate "Local""Stop""Remote"; Switch Knob operate "Open Valve" "Close Valve" .
- "Local/Remote" light is red when Switch turn-knob work in local status. Turn the Switch knob anticlockwise, the light of open valve / close valve flash red until valve stop at full open. "Valve open/close" become red, Terminal "opening" get through. When clockwise to turn the Switch knob, "open/close valve" light flash green until valve stop at full close, Terminal "closing" get through.
- When electric actuator work in local control status, Electric actuator go to open or close status, Loosen switch knob , electric actuator will stop at this position.
- When switch turn-knob work in remote status, the light of Local/Remote" turn green, the electric actuator terminal "Remote" get through. User can control the terminal "6.7.8.9" by the drawing of diagram.
- When the electric actuator is modulating type, get the terminal "5.6" through, input control signal from terminal "control signal".
- Valve jammed or other reasons lead to the electric actuator over torque, the electric actuator will stop work, the terminal "over torque" get through, output warning signal, at the same time, the light of "Failure/power" turn red, the relative direction light flash too.
- Supervisory relay has been installed in the integral control type electric actuator, The relay will be work when actuator work normally (terminal "Ready" get through), when the normal working condition of electric actuator be affected (switch turn-knob in "stop" position ,power off, phase loss or the motor temperature too high), terminal "Ready" break down, and terminal "Fault" get through.

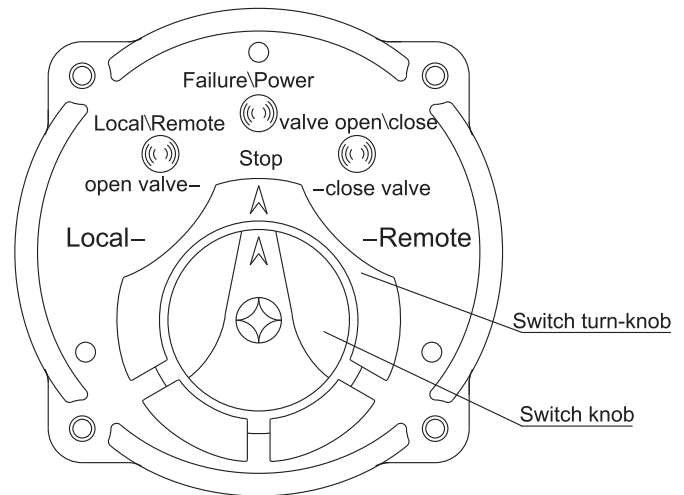


Chart 4

Failure checking

● Mechanical failure

- After pull the manual override, operate the valve by hand-wheel, check whether the manual override is sensitive and reliable or not.
- Checking whether the action and the indication of the position indicator are right or not.
- If the hand-wheel does not move, the valve was blocked , remove and repair the valve.
- If the hand wheel is operating normally, without interference, but the valve stem does not move, please check whether the adaptor is reliable or not.
- If the valve can be operated by hand-wheel, and then check the electrical.

● Electrical failure.

Check the external controller first, and then check the electric aduator.

- Check the main power supply, control power, replay, fuse and all of indicator lamp.
- If there are problems with controller, check to determine whether the relevant parts need to be replaced, if no problems with the electrical components, then check the electric actuator.
- Check the motor, which can be replaced if there are some problems .
- If the micro switch fails, it can be resolved by replacing the relevant components.

Maintenance

Suggestions conventional repair or regular maintenance two times a year.

Quality assurance and technical support

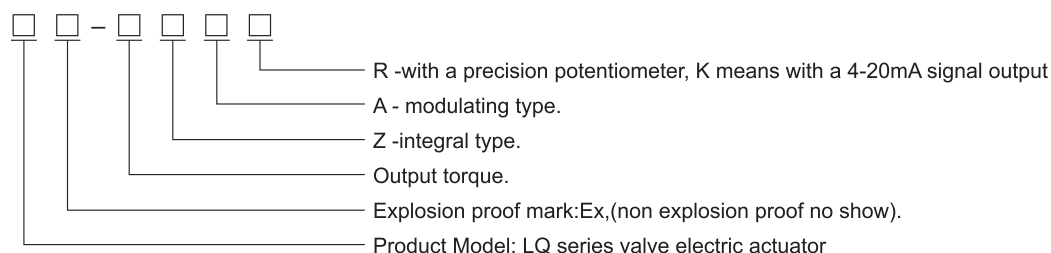
The warranty period is one year,among the warranty period, (the time from the date of delivery), the Company offers a variety of technical support.

Ordering Information and Model Representation

●The following details need to be noticed by user when ordering .

- The required torque for valve (NM, rotate speed (r / min)
- Product use environments,
- Product supply voltage,
- The connection size with valve,
- Electrical control requirements.
- Other special requirements

●Model representation



Special alert

● In order to ensure the shell protective performance of the whole electric actuator, when adjustment and maintenance, the user must operate strictly according to "Manual" and the "special alert" requirements of the relevant operations .as a result of improper operation or disobey the "user manual" and "Special provisions for warning" . Caused by failure of electric device protective shell, Its responsibility should be undertaken by the user.

●Before the electrical actuator leaves the factory, all the relevant parts of the shell are subject to test to ensure the sealing. User need to open the following site for debugging, maintenance

- the control box.
- wiring box.
- outlet line lock.

●After opening, the user must ensure the below points:

- Debugging and maintaining or in some operation process, the electric device don't have the original protection at this time, users should ensure its independence from rain, snow, hail, moisture, dust and other unfavorable factors of the invasion.
- After the operation is completed, when tighten the outlet line lock or the department of sets, the user should ensure that there is not any adverse factors such as water, dust, moisture in the open area cavity, which may lead to protective performance decline .
- The operation is completed, after tighten the outlet line lock, the user should ensure that all tightening screws、 washers and spring washers are in the box cast. Any omissions or loosening is not allowed. At the same time, users should ensure that contact between the tank cover and cabinet parts, there were not any injuries in the rubber seals for sealing purpose.
- After the cable come out from the outlet line lock, the user should ensure that tighten the nut to make sure the seal , PTFE must be included in the thread sealing between the compression nut and the box . Meanwhile, sealant should be smeared in the inner bore between the cable and the gland nut (such as 609, etc.)
- Other parts of the site, such as opening windows or local buttons,Users should ensure all of the seal are good .

Science and technology, promote the future

