

HKC ELECTRIC QUARTER TURN ACTUATOR 'HQ' SERIES INSTRUCTION AND MAINTENANCE MANUAL

HQ-005, 008, 015, 020, 030, 050, 060
080, 120, 200, 300

MAN. NO. : HQ-IMM-01-A

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*Thanks for purchasing our HQ series actuator.

Before installing or operating actuator, please carefully read this manual to know thoroughly how to install or operate.

The contents in this manual is subject to change due to the quality improvement without individual notice.

1. Check points before using actuator

1) Mechanical

- *Check external : Check if drive bushing, painting, handle and lever are O.K or not.
- *Compare specification : Compare if specification of the delivered actuator is suitable for your specification of application
- *Check options : Check if all options are correct or not

2) Electrical

- *Check if electrical specification is correct or not
(wiring diagram inside of actuator, name plate).
- *Check if the electrical power is correct or not.

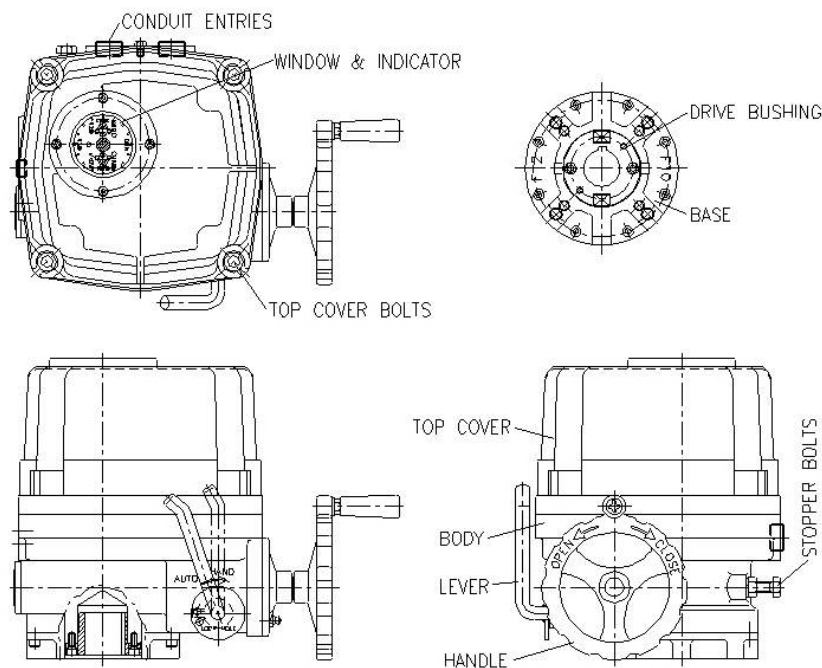
3) Other checking points

Check if instruction manual, test report(Warranty papers) and electrical wiring diagram are supplied or not.

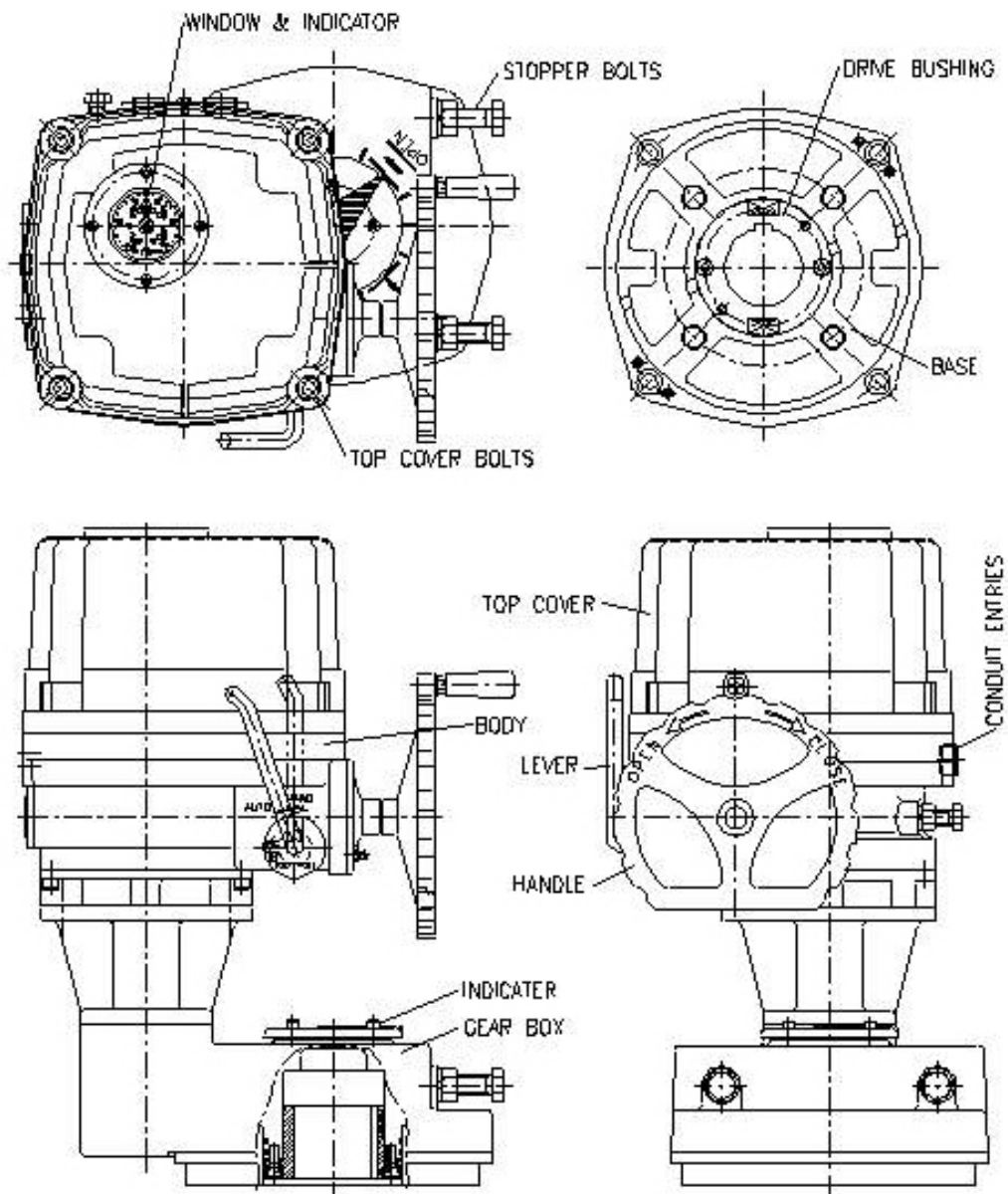
2. Introduction of HQ Actuator

1) Name of main parts

Externals

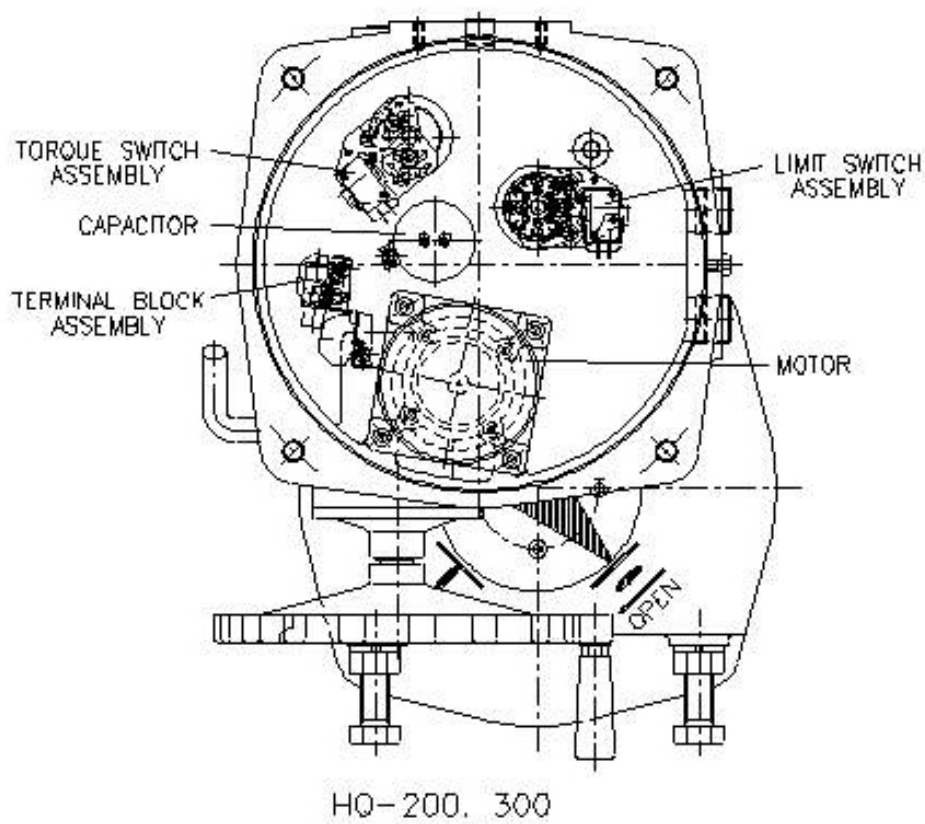
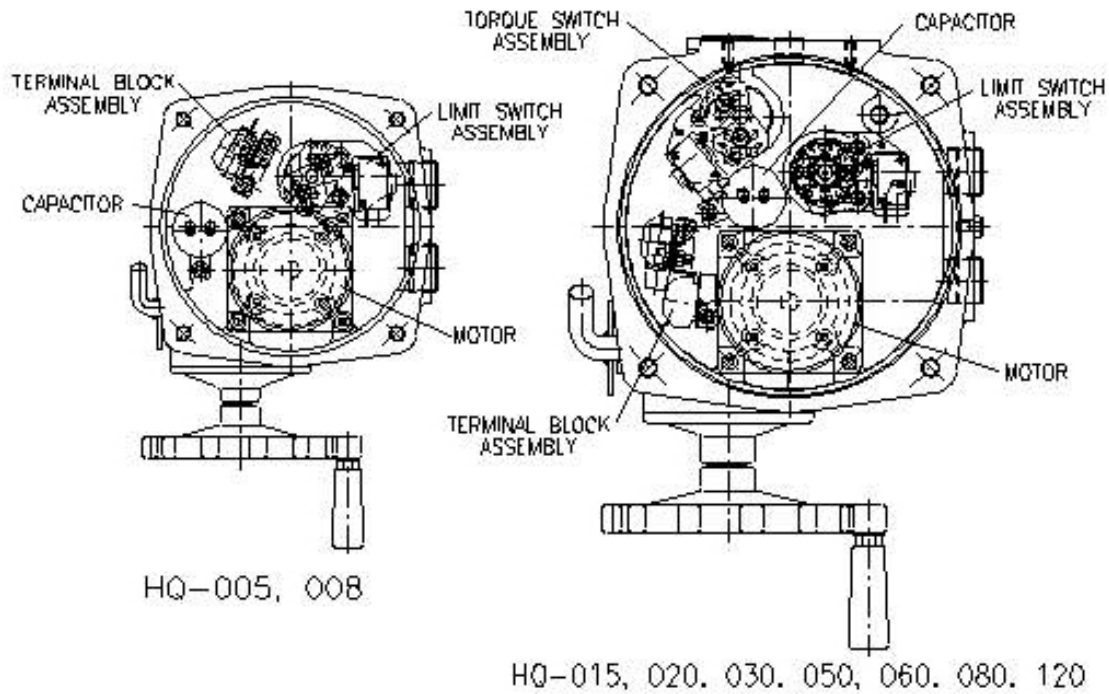


HQ-005, 008, 015, 020, 030, 050, 060, 080, 120



Internals

(1) ACTUATOR 외부명칭



2) Specification

(1) STANDARD SPEC

ENCLOSURE	: WATERTIGHT ENCLOSURE IP67, NEMA 4 AND 6
POWER SUPPLY	: 110/220V AC 1PH, 380/440V AC 3PH 50/60Hz, $\pm 10\%$
CONTROL POWER SUPPLY	: 110/220V AC 1PH 50/60Hz, $\pm 10\%$
DUTY	: S2 40~100%
MOTOR	: SQUIRREL CAGE INDUCTION MOTOR
LIMIT SWITCHES	: OPEN/CLOSE, SPDT, 250V AC 10A RATING
TORQUE SWITCHES	: OPEN/CLOSE, SPDT, 250V AC 10A RATING(EXCEPT HQ-005, 008)
ADDITIONAL LIMIT SWITCHES	: OPEN/CLOSE, SPDT, 250V AC 16A RATING(EXCEPT HQ-005, 008)
STALL PROTECTION OPERATING TEMP.	: BUILT-IN THERMAL PROTECTION, OPEN $140^{\circ}\text{C}\pm 5^{\circ}\text{C}$ /CLOSE $90^{\circ}\text{C}\pm 10^{\circ}\text{C}$
TRAVEL ANGLE	: $90^{\circ}\pm 10^{\circ}$ ($0^{\circ}\sim 110^{\circ}$)
INDICATOR	: CONTINUOUS POSITION INDICATOR AND SIGNAL LED
MANUAL OVERRIDE	: HAND/AUTO DECLUTCHING MECHANISM
SELF LOCKING	: PROVIDED BY MEANS OF WORM GEARING
MECHANICAL STOPS	: 2*EXTERNAL ADJUSTABLE SCREWS
SPACE HEATER	: 7~10W (110/220V AC) ANTI-CONDENSATION
CONDUIT ENTRIES	: TWO PF3/4" TAP
LUBRICATION	: GREASE MOLY(EP TYPE)
MATERIALS	: STEEL, ALUMINIUM ALLOY, AI BRONZE
AMBIENT TEMPERATURE	: $-20^{\circ}\text{C}\sim +70^{\circ}\text{C}$ (EXCEPT OPTIONAL ELECTRONIC CARD)
AMBIENT HUMIDITY	: 90%RH MAX. (NON-CONDENSED)
DIELECTRIC STRENGTH	: 1500V AC 1MINUTE
INSULATION RESISTANCE	: 500V DC 30M OHM
ANTI VIBRATION	: X Y Z 10g, 0.2~34Hz, 30MINUTE
EXTERNAL COATING	: DRY POWDER, POLYESTER, MUNSELL NO. 5R 3.5/12

(2) OPTION SPEC

EXA : EXPLOSION PROOF ENCLOSURE ACTUATOR(Ex d II C T6)	HQ-SERIES
WTA : WATERTIGHT ENCLOSURE ACTUATOR(IP68 10M 250HR)	HQ-SERIES
PIU : POTENTIOMETER UNIT(1K OHM)	EXCEPT HQ-005, 008
IMS : INTEGRAL MOTOR STARTER REVERSING ELE. CON. & TRANSFORMER	EXCEPT HQ-005, 008
PCU : PROPORTIONAL CONTROL UNIT(INPUT, OUTPUT 4~20mA DC)	EXCEPT HQ-005, 008
ATS : ADDITIONAL TORQUE SWITCHES(SPDT*2EA 250V AC 10A RATING)	EXCEPT HQ-005, 008
LCU : LOCAL CONTROL UNIT(REMOTE/OPEN/STOP/CLOSE SELECTOR S/W)	EXCEPT HQ-005, 008
CPT : CURRENT POSITION TRANSMITTER(OUTPUT 4~20mA DC)	EXCEPT HQ-005, 008
RBP : RECHARGEABLE BATTERY PACK POWER FAILURE CONTROL	HQ-015, 020, 030, 050, 060
EXT : EXTENSION 120° 180° 270° TURN	EXCEPT HQ-200, 300
DCM : DC MOTOR(24V DC)	HQ-015, 020, 030
LPA : LEVER PLATE ACTUATOR	EXCEPT HQ-005, 008
SLU : WHITE/POWER ON, GREEN/OPEN, RED/CLOSE, YELLOW/OVER TORQUE	EXCEPT HQ-005, 008
HSA : HIGH SPEED ACTUATOR	HQ-SERIES
LSA : LOUGH SPEED ACTUATOR	HQ-SERIES
SCA : SPEED CONTROL ACTUATOR	EXCEPT HQ-005, 008
LTA : LOW TEMPERATURE ACTUATOR($-60^{\circ}\text{C}\sim +70^{\circ}\text{C}$)	EXCEPT HQ-005, 008
HTA : HIGH TEMPERATURE ACTUATOR($-20^{\circ}\text{C}\sim +120^{\circ}\text{C}$ 1HR)	HQ-SERIES
SRA : SEA & RUSTLESS ACTUATOR	HQ-SERIES
NCA : NETWORK CONTROL ACTUATOR	EXCEPT HQ-005, 008
CED : CUSTOMER ELECTRIC DRAWING ACTUATOR	HQ-SERIES
SVA : SPECIAL VOLTAGE ACTUATOR	HQ-SERIES
CCA : CUSTOMER COLOR ACTUATOR	HQ-SERIES
OEM : ORIGINAL EQUIPMENT MANUFACTURING	HQ-SERIES

3) Features and structure

(1) General :

HQ series actuator is designed for the 90 degree turn application such as damper, ball, plug, butterfly valve and other equipment

(2) Range of torque

Min. 80Nm to Max 3000Nm. In between there are 9 models and cater for various torque depending on application.

Models are HQ-008, 015, 020, 030, 050, 080, 120, 200 and 300.

Applicable size of valve

Butterfly valve : 50mm(2") ~ 600mm(24")

Ball valve : 40mm(1 1/2") ~ 350mm(16")

(3) Body

Material is hard-anodized AL alloy and external coating of epoxy powder is suitable for the severe condition especially against the corrosion.

Housing is designed in accordance with standard of ex-proof and IP68.

(4) Sealing

Sealing carried out by the O-rings guaranties IP68.(10m under water 10days)

(5) Manual Override

Just by pulling over the lever, operating mode is switched to manual.

And just supplying electrical power to actuator, clutch is automatically disengaged from manual and operating mode is switched to electric operation.

(6) Gear & Self locking

2nd staged Double worm gearing prevents movement caused by back force transferred from valve and it provides the exact and stable position of actuator and valve when electrical power is off.

High efficiency, low noise level and trouble free design are another advantage.

(7) Manual hand wheel

The Size of hand wheel is designed according to required torque to move the actuator, so that operator can easily move the actuator by hand.

(8) Motor

Motor specially designed for HQ actuator has several features such as high output power, high efficiency and thermostat installed inside of motor prevent overheat of motor and thermal damage of motor coil.

(9) Limit switch

Since limit switch is directly driven by the 2nd output shaft, position during operation is continuous and accurate.

Setting of Cam is so easy and once cam setting is done, position is almost permanent unless operator change setting again.

(10) Torque switch

Torque switch driven by the 2nd output drive shaft for continuous and accurate torque detection.

Torque spring which detects the variation of torque during operation is

installed for preventing damage of valve and actuator under overload condition.

Once actuator is under overload, torque switch is tripped and actuator stops immediately.

Switches are installed for both open and close direction.

This switches set by factory can not be set again without check with factory.

(11) Space heater

Spacer heater is installed for preventing damage caused by condensed water inside of actuator and includes thermostat inside to prevent overheating.

Temperature of heater can be set as per environmental condition.

(12) Stopper bolt

Stopper bolt installed both close and open direction prevents actuator's travel over the limit during manual operation and also protects internal gearing from it's breakaway.

(13) Indicator

Indicator directly driven by 2nd output drive shaft has 4 signal LEDs to show the current operating situation of actuator

(Open/Close/Over torque/Power ON-Off).

Operator perceives exact current operating situation even from a distance.

(14) Terminal block

Spring loaded terminal strip is very strong against vibration and to add the number of strip for additional connection is so simple.

(15) Wiring

Basic wiring is standardized to be simplest and optimal, so that variation depending on electrical specification and options can be so easy and simple.

(16) Adapt ion

Mounting base is designed according to ISO5211 but different dimension depending on application is also possible. Removable drive bushing provides convenient machining for adaption.

(17) Lubrication

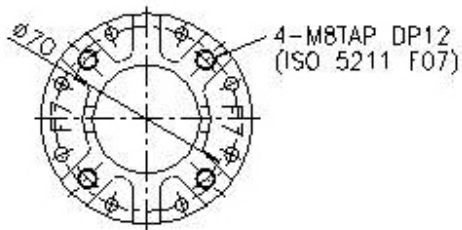
Using Greas Moly EP type, no need to refill lubricant for the long time.

(18) Others

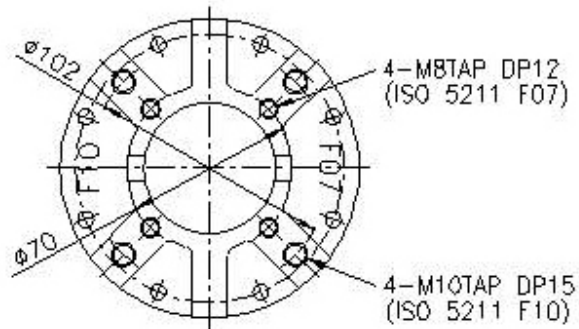
HQ guaranty high performance, high quality product throughout various and severe test and inspection.

4) Mounting base

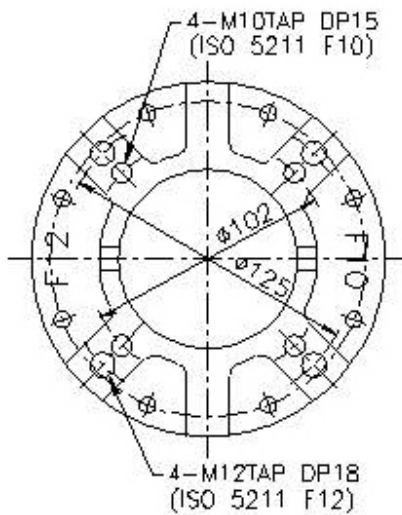
Mounting base (ISO5211)



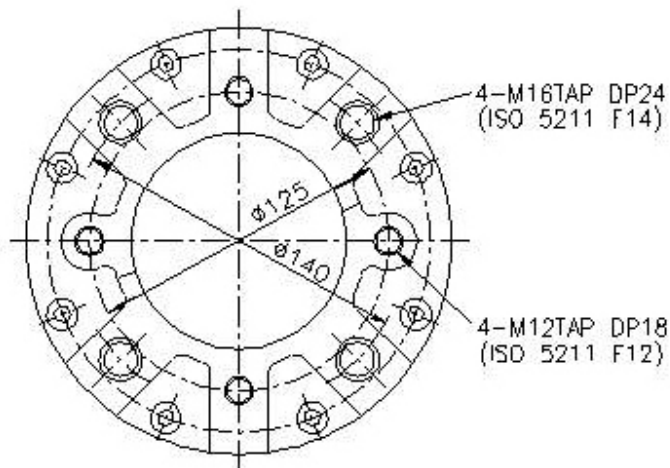
HQ-005, 008



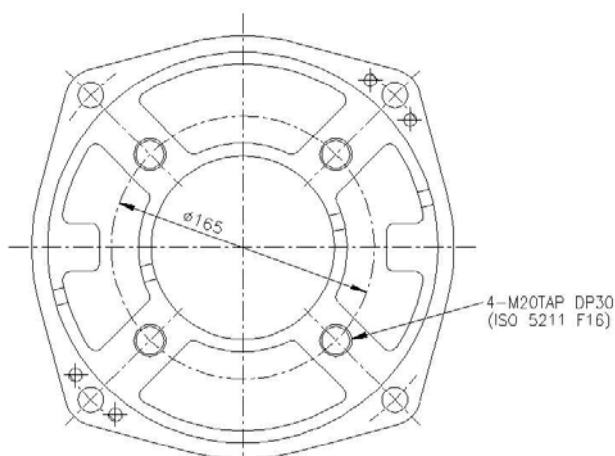
HQ-015, 020



HQ-030, 050, 060

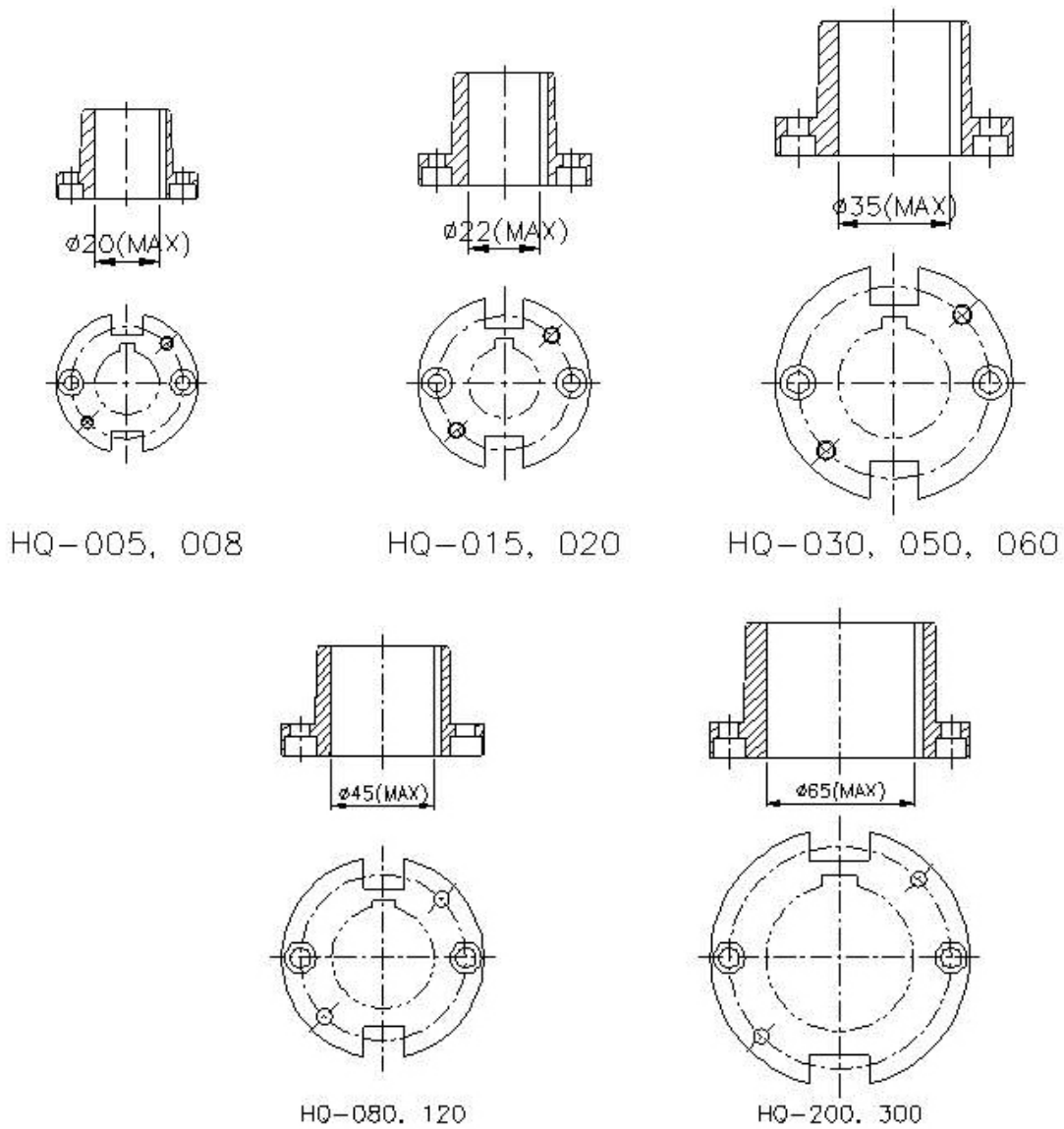


HQ-080, 120



HQ-200, 300

5) ACTUATOR DRIVE BUSHING



3.APPLICATION

VALVE ACTUATOR	BUTTERFLY VALVE 10K (KEYSTONE)	BUTTERFLY VALVE 20K (KEYSTONE)	2-WAY BALL VALVE 10K (KPC)	2-WAY BALL VALVE 20K (KPC)	3-WAY BALL VALVE 10K
HQ-005	80A	65A	40A		
HQ-008	100A	80A	50A	40A	40A
HQ-015	125A	100A	65/80A	50A	50A
HQ-020	150A	125A		65/80A	65/80A
HQ-030	200A	150A	100A		
HQ-050	250A	200A	125A	100A	100A
HQ-060	300A		150A		
HQ-080	350A	250A		125A	125A
HQ-120	400A	300A	200A	150A	150A
HQ-200	450/500A	350/400A	250A	200A	200A
HQ-300	600A	450/500A	300/350A	250/300A	250/300A

Note :1. Above table just show reference and no guaranty!

2. Sizing should be done after careful reviewing valve factory, temperature, characteristics of fluid and etc.
3. Having application under special condition such as high and low temperature, seawater, severe corrosion, high vibration), please consult with our technical dept before selecting actuator.
4. Decision by user ignoring our recommendation, we have right to avoid any responsibility.

4. Setting

1) Manual operation

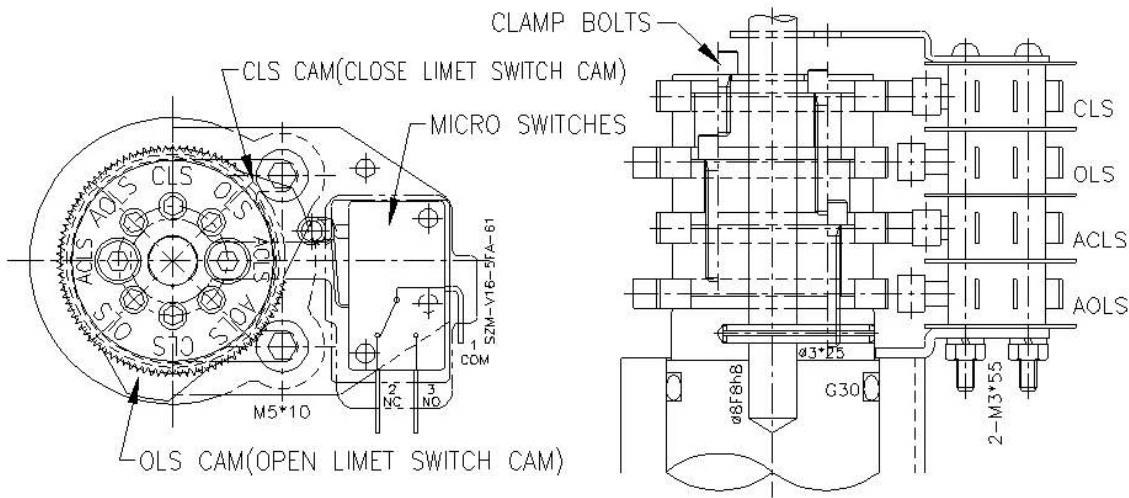
- ① Pull over the lever toward hand wheel until lever stands perpendicularly.
- ② If lever does not stand perpendicularly, pull over it again turning hand wheel slowly.
- ③ There is casting mark to indicate rotating direction on hand wheel
- ④ Clockwise is close direction and counter clockwise is open direction.
- ⑤ No need to position the lever to original for electrical operation.
- ⑥ Once electrical power is on, the lever automatically return its original position by internal clutch mechanism.

2) Limit switch setting

- ① Pull over the lever for manual operation and turn hand wheel to move actuator full close(Or open) position.
- ② Loose the bolts tightening cam by L-wrench, and turn CLS(Or OLS) cam to CW (or to CCW), so

that cam may hit the lever of close(Or open) limit switch.

Then tighten the bolt by L-wrench



3) Torque switches

Torque Switches are set by factory before delivery and therefore no need to set the switches again, but just do as follows for check if switches functions well.

- ① Push the lever of close switches by screw driver until it sounds “click” then actuator should stop immediately. If it stops, switches work well.
- ② Check open switches as per just same with above.
- * No guaranty in performance once this switches are set again.
- * Before setting, if it is compulsory, please consult with factory.

4) Stopper bolt setting

- ① Before manual operation, get both nuts loose which are engaged with stopper bolts and turn stopper bolt to come out by 3~ 4 threads.
- ② Move actuator full close position by manual.
Once cam hit the lever of limit switch to trip, stop manual operation.
- ③ Then turn close stopper bolt to go forward until it don't' not go further (End of stopper bolt contacts the 2nd worm wheel).
- ④ Turn close stopper bolt to come out by 2 threads and tighten the loosen nut.
- ⑤ Do as per same with above for open stopper bolt

5) Indicator setting

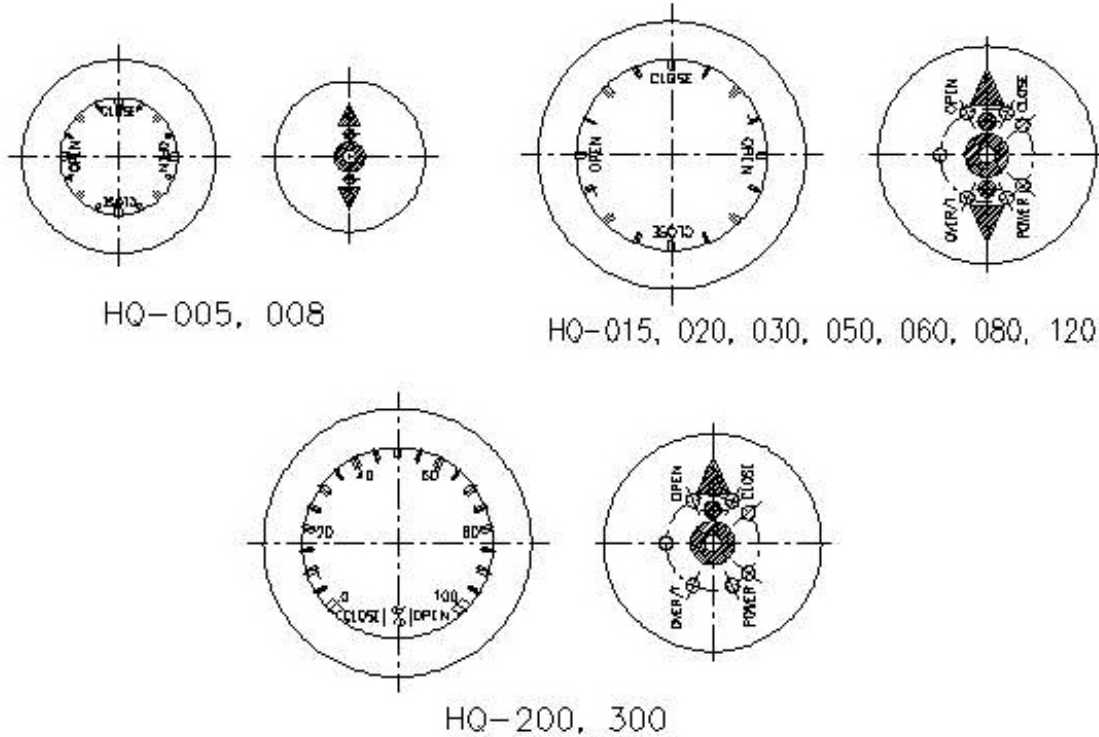
- ① Move actuator full close position and turn indicator by hand until orientation of indicator is aligned to the figure of window.
- ② Tighten the bolt (Be careful not to be injured by the cutting edge of indicator and leakage of electricity when power is on)

③ Figure of Window and indicator

④ Signal LEDs

*WHITE LED ON : POWER ON *GREEN LED ON : OPEN *RED LED ON:CLOSE

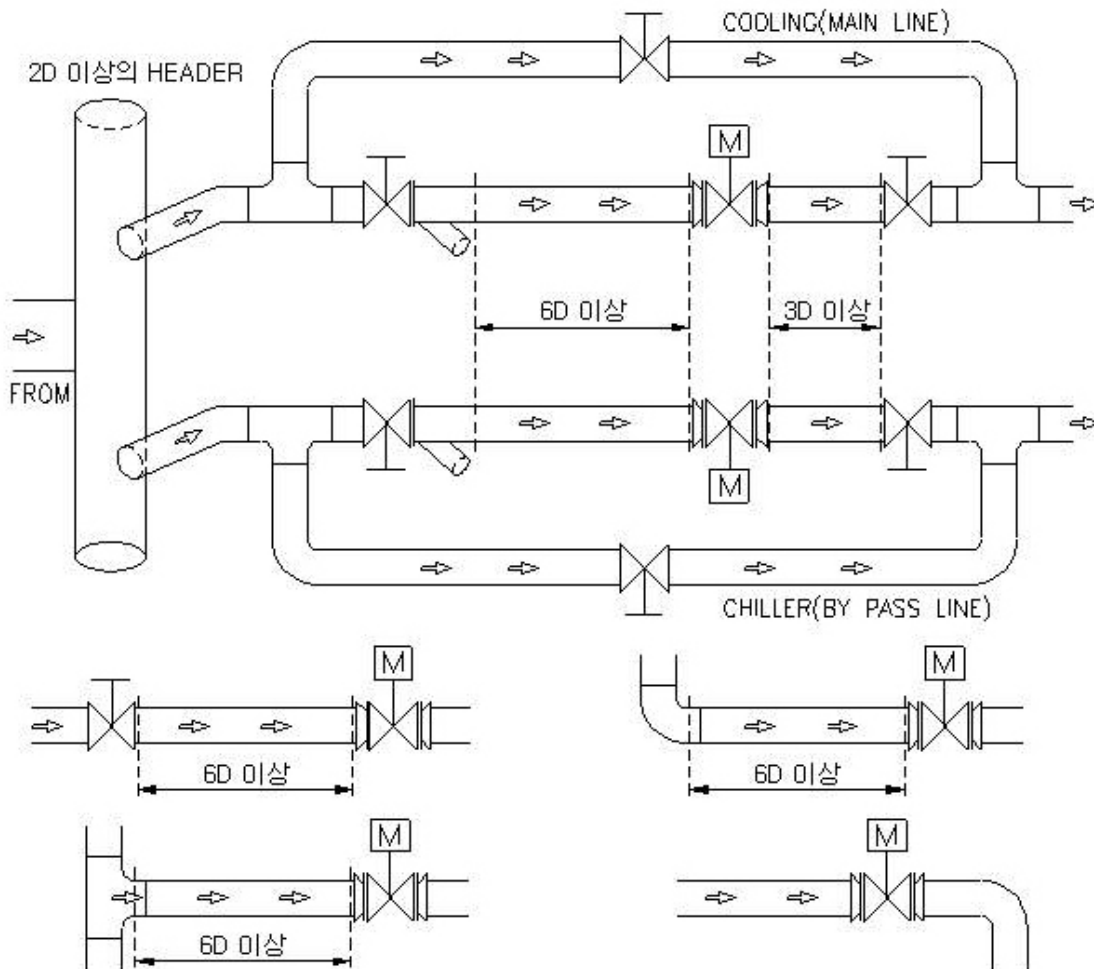
*YELLOW LED ON: OVER TORQUE SWITCHES TRIP (EXCEPT HQ-008)



5.Recommendation for installation of actuator in the pipeline

1)Location of actuator on the pipeline

MIN. MIN. MIN. MIN. MIN.



2)Orientation of installation of actuator

- *No limit, but it is recommended to install actuator in the position which cable entry face the ground orientation for watertight function and hand wheel faces front for easy manual operation without interruption.
- *Reserve the space for maintenance.

6.Electrical wiring

1) Cable and conduit

Cable entries are machined with PF3/4" tap and sealed by Plug before delivery.

- *Please remain the plug as it is if user doesn't use both cable entries.
 - *Please make sure to seal the entries by using rubber or metallic packing after wiring, so that water may not come in.
 - *When user use actuator as ex-proof, please make sure to use the certified connection component which is at least same grade with actuator.
- This is not our scope of supply, but if user don't use suitable component, factory won't guaranty the performance of ex-proof actuator.

2) Electrical wiring

- *Check if electrical specification like as power, wiring & etc are correct or not.
- *One sheet of wiring diagram is to be supplied together with actuator.
- *Do the wiring as per the given wiring diagram, such as power, control power , internal wiring and ground.
- *Make sure to supply electric power to heater for keeping inside of actuator clean and dry.
- *Make sure to check wiring to the terminal is strong enough.
- *Make sure that one relay operates one actuator only. Can not operate two or more actuators simultaneously.
- *Make sure to clean inside of actuator and no foreign material inside.

3) Check rotating direction

- *In 3 phase actuator, operator should check the rotating direction of actuator before electrical operation.
- *If operating direction is wrong, limit switches doesn't function and it results damage from jamming or motor's overheating.
- *So, put the actuator at 50% open(or Close) position by manual and supply power into the actuator and check its rotating direction.
- *If actuator moves t open as per open signal, the direction it is O.K, but reverse, need to change the wiring.
- *Among 3 of power wires, change 2 wires each other.
- *Then check the rotating direction again in order to confirm it again.

3) Commissioning

- *Make sure to check the rotating direction of actuator first before operation.
- *Check the function of limit and torque switches, direction of indicator, signal LEDs, and space heater.
- *Check lever movement is O.K(Manual override)
- *Check the lamps in the control panel.
- *After commission, please make sure to tighten the 4 bolts of the top cover and to do proper sealing.

7.Other

1) Revere direction actuator

Generally actuator is set as close → clockwise and open → counterclockwise.

If user want to use reverse direction actuator, please do as follows.

HQ-008

- *Open the cover using L-wrench
- *Change wires each other which are connected to terminal no 6 and 7 and do same *way for 8 and 9.
- *Change the direction of indicator
- *Put actuator about 50% open position and check rotating direction is correct.

HQ-015 ~ HQ-300(ON-Off)

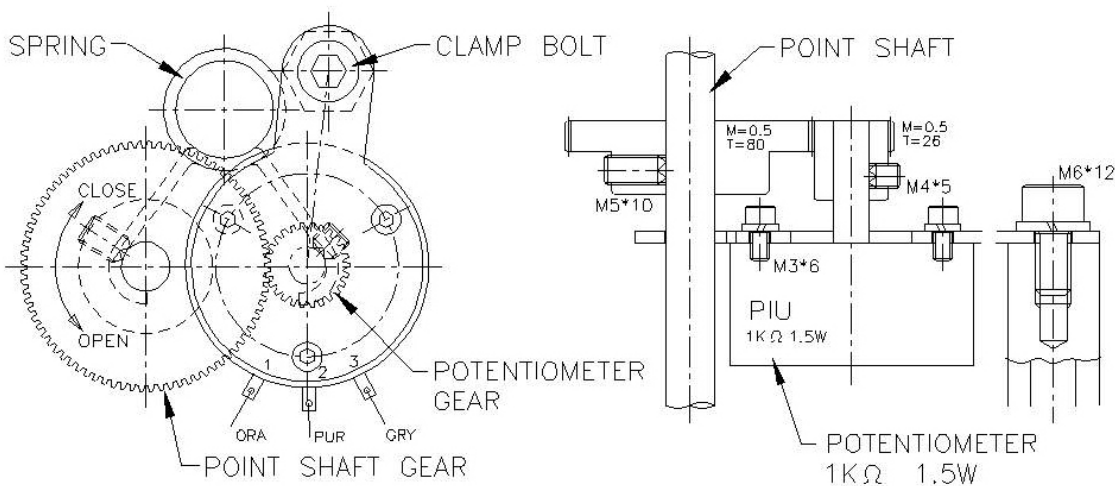
- *Open the cover using L-wrench
- *Change wires each other which are connected to terminal no 6 and 7 and do same way for 8 and 9.
- *Change the direction of indicator(for HQ200 and 300, change window also)
- *Put actuator about 50% open position and check rotating direction is correct.

HQ-015~HQ-300(Proportional control)

- *Open the cover using L-wrench
- *Change wires each other which are connected to terminal no P1 and P3 in the PCU card
- *Change wires each other which are connected to terminal no 9 and 10 and do same way for 11 and 12.
- *Change the direction of indicator(For HQ200 and 300, change the window also)
- *Put actuator about 50% open position and just push the auto setting button.
- *Supply 4 ~ 20mA and check the operation.

2)Potentiometer setting

- * Put actuator full close position and check resistance between P1(Orange) and P3(Grey), it should be around 1000Ohm.
- * Put the resistance between P1(Orange) and P2(Purple) of potentiometer around 80~120Ohm.
- * Engage potentiometer gear with pointer shaft gear and tighten the bolt.
- * Put spring between potentiometer and pointer shaft and fix both.
- * If user wants to use revere direction actuator, change the wires of P1(Orange) and P3(Grey) of PIU each other.



3) Jamming

*In case that actuator moves wrong direction and moves over the travel limit, internal worm gear contacts the stopper bolt and engaged each other.

This is we call, jamming and can not move actuator at all.

*How to solve

- Off the power
- If jamming is happened during close, take close stopper bolt to come out by about 2 ~3 threads
- Pull over the lever and put it manual position.
- Turn hand wheel to counterclockwise until 50% open position.
- Check rotating direction again.
- If everything is O.K, put stopper bolt original position.
- If jamming is happened during open, procedure is same with close, but turn hand wheel to clockwise by manual.

4)Special tools for setting

- * L-Wrench 1 set(Metric)
- * Screw drivers -, +)
- * Spanner set (Metric), Monkey spanner 200mm, 300mm 1 each
- Wire stripper, Long nose, Light
- * Multi Meter(AC, DC Volt, Resistance)
- * DC signal generator(0~4mA DC) : PCU option
- * MA DC Meter (0~25mA DC) : PCU and CPT

8.Caution

1) Selection of valve and actuator :

Review all specification of valve and actuator carefully before making selection and reserve about 30% torque of actuator for safety purpose.

If required torque is 90Kg-m, recommended actuator torque is about 117Kg-m.

2) Option : Please consult with factory before making selection, if possible.

3) Before necessary setting such as limit switch, please don't operate actuator either fully open or fully close.

4) After electrical wiring, make sure to secure the sealing of cable entries.

5) Before operating actuator, please review this manual carefully and follow the instruction without fail.

Please be careful at temperature, humidity, vibration, voltage drop.

6) Storage : Keep actuator dry, clean and cool.

7) Trouble : Please refer to following trouble shooting but please don't dismantle the actuator without consulting with factory.

8) If repair or maintenance is required, please check the model, electrical condition, serial Number and current situation to inform factory.

9. After sales service

1.Free of charge

- 1)When delivered actuator is different from the specification of customer's order
- 2)When quality of actuator is different from the specification published by HQ.
- 3)When trouble of component is found
- 4)When trouble is generally recognized as factory's fault.

Warranty period is 1 year after deliver

2.Charge

- 5)When trouble caused by misuse ignoring actuator specification
- 6)When trouble caused by user's mistake or intention(Dismantling)
- 7)When trouble caused by modification by user's intention
- 8)When trouble caused by not checking of rotating direction for 3 phase actuator.
- 9) When trouble caused by the un-proper sealing of cable entries.
- 10) When trouble caused by fire, flood and other natural disaster.
- 11) When trouble is generally recognized as user's fault.
- 12) When trouble happen after warranty period

3. Trouble shooting

1)110/220VAC 1Ph, 380/440VAC 3Ph standard actuator

Trouble	Cause	Counter plan
Actuator doesn't work at all	Check if power is on	Power on
	Check if voltage is too low	Check power
	motor and supplied power is different	Check motor power and supplied power
	wiring is not correct and tight or loosen	Do wiring again tightly
	coil of motor is damaged	Change the motor
	thermostat of motor trips	Change thermostat
	capacitor is damaged	Change the capacitor
	setting of limit and torque switch is not correct	Do setting switches again
	jamming happens	Check rotating direction per instruction
Torque switch open	Actuator is undersized	Select again as per real required torque
	Foreign material between valve seat and disc	Remove foreign material
	Stopper bolt is set prior to limit switch	Reset the stopper bolt
Switching to manual is not possible	Lever is not fully pulled over	Fully pull over the lever
	Lever is not pulled over because of Jamming	Disengage the jamming
	Clutch of lever and handle is engaged each other	Turning handle slowly, pull over lever
Abnormal signal indicator	Damage of Signal LED	Change the signal LED
	Damage of micro switches	Change the micro switches
	Setting of limit switch is wrong	Do setting switch again
	Stopper bolt is set prior to limit switch	Do setting stopper bolt again
Remote operation is not possible	Wiring is not correct	Do wiring again
	Switch is not at remote position	Put the switch at remote position

2)PCU option

Trouble	Cause	Counter plan
PCU doesn't work	Input signal is not applied	Check input signal
	PIU signal is failed	Check the resistance of potentiometer and change it if resistance is not correct
	PCU card is damaged	Change the PCU card
Output signal is not detected	PIU signal is failed	Check the resistance of potentiometer and change if resistance is not correct
	PCU card is damaged	Change PCU card

3)CPT option

Trouble	Cause	Counter plan
Output signal is not detected	PIU signal is failed	Check the resistance of potentiometer and change if resistance is not correct
	PCU card is damaged	Change PCU card

4)IMS option

Trouble	Cause	Counter plan
IMS doesn't work	IMS coil is damaged	Check the coil function and if not correct, change IMS

10. Maintenance

1) Lubrication

Lubrication is already done by factory and generally no need to refill it again.

But in the places such as very dry condition below R.H 15% or high temperature higher than 30°C, it is required to do lubrication once two year through Grease Nipple.

2) Regular operation

Electrical power always should be supplied to actuator and it is recommended to operate actuator once a week.

3) Maintenance

In order to use actuator for long time, regular maintenance once a year is required.

Please check operating condition, corrosion, painting & etc.

4) Others

Should you have any further queries, please contact us through Phone, fax and E-mail without hesitation.