NEWTORK
VALVE AUTOMATION

USER MANUAL

NTQ Series Electric Actuator

For NTQ-005 ~ NTQ-600

Quarter-Turn electric actator

Version : 2021

Contents

General Description

NTQ series quarter-turn valve electric actuator is the new generation of our company, which can be used for driving and controlling the butterfly valve, ball valve and plug valve(quarter-turn valves with 90° movement), available for open.close or adjusting the valve with the functions of remote control and local control both, they are widely used in the fields such as oil ,chemistry, power generation, water treatment, paper making, etc.

- IP67 enclosure protection, optional IP68 protection
- This user manual is for weather proof type. The additional Manual will be provided for special functions optional.

Mechanical Characteristic

- Housing: Hard anodized Aluminum casting and external epoxy power coated against severe industrial environment.
- Gearing: Precisely machined double worm gear C/W minimum black-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 and induction motor to generate high starting to 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.

Local Control Electrical Characteristics

- Automatic phase correction, phase failure protection, overheating and overtorque protection.
- Remote on-off control can adopt free voltage or DC24V.
- Flexibility wiring methods.
- on-off and modulating switched arbitrarily.
- selector with impenetrable design to improve the sealing of actuator.
- 5 contacts indicate the actuator status, convenient to the monitoring of DCS system.
- Monitor relay give comprehensive fault signals for DCS system.
- Possible to supply padlockable as option to avoid the mistake operation.

Working Environment

- Power supply(optional)
  3PH:AC380V, AC415V, AC440V; ±10% 50/60Hz;
  1PH:AC110V, AC220V; ±10% 50/60Hz;
  DC24V ±10%.
- Basic error:2.5%
- Enclosure protection :IP67
- Ambient Temperature: -20~60°C.
- Height above sea level : ≤ 1000m
- Humidity: ≤ 90%(25°C)
- No strong corrosion environment.
- weather products can't be used at the application with mixed explasive gas.
- Duty rating: S2: 1 0S(on-off),54:30-50%, 1200 start / hour,modulating.
- No strong vibration environments.

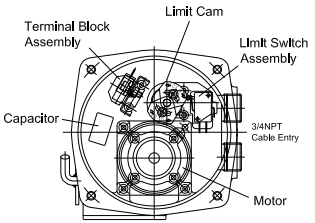
Functions and Structure

Functions

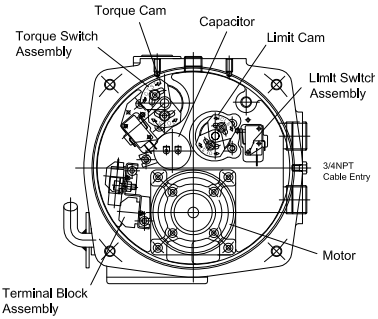
- Motor: single phase or three phase
- limit gearing: with a double worm gear.
- Travel control and position indication: the drive shaft draw the cam shaft to make 90° rotation, then the cam make 90° rotation to control the travel. The position indicating plate is co-axial with the cam shaft to make 90°rotation to indicate the valve position, the potentiometer used for signal feedback is not provided normally, please ask the manufacture to provide it if any requests.
- Torque mechanism: It is composed of cams and micro-switches for both of close and open to control the torque of actuator.(NTQ-005, NTQ-060, NTQ-010 doesn't have torque switch)
- Manual override and hand wheel : It is semi-automation with the priority of electric operation. Depress the manual override to MANUAL position and then rotate the handwheel to achieve manual operation. the manua override will return to AUTO position automatically and achieve electric operation.

Structure

NTQ series valve actuator contain of motor, gearing, limit switches, torque switches, position indicator, handwheel, position limit mechanism etc.

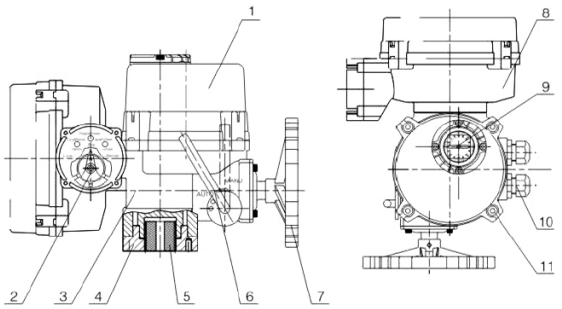


NTQ-006~010



NTQ-016~600

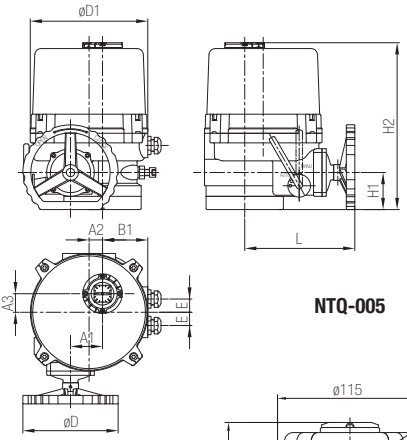
Outline Dimensions and Mounting Base



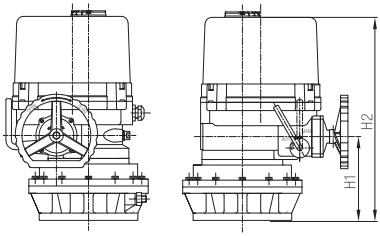
NO	Name
1	Housing
2	Selector
3	Body
4	Mounting base
5	Coupling
6	Manual-override
7	Handwheel
8	Electrical compartment
9	Indicator
10	NPT3/4 cable entries
11	Captive serew

Outline dimension

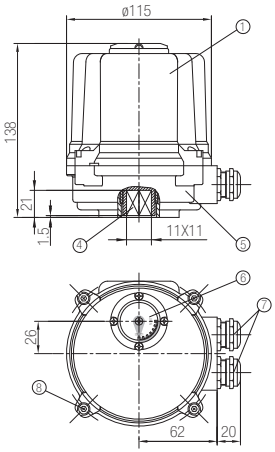
Size 1 - Size 4



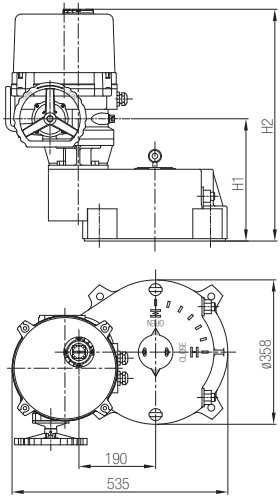
NTQ-200, NTQ-250



NTQ-005



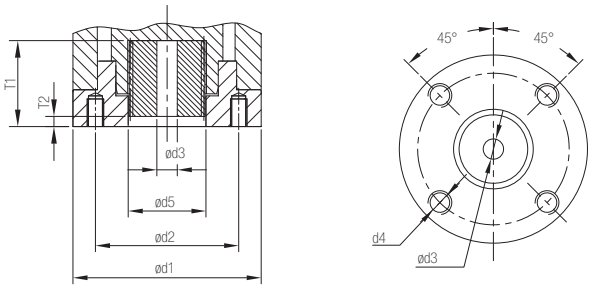
NTQ-400, NTQ-600



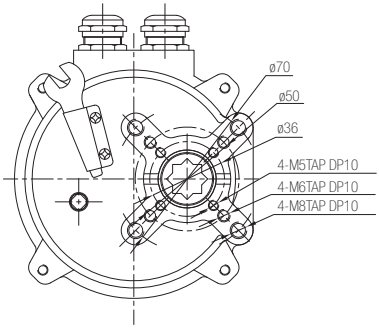
Item	A1	A2	A3	B1	D	D1	E	H1	H2	L	P	Q
Size 1	41	12	31	67	100	157	23	55	223	167	96	179
Size 2	57.5	23.5	27	80.5	180	206	25	67	261	197	115	207
Size 3	60.5	25.5	35	80.5	180	222	25	70	315	208	121	207
Size 4	70	35	40	96	180	262	25	81	352	230	132	222
NTQ-200 NTQ-250	70	35	40	96	180	262	25	185	456	230	236	222
NTQ-400 NTQ-600	70	35	40	96	180	262	25	303	574			

NTQ SERIES MOUNTING BASE DRAWING

ISO 5211 Mounting Base



Size 1 ~ Size 4

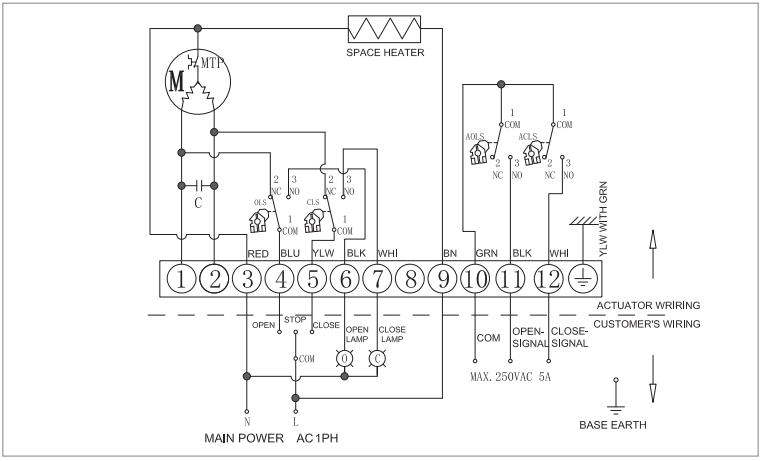


NTQ-005 (□11X11 Star standard)

Item	ISO 5211 Mounting Flage Size	d1	d2	Standard	Max	d5	T1	T2	d4
Size 1	F05	Φ92	Φ50	Φ11X11 Star	Φ22 □20"	Φ39	42	3	4-M6 TAP DP12
	F07		Φ70						4-M6 TAP DP12
Size 2	F07	Φ132	Φ70	Φ17X17 Star	Φ32 □25	Φ48.5	49	3	4-M8-TAP DP 15
	F10		Φ102						4-M10 TAP DP 15
Size 3	F10	Φ146	Φ102	Φ22X22 Star	Φ32 □25	Φ48.5	51	5	4-M10 TAP DP 15
	F12		Φ125						4-M12 TAP DP 15
Size 4	F12	Φ176	Φ125	Φ27X27 Star	Φ42 □38	Φ90	62	7	4-M12 TAP DP 18
	F14		Φ140						4-M16 TAP DP 25
NTQ-200 NTQ-250	F14	Φ215	Φ140	Customize	Φ60 □50	Φ118	75	7	4-M12 TAP DP 25
	F16		Φ165						4-M20 TAP DP 25
NTQ-400 NTQ-600	F16	Φ350	Φ165	Customize	Φ60 □50	Φ135	118	8	4-M20 TAP DP 25
	F25		Φ254						4-M16 TAP DP 30
	F30		Φ298						4-M20 TAP DP 35

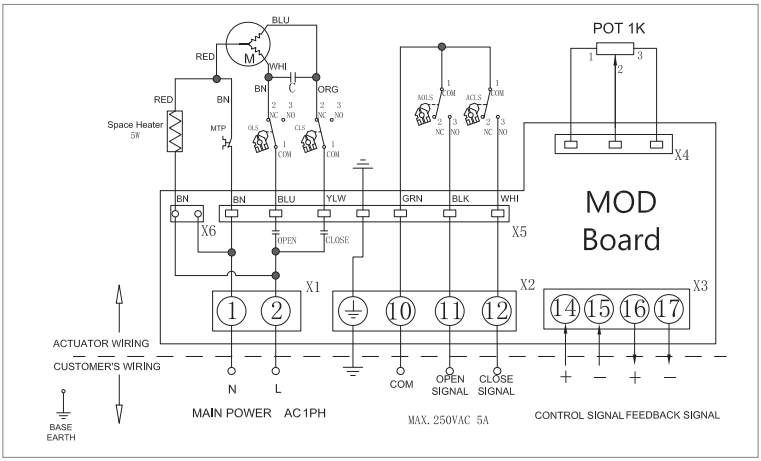
NTQ-006 / 010 ON-OFF

(1PH AC110V/220V)



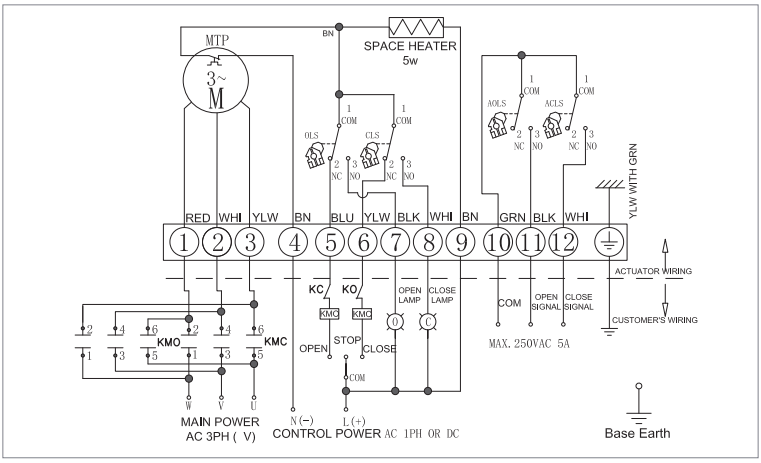
NTQ-006 / 010 Modulating

(1PH AC110V/220V)

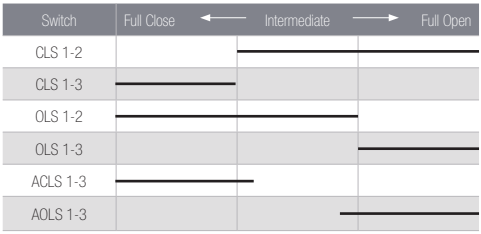


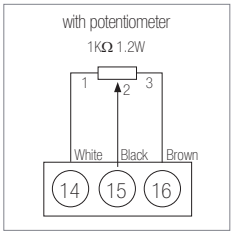
NTQ-006 / 010 ON-OFF

(3PH AC380V,415V,440V)



Limit Switches Operation

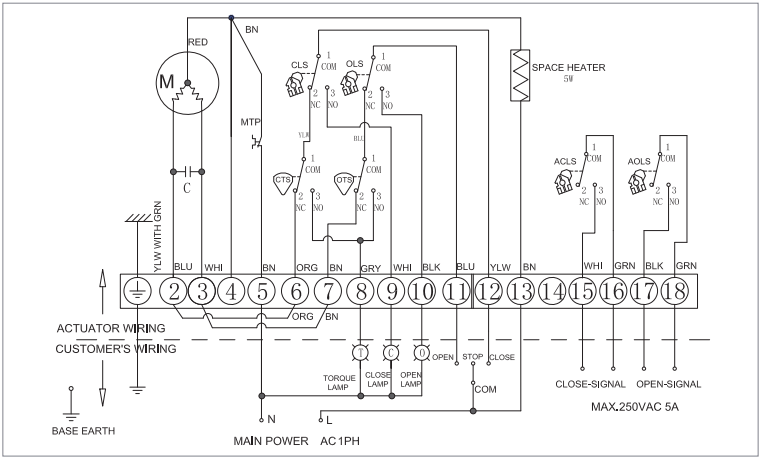




AOLS	Aux Open Limit Switch	OLS	Open Limit Switch
ACLS	Aux Close Limit Switch	KMC	Magnetic Contactor Close
O	Open lamp	KMO	Magnetic Contactor Open
C	Close lamp	MTP	Motor Thermal Protector
CLS	Close Limit Switch	M	Motor

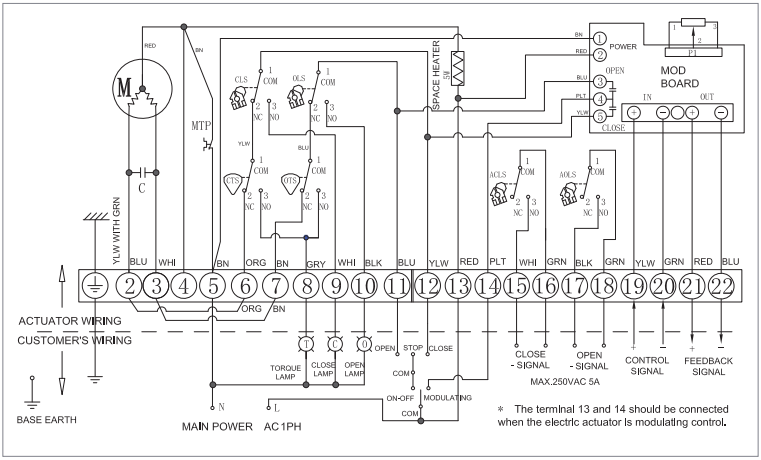
NTQ-016~600 ON-OFF

(1PH AC110V/220V)



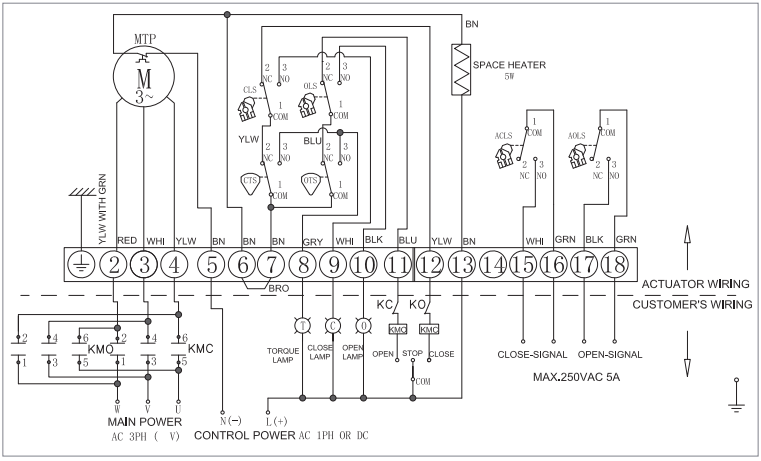
NTQ-016~600 Modulating

(1PH AC110V/220V)



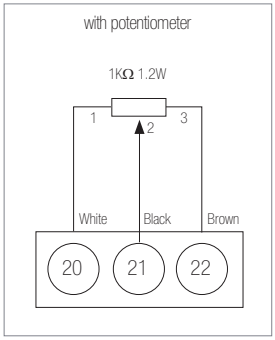
NTQ-016~600 ON-OFF

(3PH AC380V / 415V / 440V)



Limit Switches and Torque Switches Operation

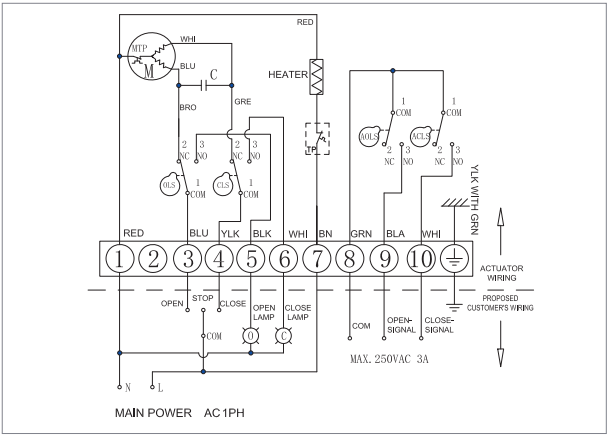
Switch	Full Close ← Intermediate → Full Open
CLS 1-2	
CLS 1-3	
OLS 1-2	
OLS 1-3	
ACLS 1-3	
ACLS 1-3	
AOLS 1-2	
AOLS 1-3	
CTS 1-3	Closing torque switch interrupts control when mechanical overload occurs during closing cycle
OTS 1-3	Opening torque switch interrupts control when mechanical overload occurs during opeing cycle



AOLS	Aux Open Limit Switch
ACLS	Aux Close Limit Switch
O	Open lamp
C	Close lamp
T	Torque Switch
CLS	Close Limit Switch
OLS	Open Limit Switch
CTS	Close Torque Switch
OTS	OpenTorque Switch
KMC	Magnetic Contactor Close
KMO	Magnetic Contactor Open
MTP	Motor Thermal Protector
M	Motor

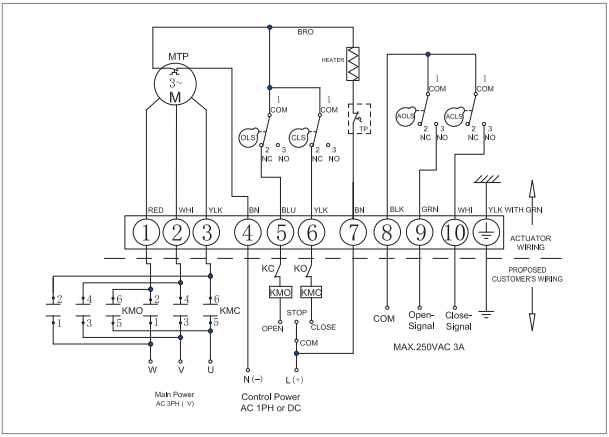
NTQ-005 ON-OFF

(1PH AC110V/220V)



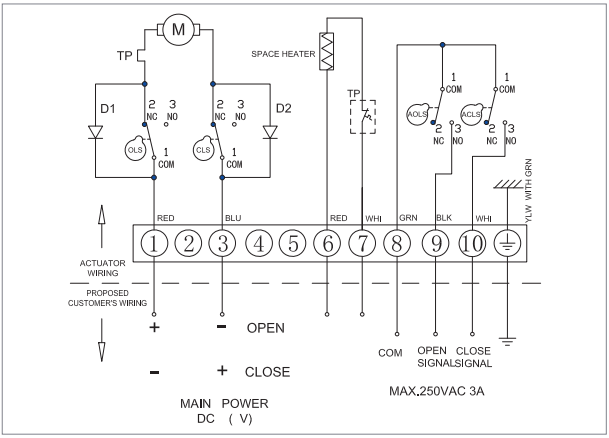
NTQ-005 ON-OFF

(3PH AC380V / 415V / 440V)

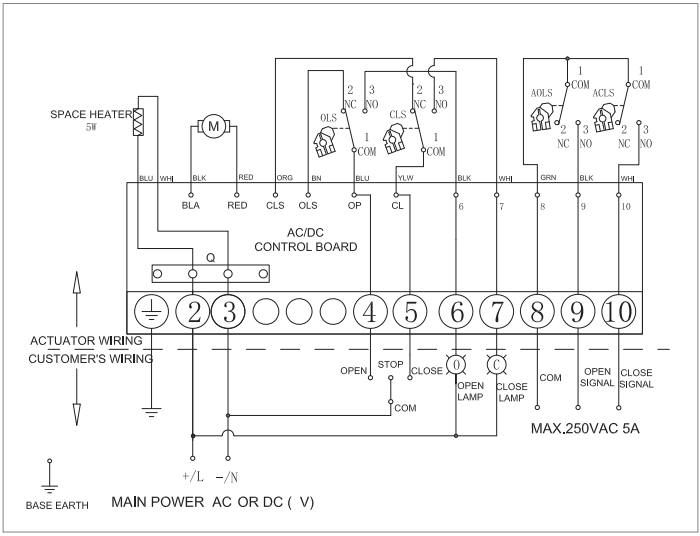


NTQ-005 / 010 ON-OFF

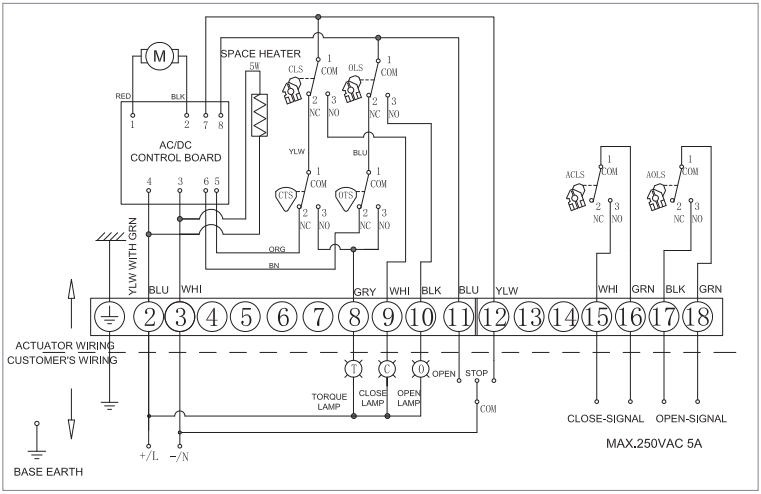
(DC24V)



NTQ-SIZE 1 DC24V



NTQ-SIZE 2~4 DC24V



Electrical Connection

- **Remove the electrical cover:**
  Use Hex wrench to loose the hex socket screws of the electrical cover(Please just loose them in case of loss),then you can find the wiring diagram from the inside of cover removed.

- **wiring:**
  According to the wiring drawing, please make the power cable and control cable go through the cable entries to be connected with terminal block, as the spring loaded push type terminal adopted, please push the spring by the slotted screwdriver to insert the exposed wires into the terminal hole, release the spring to tight wires.
  Electric actuator has two grounding lugs for base earth, one is at terminal block, the other one is at the between of cable entries, the earth connetion should be reliable and tight.
  The cable jacket must be stayed inside of the cable entries, locked by rotating the gland.
  The power supply must be consistent with the technical data on the nameplate
  Must tighten the hex socket screws to ensure the good seal after completed.

- **ON-OFF type wiring notices:**
  If there is 1 PH power supply, two or more electric actuators will not be connected in parallel, and the same joint will not be used to control several electric actuators, otherwise it will cause the actuator uncontrolled and motor overheating.
  If there is 3PH power supply, to avoid the "out of control" tay at the intermediate of travel before electrical operation, moving toward the open direction(or close direction) after pushing the open button(or close button),if the movement is reverse direction, please disconnect the power supply, also exchange the any the actuctor should two lines of input phase lines.

- **cable entries seal:**
  In any working condition, the inner rubber of cable entries must be with the good seal performance even the product is not used, very strict inspection has been taken before shipment, the device should be stored at the dry location if it is unable to be installed on time, please do not take away the cable gland which will be used to avoid the corrosion.

Mounting Base Dimension

coupling

a. Toothed coupling

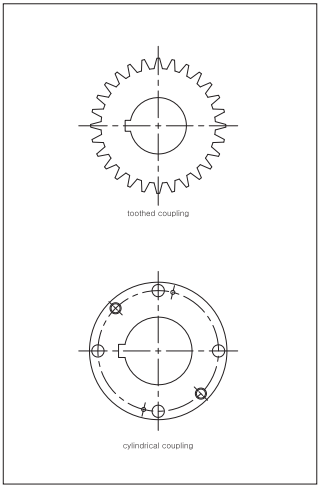
- Use the Hex wrench to remove the coupling.
- Machining the coupling according to the valve stem.
- Put the machined coupling into the drive shaft according to the direction of the keyway.

b. Cylindrical coupling

- Use the Hex wrench to remove the two screws of the coupling.
- Machining the coupling according to the valve stem.
- Put the machined coupling into the drive shaft according to the direction of the keyway, then tighten the two screws .

C. Flange connection

Valve flange connection should be consistent with the mounting base of electric actuators to ensure the correct connection between the electric actuator and the valve through the coupling.

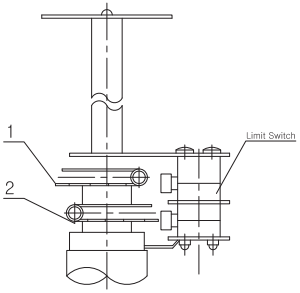


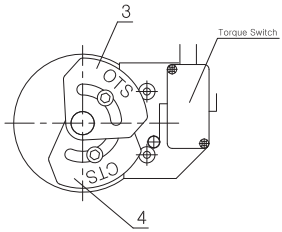
Mechanical Adjustment

Travel limit

- After depressing the Manual-override to MANU position, please rotate the handwheel in clockwise to reach fully close position.
- Use 4mm Hex wrench to loose the hex socket screws on CLS CAM
- Adjust the cam to make it touch with the close limit switch (the rattle sound heard) ,then tighten the hex socket screws.
- After the power is supplied, push the open direction button to make a reverse movement first (the manual-override can return to the "Auto" position automatically), then move to close direction to check if the close direction limit is correct.
- If the position is not correct, please repeat the operation to reach the satisfied position, vice versa.

Note: 1 :The upper OLS CAM is for open limit switch.
2:The lower CLS CAM is for close limit switch.
3:The upper OTS CAM is for open torque switch.
4:The lower CTS CAM is for close torque switch.

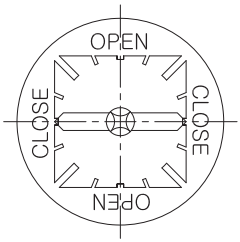




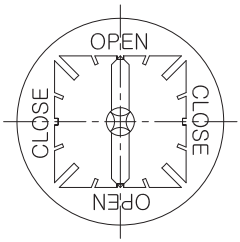
Note. 1:The upper OLS CAM is for open limit switch.
2:The lower CLS CAM is for close limit switch.
3:The upper OTS CAM is for open torque switch.
4:The lower CTS CAM is for close torque switch.

- Position Indication (Shown as below)

The pointer and top scale window show the "OPEN" and " CLOSE".
Due to re-adjusting of travel limit, the indicator might be have discrepancies, you can direct adjust the pointer manually, there is no need to loose the fastening screws of pointer plate.



close position



open position

Mechanical Position Limit

- Two mechanical, stoppers on the device have been adjusted and tightened in factory, if no special requirements, users do not have to loose them.
- In case of adjusting the mechanical stoppers, please confirm the valve position fixed by the stoppers first, when the top scale window is upward, you face the stoppers, the right one is for close, the left one is for open.
- When the adjusting is required(any positions required),please loose the nut and rotate inward the stoppers to touch the surface of fan-shaped worm wheel, then please return back 0.5-1 circle for the purpose of protecting the travel limit. Finally, tighten up screw nut reliably, then the position limit adjustment is completed.

  Note: The mechanical stoppers of Size1-Szie4 is at the bottom of cable entries.

  The mechanical stoppers of Size4+Gearbox is at the side of worm gear box.

open-close checking

After the travel limit and mechanical position limit finished, please push the open/close button on the control equipment to check the valve's open-----close or close----open operation, also check the indicator and open/close lamp at the same time.

Torque switch(Size1 Without torque switch)

Normally, due to the setting reaches the rated torque before leaving factory, there is no need to re-set or adjust the torque switch, Please operate it by professional if necessary.

The actuators of Size2-Size4 have two torque switches, each for close/open directia, You can use 3mm Hex wrench to loose screws on cam to change the torque value by rotating the cam.

Warning: Please use precise instrument for setting torque switch to protect electric actuators and valves.

Quality will not be guaranteed if you re-set and adjust torque switch arbitrarily.

Manual - Override

The electric actuator has hand wheel which can be operated manually in case of emergency operation.

Manual operation:

After depressing the manual-override to the direction of handlewheel, the manual position will be locked by itself(motor doesn't work), rotation in clockwise is for close by rolling the handwheel.

Note:

The design of the Manual-override is semi-automation, when the motor works, Manual-override will return to Auto position automatically.

Do not depress the Manual-override to Auto position when it stays at Manual position, otherwise, the actuator will be damaged.

MOD Module

- Main technical parameter and performance of MOD control module Input control signal loss protection.

Local manual operation.

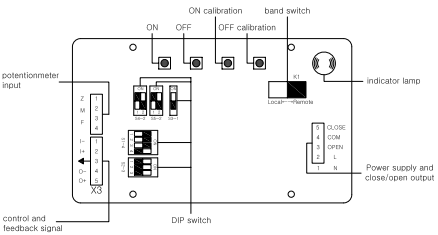
Potentiometer intermediate position identification, failure alarm.

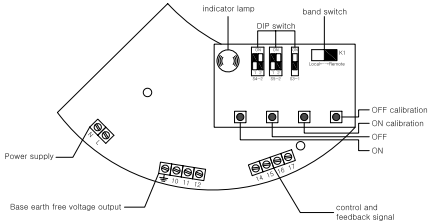
Deadband and Polarity setting according to the real situation.

Input and output signal available:4-20mA or 0-10V(DIP switch)

Input resistance: 150Ω(current):400KΩ(voltage)

Load resistance: 750Ω



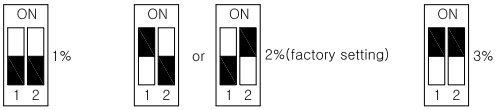


operation instruction of MOD control module

1. DIP switch status and content{DIP switch must be set in "Local "status.)

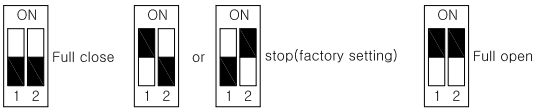
1) Deadband set(S4-2)

Set by DIP switch S4-2,including 1%,2%,3%. Relation between switch status and deadband as below:

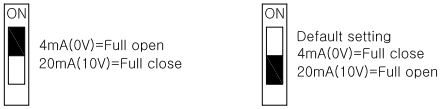


2) Valve position action after Control signal loss(S5-2)

Control signal fall below 2.5mA or above 21.5mA,voltage signal above 11V,actuator moves as signal loss.three options:Stop,full open.full close. Set by DIP switch S5-2. Relation between switch status and valve position as below:



3) Polarity (S3-1)



4) Control signal selection(S1-4)(SIZE1 without this selection)

Set by DIP switch S1-4,two options:voltage mode.current mode. Relation between switch status and control signal as below:

5) Feedback signal selection(S2-3)(Size1 without this selection)

Set by DIP switch S2-3,two options:votage mode.current mode, Relation between switch status and feedback signal as below:

2. Operation method

1) NTQ with MOD control module includes two status "Local" and "Remote", switched by K1.
2) If the switch K1 place at "Remote",valve actuator will input the remote analogue signal to control.
3) If the switch K1 place at "Local",the indicator lamp will be green, valve actuator can be operated as below:

(1) Manual operation

Actuator moves toward opening after pressing the ON key on MOD panel, but it stops moving after the key released; likewise, Actuator moves toward closing after pressing the OFF key on MOD panel, but it stops moving after the key released.

Note:When the actuator moves, the indicator lamp will be green, but it will go out at once, after reaching a certain positior it means the potentiometer is at the intermediate position. This is a normal situation, user can reset the potentiometer according to this situation.

(2) Full open,full close calibration

The travel switch should be set before calibration.

- Full open calibration

Actuator reaches the full open position after pressing the ON key on MOD panel,then press and hold the "ON calibration" key in 5 seconds,please release the key when the indicator lamp turn red.full open calibration is finished when the lamp turn green.

- Full close calibration

Actuator reaches the full close position after pressing the OFF key on MOD panel. then press and hold the "OFF calibration" key in 5 seconds. please release the key when the indicator lamp turn red.full close calibration is fin ished when the lamp tum green.

(3) Control signal and feedback signal correction

MOD control module has already passed the standard signal correction before delivery, there is no need to correct again.If the user need to recalibrate it on site. please do it as follow:

- control signal correction

Control signal calibration adopt linearization self processing, collecting the high reference only, do it as following steps to adjust the control signal:

a. Access signal source through the input terminal of control signal. pay attention to positive and negetive, then access 20mA or 10V high reference based on the position of DIP switch" S1-4".
b. Place the switch K1 at "Local" position.
c. Press and hold "ON calibration" key in 2 seconds, then press the "OFF calibration" key at the same time,after releasing all keys,the lamp turn red to access the process of control signal calibration. Press "OFF" key and hold it in 5 seconds. after the lamp turn green,release the key. calibration is finished.

- Feedback signal correction

Do it as following steps to adjust the feedback signal:

a. According to the position of DIP switch"S1-4",access the current or voltage instrument through feedback output terminal.
b. Place the switch K1 at "Local" position.
c. Press and hold "OFF calibration" key in 2 seconds, then press the "ON calibration" key at the same time,after releasing all keys.the lamp turn red to access the process of feedback signal calibration.
d. Watching the instrument.press "ON calibration" key to increase the output signal,press"OFF calibration" key to decrease the output signal,after adjusting the output as the low reference required.press and hold the "ON" key in 2 seconds.the indicator lamp turn red. release the key to exit the low reference correction and access the high reference correction.Same as the steps of low reference correction. after adjusting the output as the high reference required,press "OFF"key,the indicator lamp turn green.it means the correction is finished.

Trouble Shooting

Status	Troubles	Reasons	Shooting
Local	Indicator lamp doesn't work	Whthout power supply, control module failure	Provide power supply, exchange control module
	Keys no responses	Overheating motor or motor damaged	Cooling motor, exchange motor
		Limit switch or torque switch action or damaged	Check the cam; the jammed valve and actuartor; Exchangde switches
Remote	Red lamp always	Control signal failure, incorrenct signal input or incorrect control signal correction	Check input signal positive and negative line Recalibrate the control signal
	Indicator lamp blink red	Feedback signal failure (Refers to control signal value)	Full open position and full close position recalibration
		Potentiometer is at deadband	Re-adjusting potentiometer travel and recalibrate full open full close postion
		Potentiometer cable damaged	Check potentiometer cable or exchange potentiometer

Local Control Unit

- The black switch is mode selector switch for "Local" ,"Stop", "Remote" operation, and the Local\Remote Lamp Failure Power Lamp valve open\close lamp red one is operation switch for "open valve" and "close valve" operation.

1) When the selector switch place at "Stop" ,actuator stop working and can not be controlled by remote signal or operation switch.

2) When the selector switch place at "local", "Local/Remote" lamp turn red.
- counter clockwise turn the selector switch,actuator move toward open direction,"valve open\close" lamp blink red.
- Clockwise turn the selector switch, actuator move toward close direction,"valve open\close" lamp blink green.
- When there is fully open or fully close, the corresponding indicator lamp light always.
  Actuator stops working, at the same time, terminal"open signal" or "close signal" connect with terminal"COM".
  Note:When user don't operate the operation switch, it will return back to the stop position automaticly,then actuator stops working.

3) When the selector switch place at "remote", "Local\Remote" lamp will turn green.
- Terminal "Remote" will connect with "COM", the external wiring includes all kinds of circuit controls, user can wiring terminals "5,6,7,8" based on the wiring drawing for on-off control.
- when the terminal"4,5" is connected, actuator work as modulating, just input analog control signal.
- when the control signal falls below 2.5mA, actuator stop moving at once, "Failure/Power" lamp blink red.
- The actuator stops moving as the overheating of motor, "Failure/Power" lamp blink red.
- overtorque occurs as jammed valve, actuator stops working to protect the motor, terminal "Torque" will be connected, output alarm signal, at the same time," "Failure/Power" lamp turn red, the corresponding indicator lamp blink red(Short blink frequency).
- Built-in monitor relay is active when the actuator works in normal(terminal" preparation" connecting). but when the selector switch play at "Stop",the abnormal working caused as the factors such as power loss, phase loss, motor overheating, the actuator will stop working, and terminal "Preparation" will be disconnected, but terminal "Fault" will be connected.
  Note: The fully open and fully close position of this series electric actuator with local controller based on travel switch, there is no need to calibrate them.

Failures Checking and Maintenance

- **Mechanical failures**

  1) After depressing the manual override, please drive valve with hand wheel to check if the manual override is reliable and sensitive.
  2) Check if the action and indication of indicator windows is correct.
  3) Disassemble the valve due to motionless handwheel and jammed valve. If the valve can be driven by handwheel, please check electrical.
  4) Hand wheel works normally without any jams, but valve stem doesn't move any more, please check if adaptor is reliable or not.

- **Electrical failures**(checking external control equipment first, then checking the electric actuator)

  1) Check if the power supply, control power, relay, fuse, all lamps, and switches are normal.
  2) Check if the motor is normal, please exchange it if any problems.
  3) Check If the microswitch is normal, it can be solved by exchanging related components.

- **Maintenance**

  Suggestion of twice regular maintenances one year or periodical inspection.

Ordering Information

Please supply the following information when order

- Torque requested(N.m), Action time(S)
  Application environment
- Power supply
- Electrical control requirements
  Valve mounting base
  Other special requirements

Warning

- In order to enure the enclosure protection, user must operate the electric actuator in accordance with "User Manual". User take responsibility for incorrect operations or any operations without referring to "User Manual" causing enclosure protection failure.
- All related spare parts with enclosure protection have been tested strictly to guarantee its good sealing before delivery. User have to ensure the following notices if any adjustments, maintenances or other needs:

1. The electric actuator don't have the enclosure protection function when it is adjusted or operated, user must protect it away from rain, snow, hail, tidal air, dust.
2. After adjusting or maintenance, user should ensure there is no negative factors left inside of actuator like water, dust, serious tidal air to affect the enclosure protection performance.
3. After adjusting and maintenance, user have to make sure all screws tight and o-ring without damage.
4. User should ensure the good sealing of cable entries and gland.
5. User should ensure the good sealing of actuator after opening and resetting the indicator window or selector.

NEWTORK KOREA CO., LTD.

51, Sepinae-gil, Opo-eup, Kwangju-si, Gyeonggi-do KOREA, 12790
Tel. +82-31-711-3107 / Fax. +82-31-711-3057
E-mail. newtork@newtork.co.kr