KUHNWAY

ELECTRIC ACTUATOR

MK 21-MK24 SERIES

KUHNWAY

www.kuhnway.com

MK ELECTRIC ACTUATORS

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KUHNWAY

MK Actuator Overview

Dimensions

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Quick Start

MK Electric Actuators

■ Specification and performance data

Model	Torques(N.m)		Electrical Gear Ratio		Manuel Gear Ratio	Motor Power (W)	Time for 90˚ (sec)		Weight (kg)
MK 21	68	34	2360	1080	68	80	22	10	7.5
MK 22	225	112	2360	1080	65	150	22	10	10
MK 23	770	385	2345	1115	72	350	22	10	25
MK 24	2200	1350	7035	3345	216	350	66	30	39

■ Applications





■ Standard

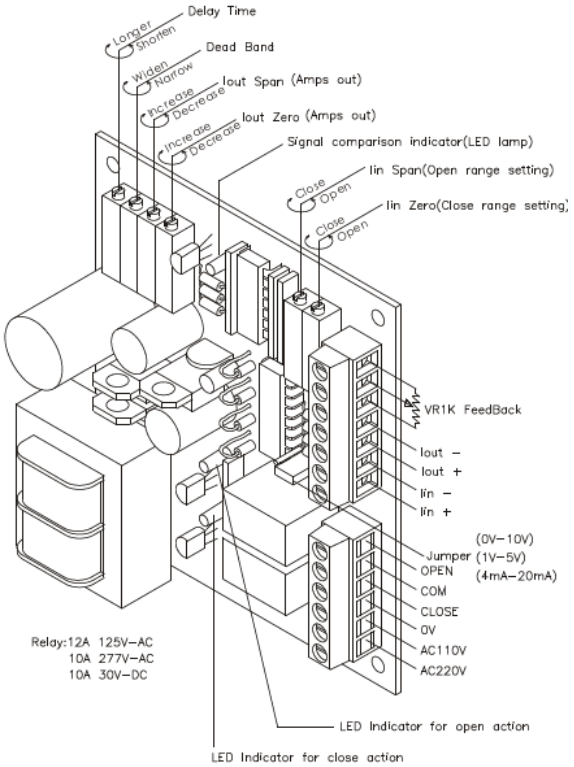
- Watertight IP 65.
- Over torque protection switch.
- Mechanical position indicator
- Hand wheel.
- Two limit switches.
- Thermal protection device.

■ Options

- Modulating Control Unit (MCU)
- Local Control Unit (LCU)
- Bracket and Socket
- Potentiometer (1kΩ)
- Auxiliary Limit Switches
- Heater

Accessories

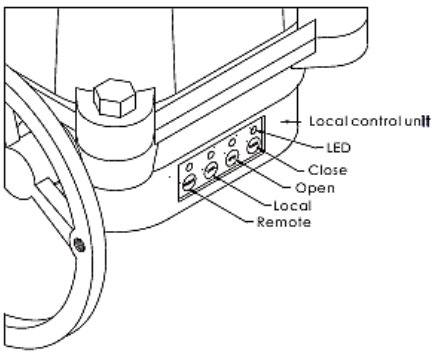
■ Modulating Control Unit (MCU)



Actuator can be operated according to input signal and provide the output signal for indicator.

- Three input options :
  4~20 mA 、 1~5 VDC 、 2~10 VDC
- Output :
  4~20 mA

■ Local Control Unit (LCU)



Local control unit is waterproof including four buttons with LED indicators. When the main control switches to on-site control mode, the controller allows the actuator to be opened and closed via the control panel. Similarly, the main control mode can switch back to remote operation mode, enabling the actuator to be controlled via a remote controller.

The on-site controller is designed to effectively prevent misoperation or accidents, ensuring safe and reliable operation.

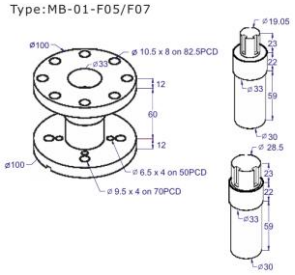
Accessories

■ Bracket and Socket

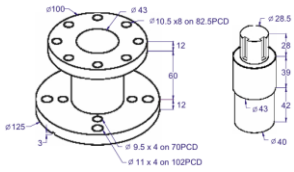
The MK series electric actuators use UNC thread standard mounting holes. If the valve body follows the ISO5211 standard, ISO5211-compatible brackets and sockets are required. These components ensure efficient compatibility, stable connections, and improved system reliability and efficiency.

Bracket **Socket**

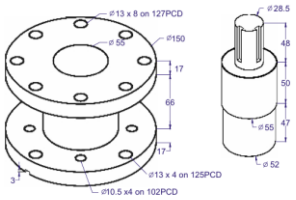
Type:MB-01-F05/F07



Type:MB-02-F07/F10



Type:MB-03-F10/F12



Bracket's material : aluminum alloy

- **Socket's types and specification**

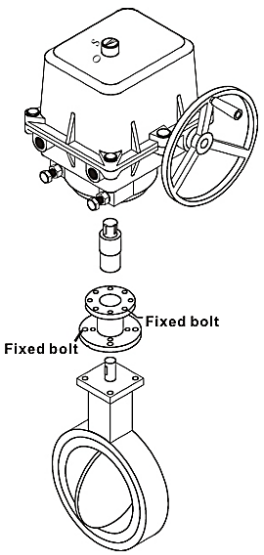
Type	MS-01	MS-02	MS-03	MS-04	MS-05	MS-06	MS-07
Connect with actuator	Ø19.05	Ø19.05	Ø19.05	Ø19.05	Ø19.05	Ø28.5	Ø28.5
Connect with valve's shaf	Ø19.05+0.05	Ø15.9+0.05	Ø12.7+0.05	14	11	Ø19.05+0.05	14
Keyway size	3/16"Wide X 1 1/8" Deep		1/8"WideX1 1/8"Deep	1 1/8" Deep		3/16"WideX1 1/8"Deep	1 1/8" Deep

Type	MS-08	MS-09	MS-10	MS-11
Connect with actuator	Ø 28.5	Ø 28.5	Ø 28.5	Ø 28.5
Connect with valve's shaf	Ø 25.3+0.05	Ø 22.23+0.05	19	17
Keyway size	1/4"WideX1 3/8"Deep	3/16"WideX1 3/8"Deep	1 3/8" Deep	

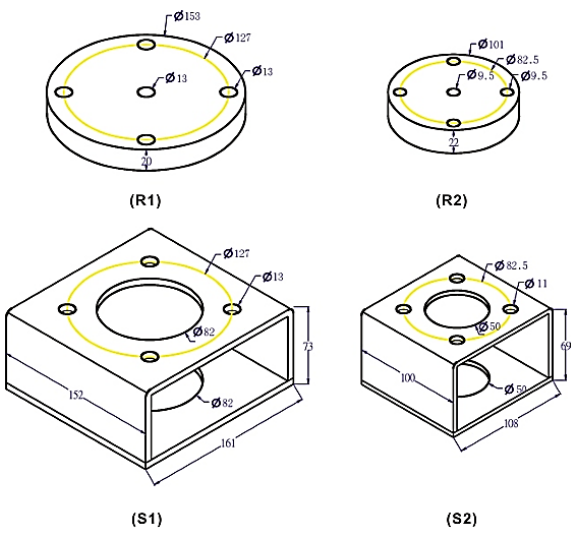
Type	MS-12	MS-13	MS-14	MS-15	MS-16
Connect with actuator	Ø 28.5	Ø 28.5	Ø 28.5	Ø 28.5	Ø 28.5
Connect with valve's shaf	Ø 34.9± 0.05	Ø 31.8± 0.05	Ø 28.65± 0.05	24	22
Keyway size	5/16"Wide X 1 1/2" Deep			1 1/2" Deep	

Socket's material : carbon steel

- **Illustration**

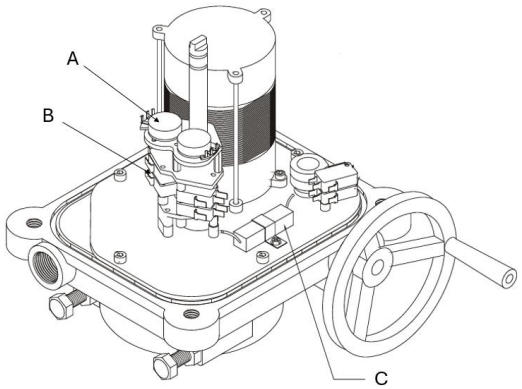


- **Semi-product, assembly accessories**



Accessories

■ Other Components



A. Potentiometer (1kΩ)

Provides feedback signal to indicate the opening status

B. Auxiliary Limit Switches

The standard model equips with the 1st & 2nd switches for fully-open and fully-closed. The option consists of the 3rd & 4th auxiliary switches which provide dry contacts for fully-open and fully-closed. ◦

C. Heater

A space heater can increase the internal temperature and keep dry inside actuator to avoid the freezing lubricant and moisture causing actuator failure under low temperature or high humidity.

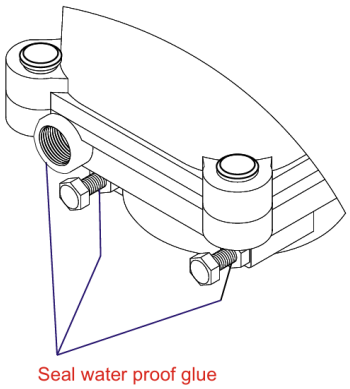
■ Electric actuators adapt butterfly valve's size

Model	Adapt butterfly valve size										
	2	2½	3	4	5	6	8	10	12	14	16
MK 21	○	○	○	◎							
MK 22				○	○	○	◎				
MK 23						○	○	○	◎		
MK 24									○	○	○

Remarks:
○ Indicates suitability for mounting with the specified butterfly valve size.
◎ For applicable butterfly valve sizes, please consult the manufacturer or local distributor.

■ Special Notes for Installation of Electric Actuators

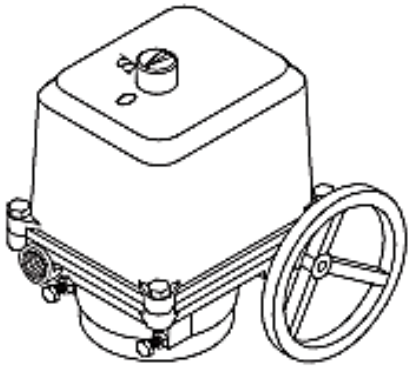
1. When installing an electric actuator with a valve, ensure that the valve shaft, mounting bracket, and coupling are properly aligned. The vertical axis and center position must match those of the actuator.
2. After completing the final adjustment of the travel stops, seal both adjustment points with waterproof adhesive.
3. After completing the wiring installation, ensure that the cable entry and connection points are properly sealed with waterproof adhesive.
4. Do not use electric actuators in vacuum environments.

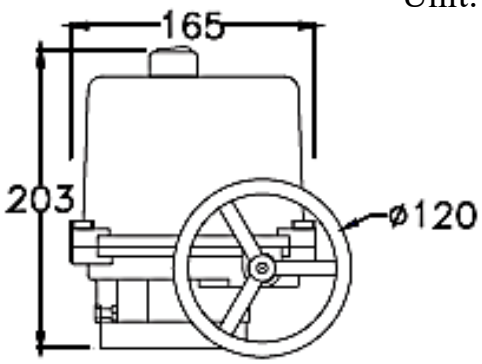


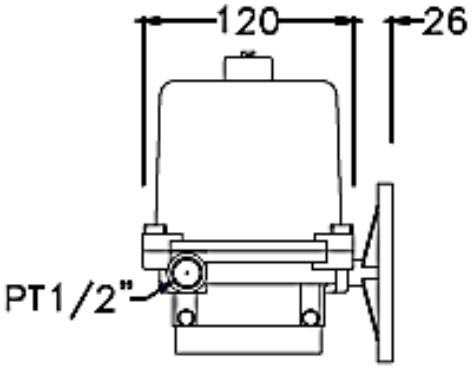
Dimensions

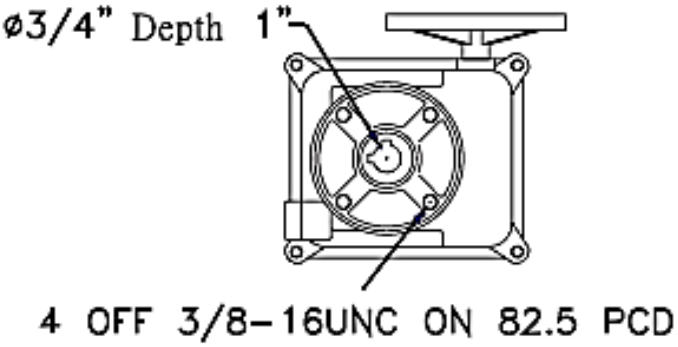
MK21

Unit: mm





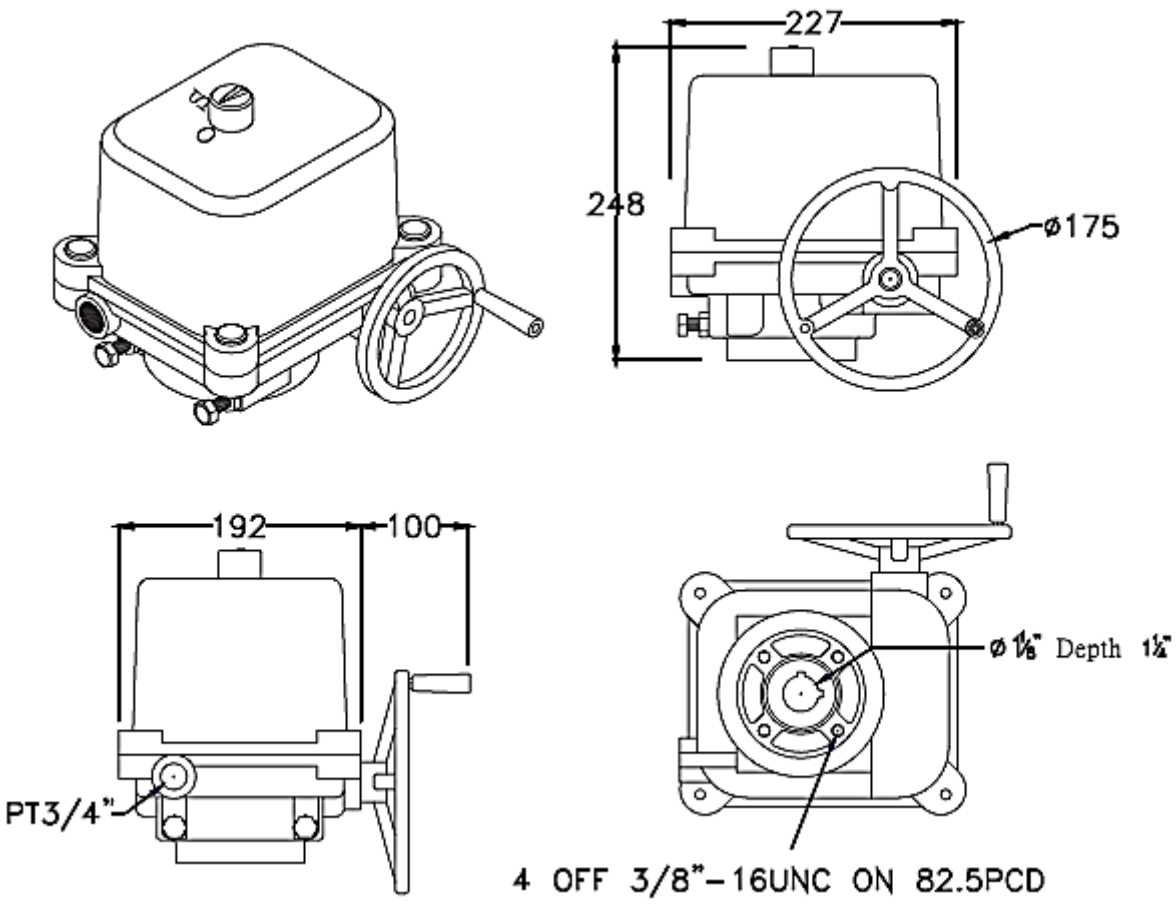




Dimensions

MK22

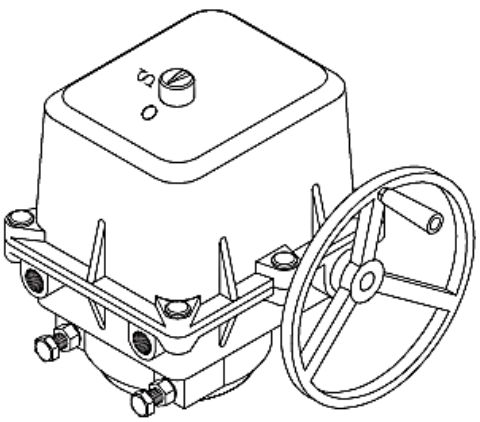
Unit: mm

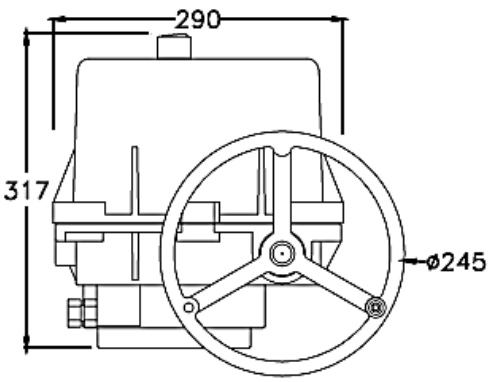


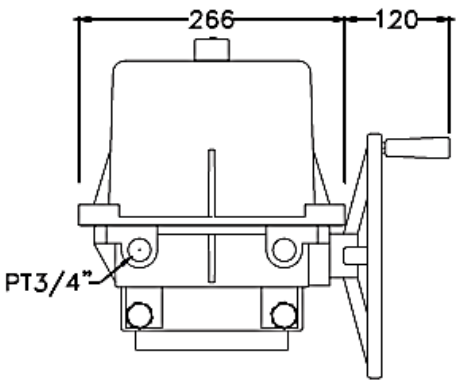
Dimensions

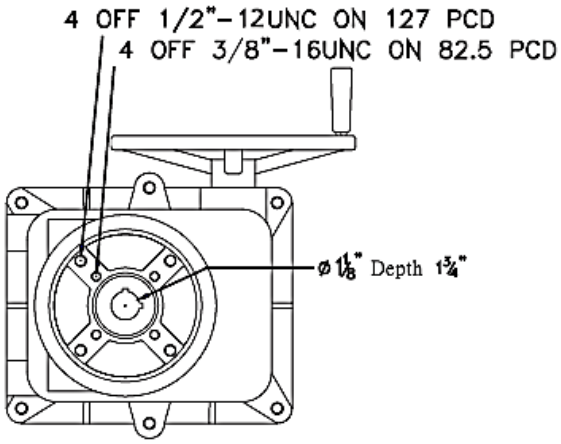
MK23

Unit: mm





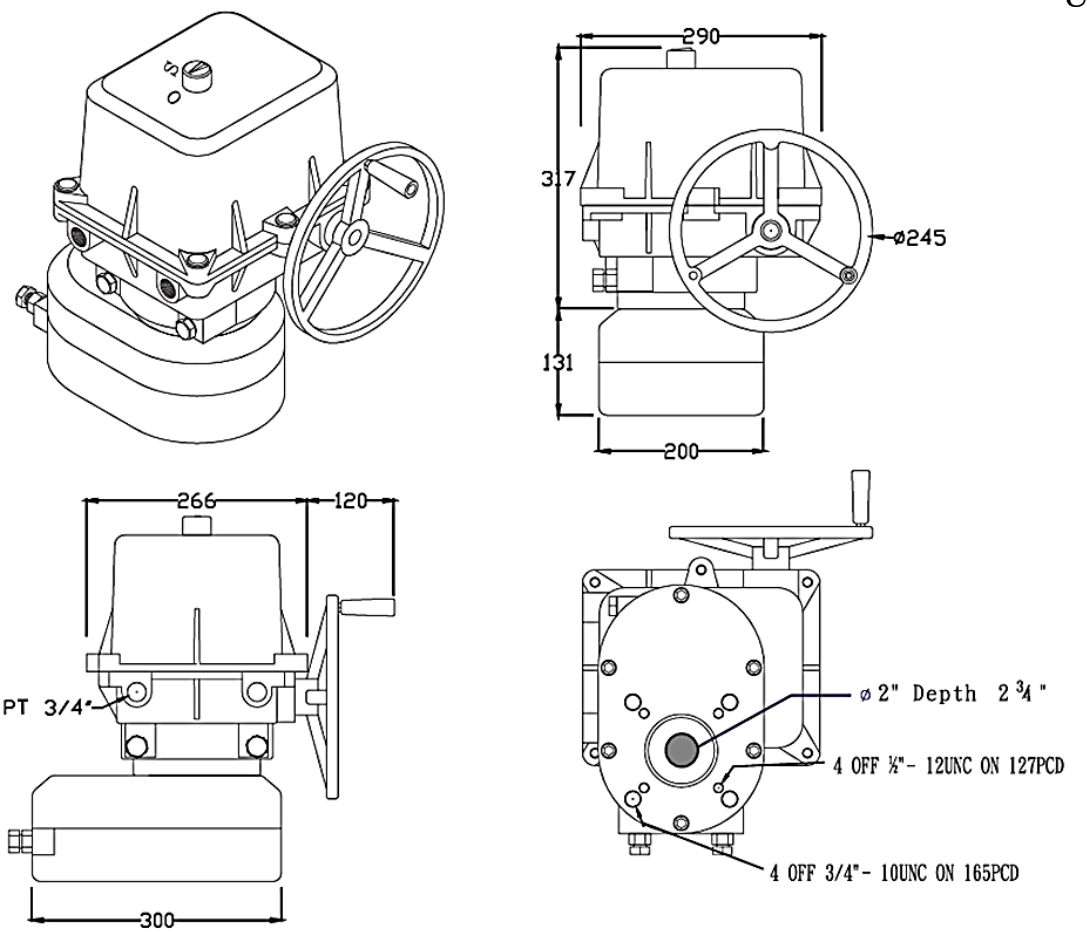




Dimensions

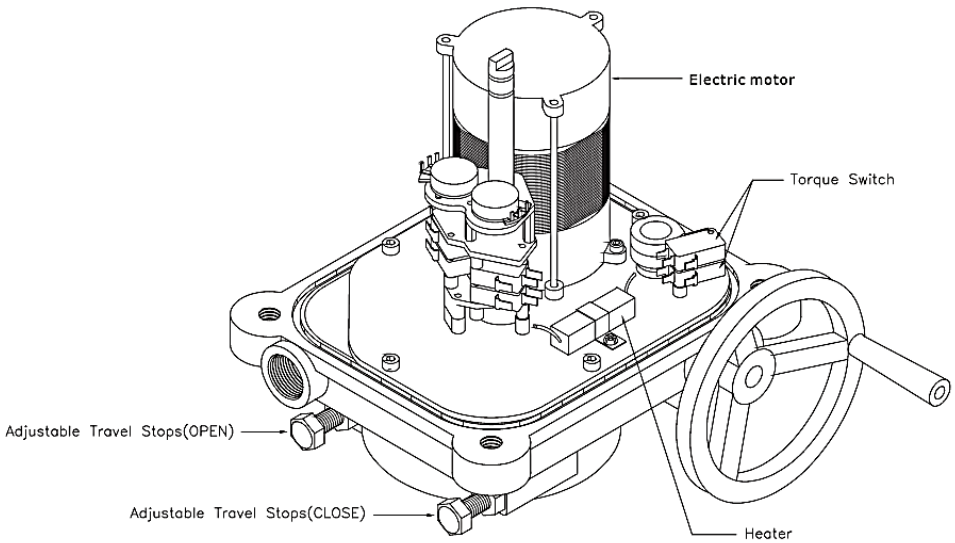
MK24

Unit: mm

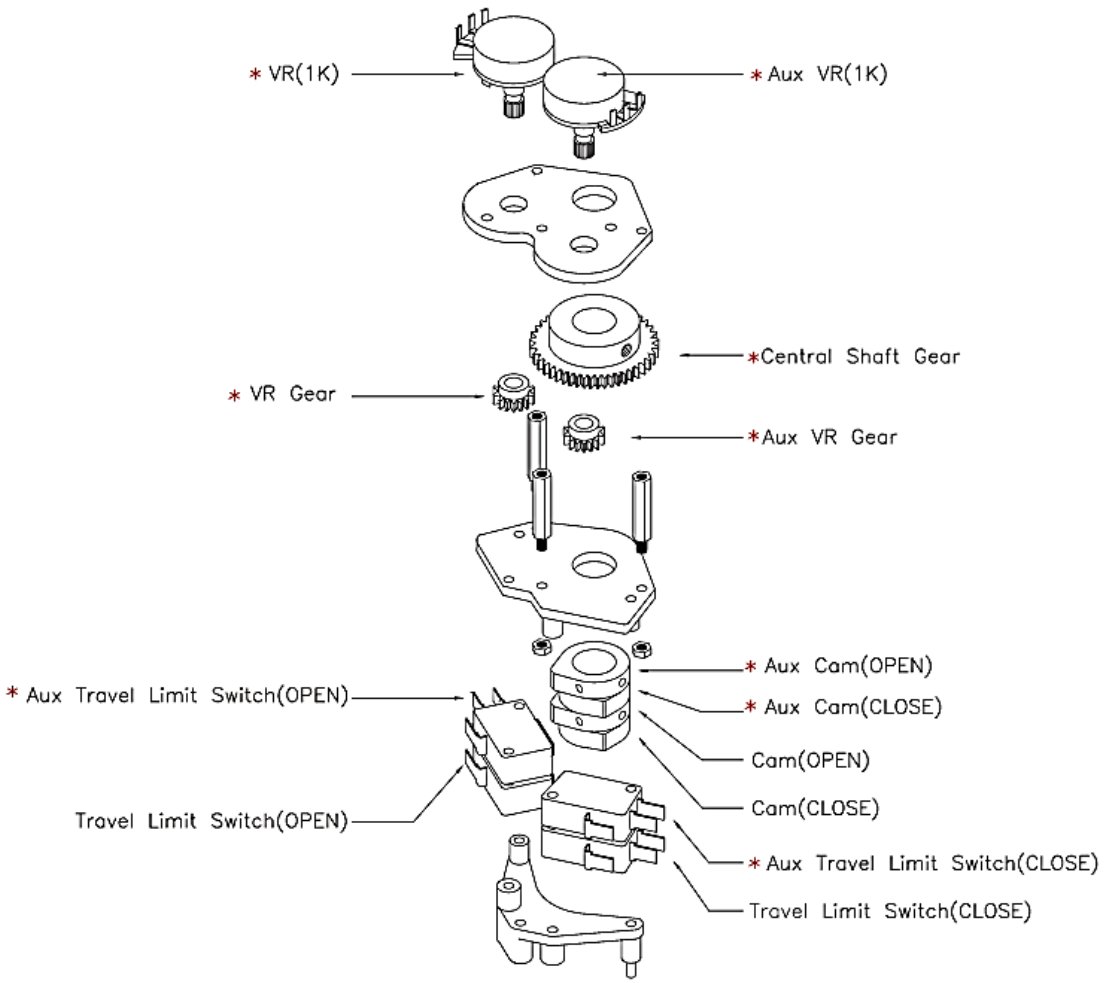


Dimensions

* Component assembly drawing

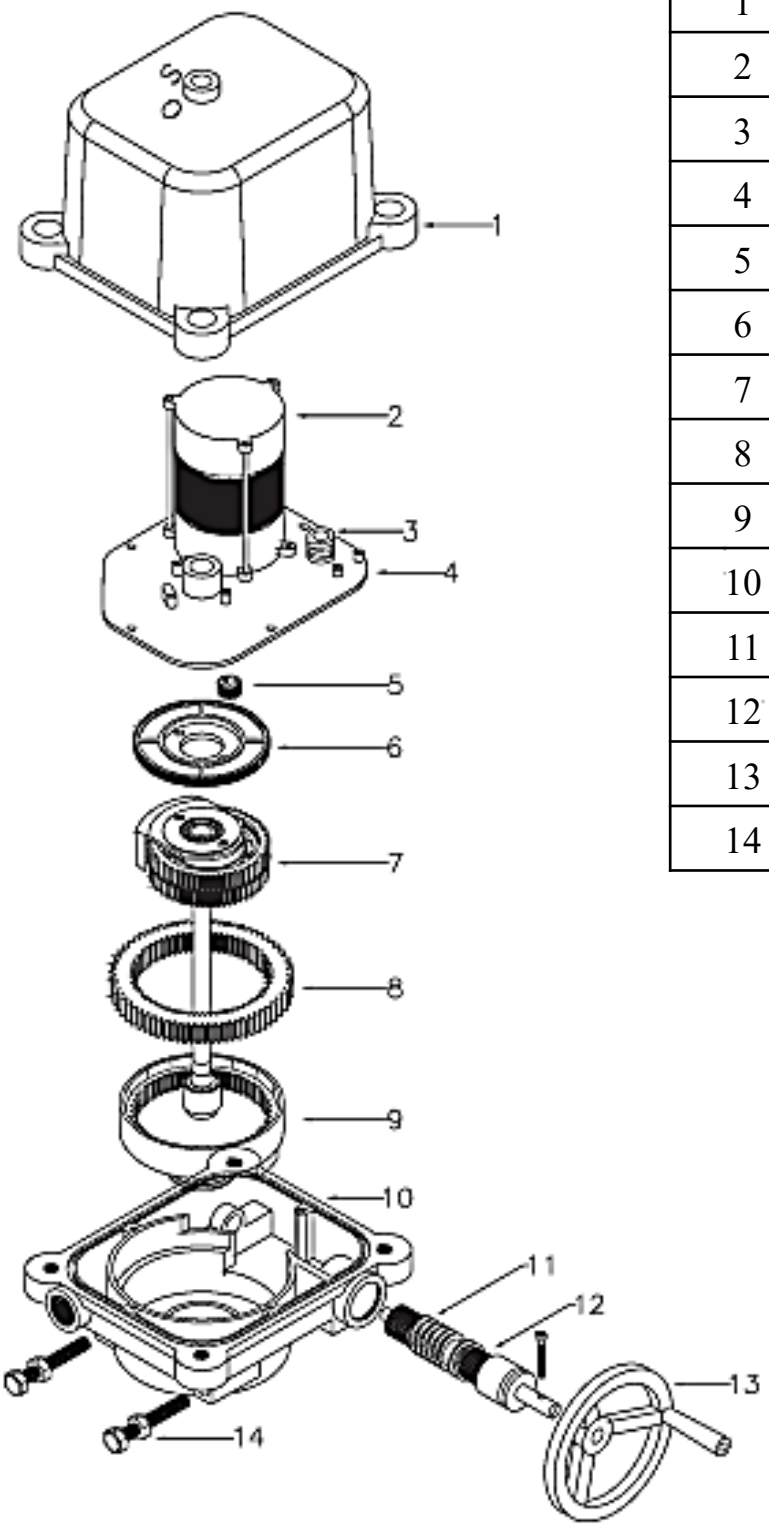


* Symbol is optional component



Dimensions

Assembly Diagram



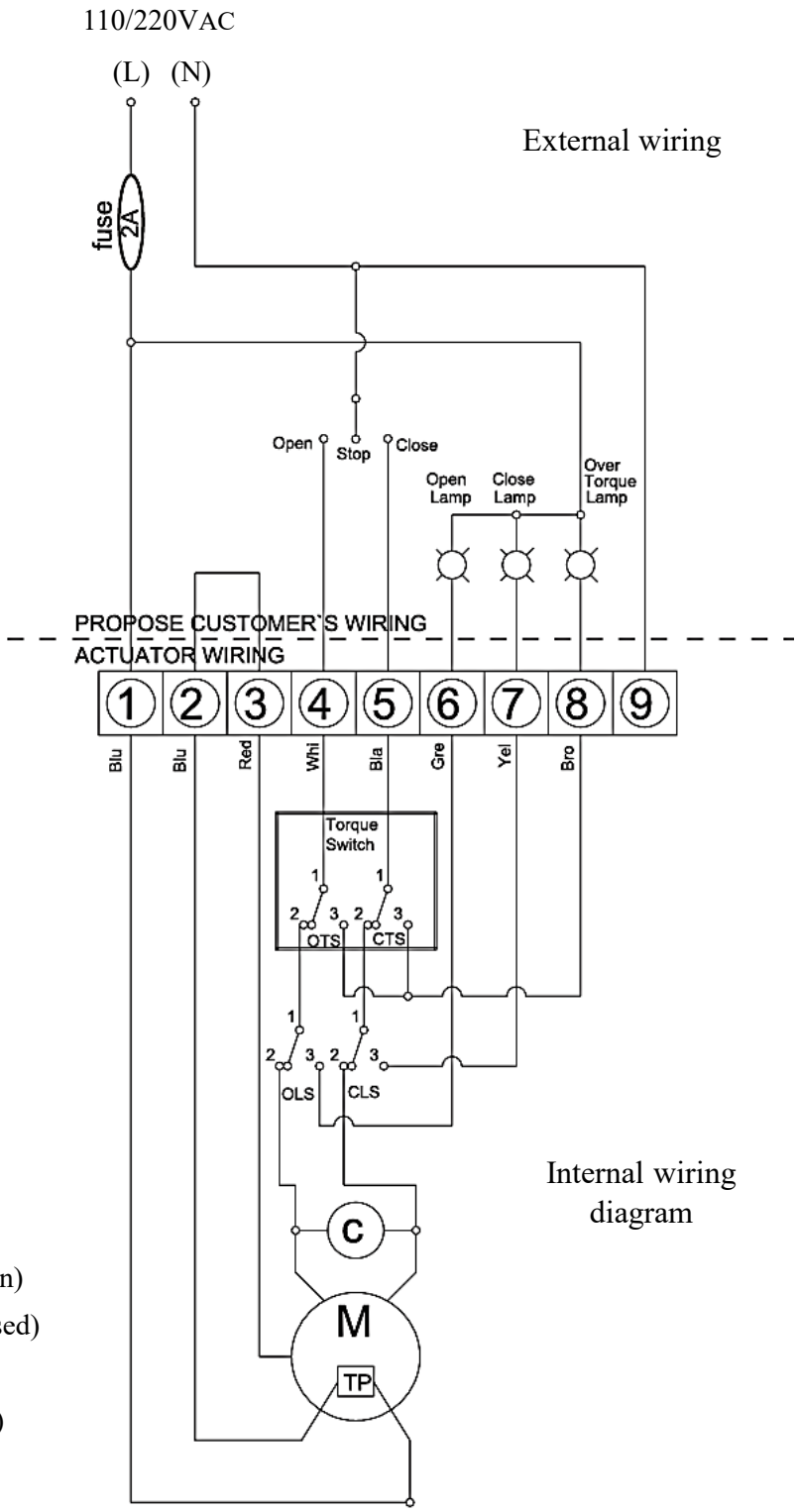
No.	Parts List
1	Upper Cover
2	Electric Motor
3	Torque Switch Cam
4	Cover for gear box
5	Motor's gear
6	Gear
7	Planetary gear set
8	Gear
9	Gear
10	Gear Box
11	Worm gear
12	Conical spring
13	Hand wheel
14	Positional adjustable screw

Wiring Diagram

■ **ON / OFF TYPE**

110 / 220 V_{AC} (Single Phase)

Wiring is connecting TP with supplying power via series wiring mode.



①: connect to Power Supply (L)

⑨: connect to Power Supply (N)

②: connect to ③

④: when connected to (N) = "OPEN"

⑤: when connected to (N) = "CLOSE"

⑥: Open Indicator Lamp

⑦: Closed Indicator Lamp

⑧: Over-torque Indicator Lamp

TP: Thermal Protector

M: Motor

C: Starting Capacitor

OLS: Stroke Position Switch (Fully Open)

CLS: Stroke Position Switch (Fully Closed)

OTS: Over-torque Switch (Fully Open)

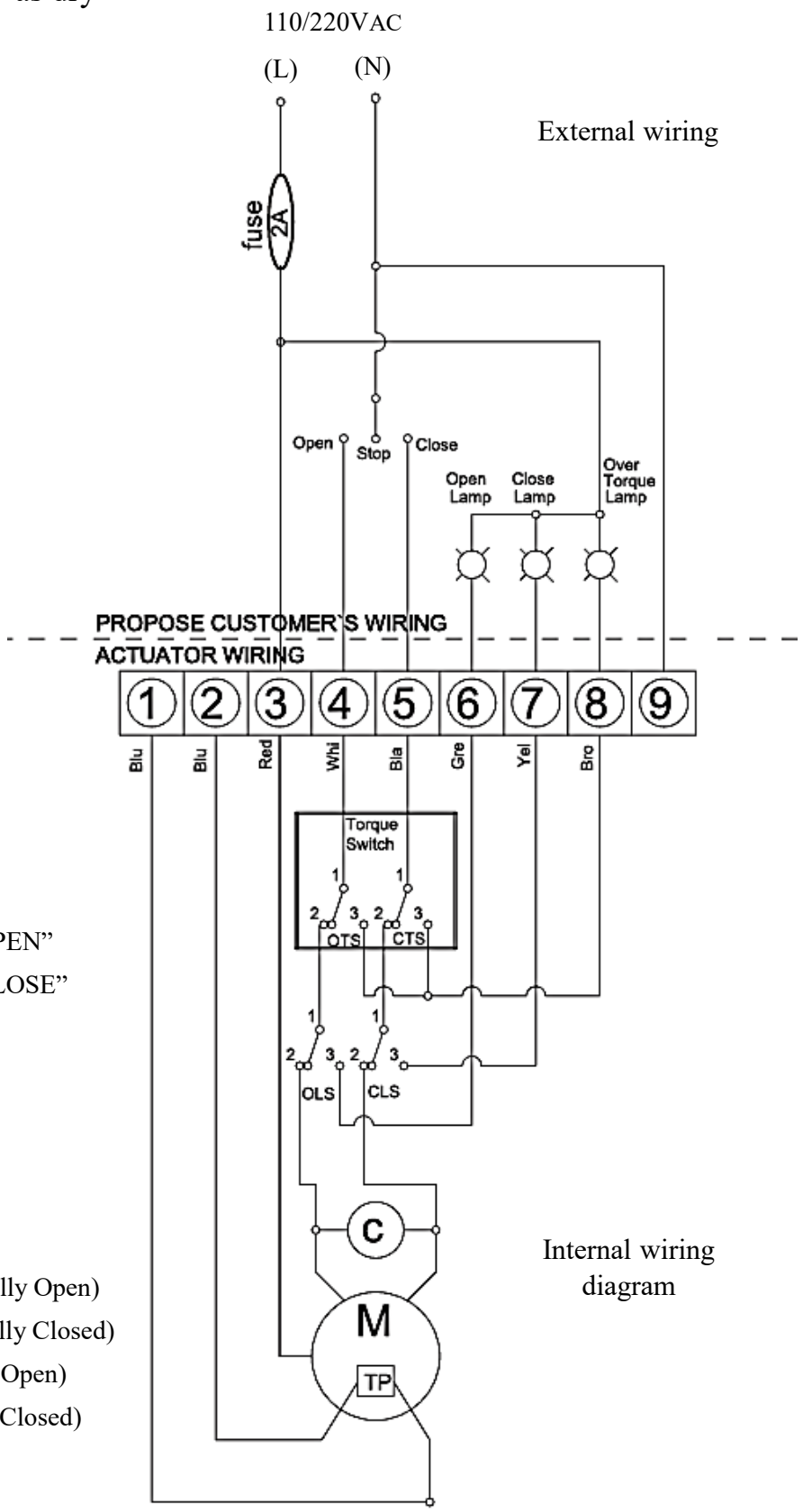
CTS: Over-torque Switch (Fully Closed)

Wiring Diagram

■ **ON / OFF TYPE**

110 / 220 V_{AC} (Single Phase)

It is available for using TP as dry contacting point.



③: connect to Power Supply (L)

⑨: connect to Power Supply (N)

④: when connected to (N) = "OPEN"

⑤: when connected to (N) = "CLOSE"

⑥: Open Indicator Lamp

⑦: Close Indicator Lamp

⑧: Over-torque Indicator Lamp

TP: Thermal Protector

M: Motor

C: Starting Capacitor

OLS: Stroke Position Switch (Fully Open)

CLS: Stroke Position Switch (Fully Closed)

OTS: Over-torque Switch (Fully Open)

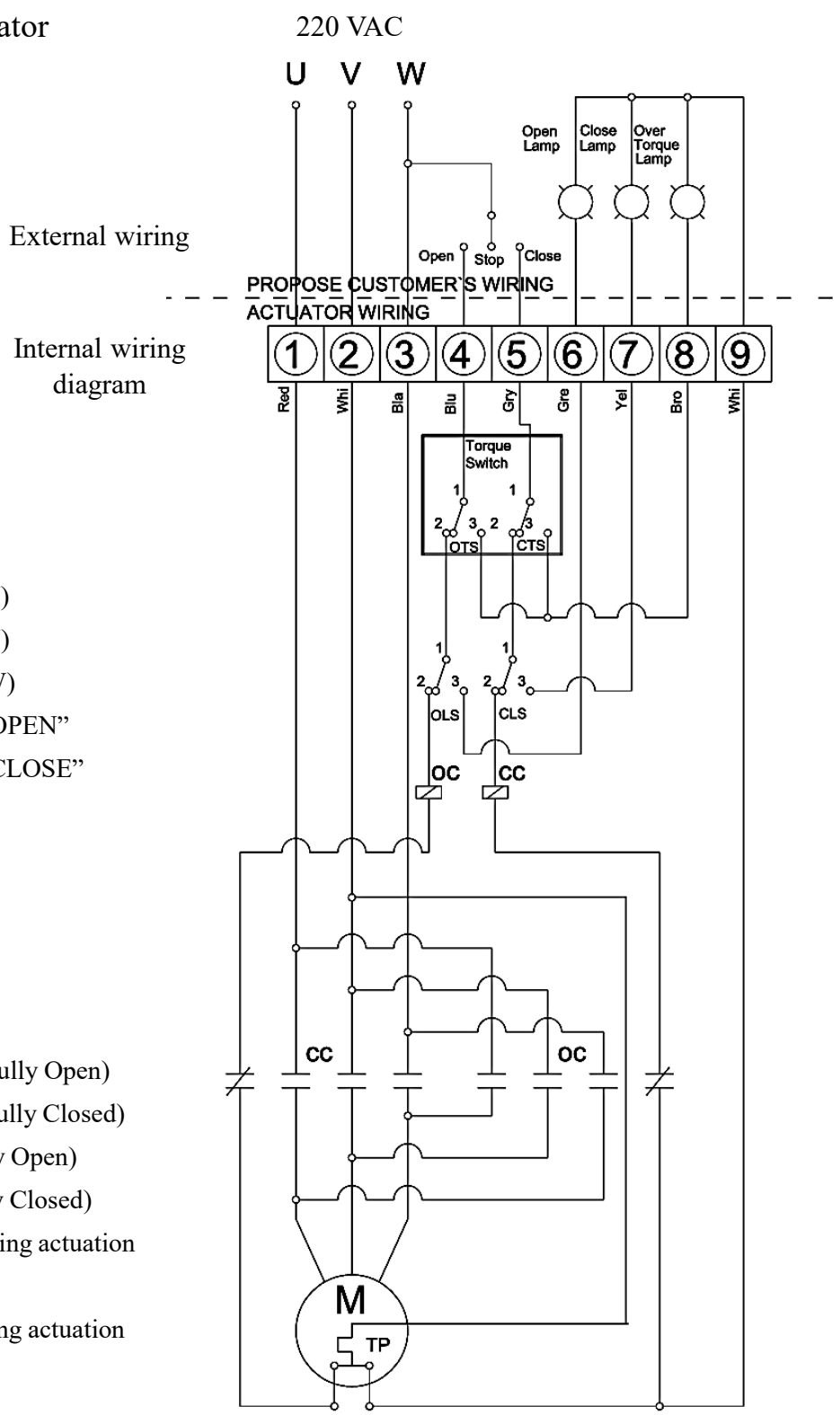
CTS: Over-torque Switch (Fully Closed)

Wiring Diagram

■ ON / OFF TYPE

220 V_{AC} (Three Phase)

Three phase electric actuator wiring diagram



①: connect to Power Supply (U)

②: connect to Power Supply (V)

③: connect to Power Supply (W)

④: when connected to (W) = “OPEN”

⑤: when connected to (W) = “CLOSE”

⑥: Open Indicator Lamp

⑦: Close Indicator Lamp

⑧: Over-torque Indicator Lamp

TP: Thermal Protector

M: Motor

C: Starting Capacitor

OLS: Stroke Position Switch (Fully Open)

CLS: Stroke Position Switch (Fully Closed)

OTS: Over-torque Switch (Fully Open)

CTS: Over-torque Switch (Fully Closed)

OC: Magnet Contactor for opening actuation purpose.

CC: Magnet Contactor for closing actuation purpose.

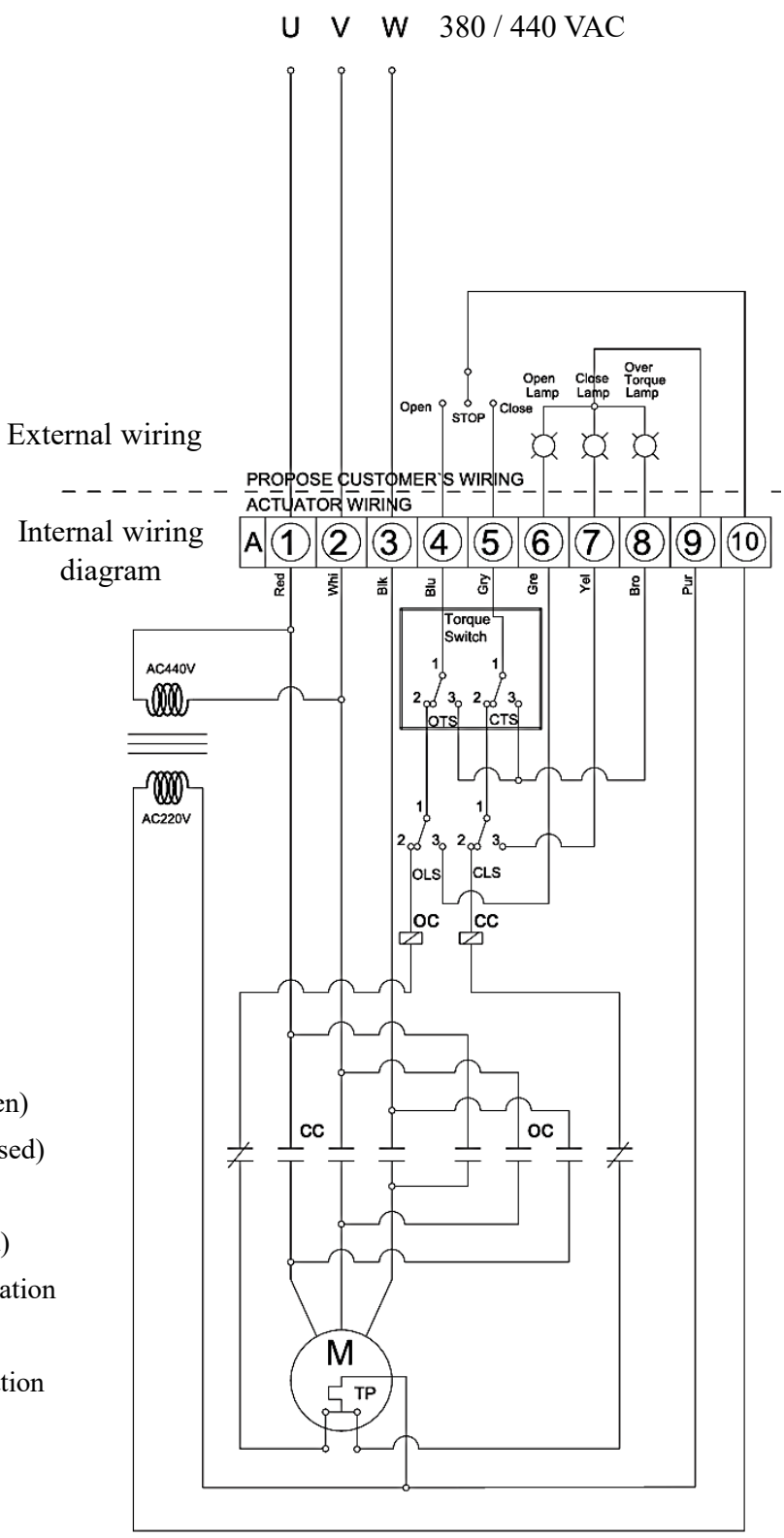
Notice: If completing external wiring but electric actuator cannot be operated at normal status, please check the phase of U.V.W. whether the wiring is correct or not. If wrong wiring for U.V.W. of three phases, please change the contacting point for U.V.W.

Wiring Diagram

■ ON / OFF TYPE

380 / 440 V_{AC} (Three Phase)

Three phase electric actuator wiring diagram



①: connect to Power Supply (U)

②: connect to Power Supply (V)

③: connect to Power Supply (W)

④: when connected to (W) = "OPEN"

⑤: when connected to (W) = "CLOSE"

⑥: Open Indicator Lamp

⑦: Close Indicator Lamp

⑧: Over-torque Indicator Lamp

TP: Thermal Protector

M: Motor

C: Starting Capacitor

OLS: Stroke Position Switch (Fully Open)

CLS: Stroke Position Switch (Fully Closed)

OTS: Over-torque Switch (Fully Open)

CTS: Over-torque Switch (Fully Closed)

OC: Magnet Contactor for opening actuation purpose.

CC: Magnet Contactor for closing actuation purpose.

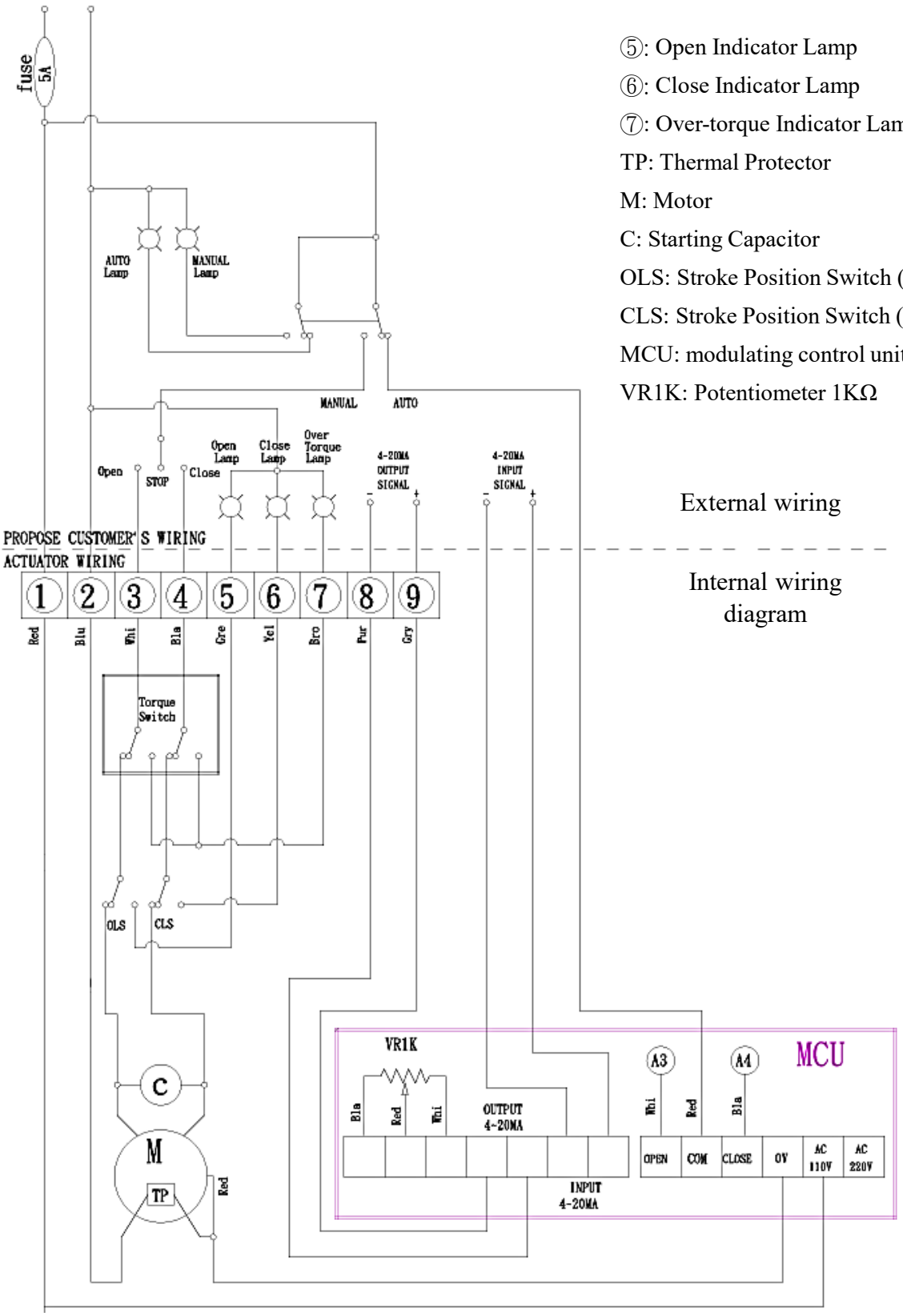
Notice: If completing external wiring but electric actuator cannot be operated at normal status, please check the phase of U.V.W. whether the wiring is correct or not. If wrong wiring for U.V.W. of three phases, please change the contacting point for U.V.W.

Wiring Diagram

■ Modulating TYPE

110 V_{AC} (Single Phase)

AC110V Single phase, electric actuator modulating control unit



⑤: Open Indicator Lamp
⑥: Close Indicator Lamp
⑦: Over-torque Indicator Lamp
TP: Thermal Protector
M: Motor
C: Starting Capacitor
OLS: Stroke Position Switch (Fully Open)
CLS: Stroke Position Switch (Fully Closed)
MCU: modulating control unit
VR1K: Potentiometer 1KΩ

External wiring

Internal wiring diagram

Wiring Diagram

■ **Modulating TYPE**

380 / 440 V_{AC} (Three Phase)

Three phase, electric actuator modulating control unit

TP: Thermal Protector

M: Motor

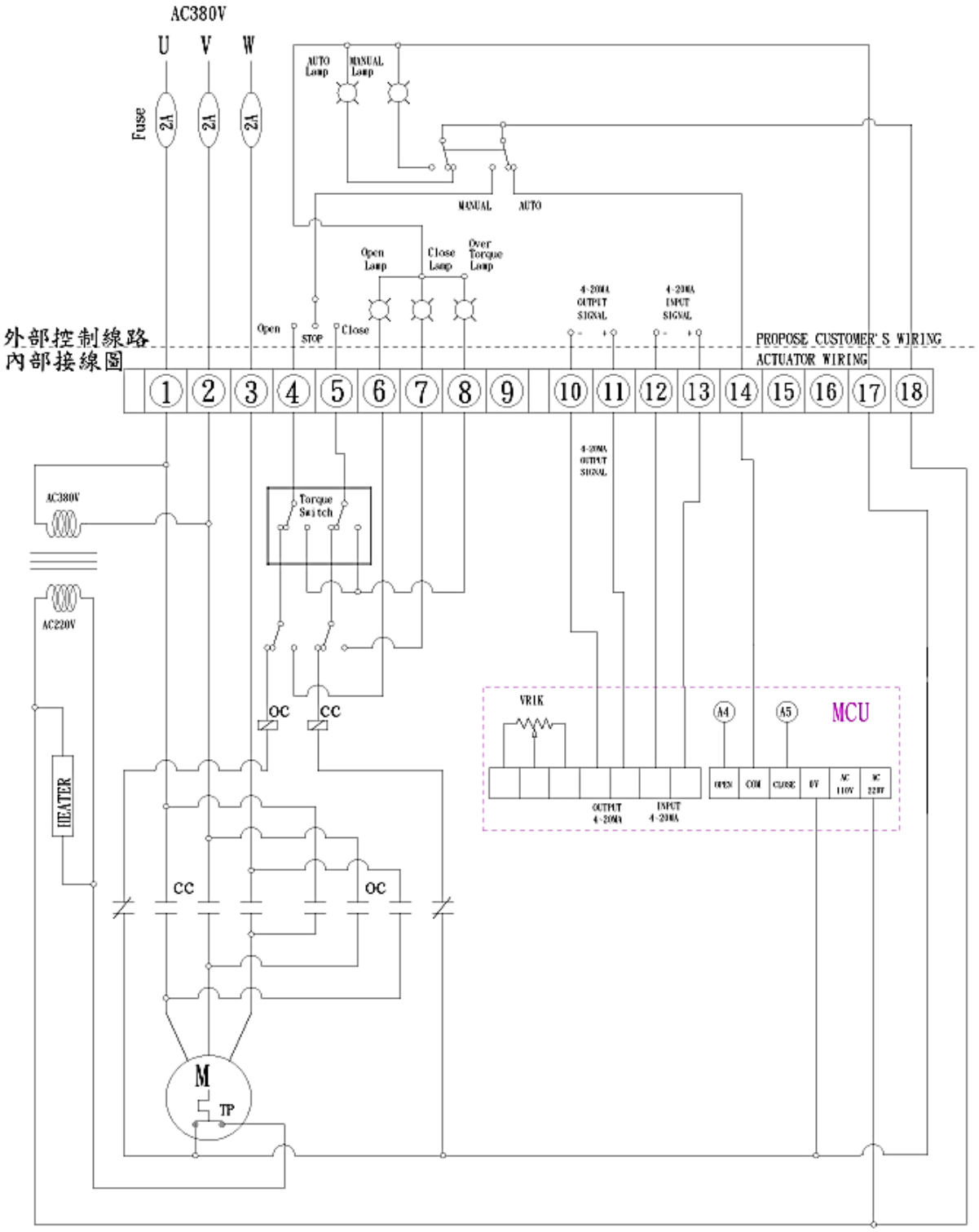
OC: Magnet Contactor for opening actuation purpose.

CC: Magnet Contactor for closing actuation purpose.

MCU: modulating control unit

VR1K: Potentiometer 1KΩ

HEATER (optional)



Wiring Diagram

■ Modulating TYPE

380 / 440 V_{AC} (Three Phase)

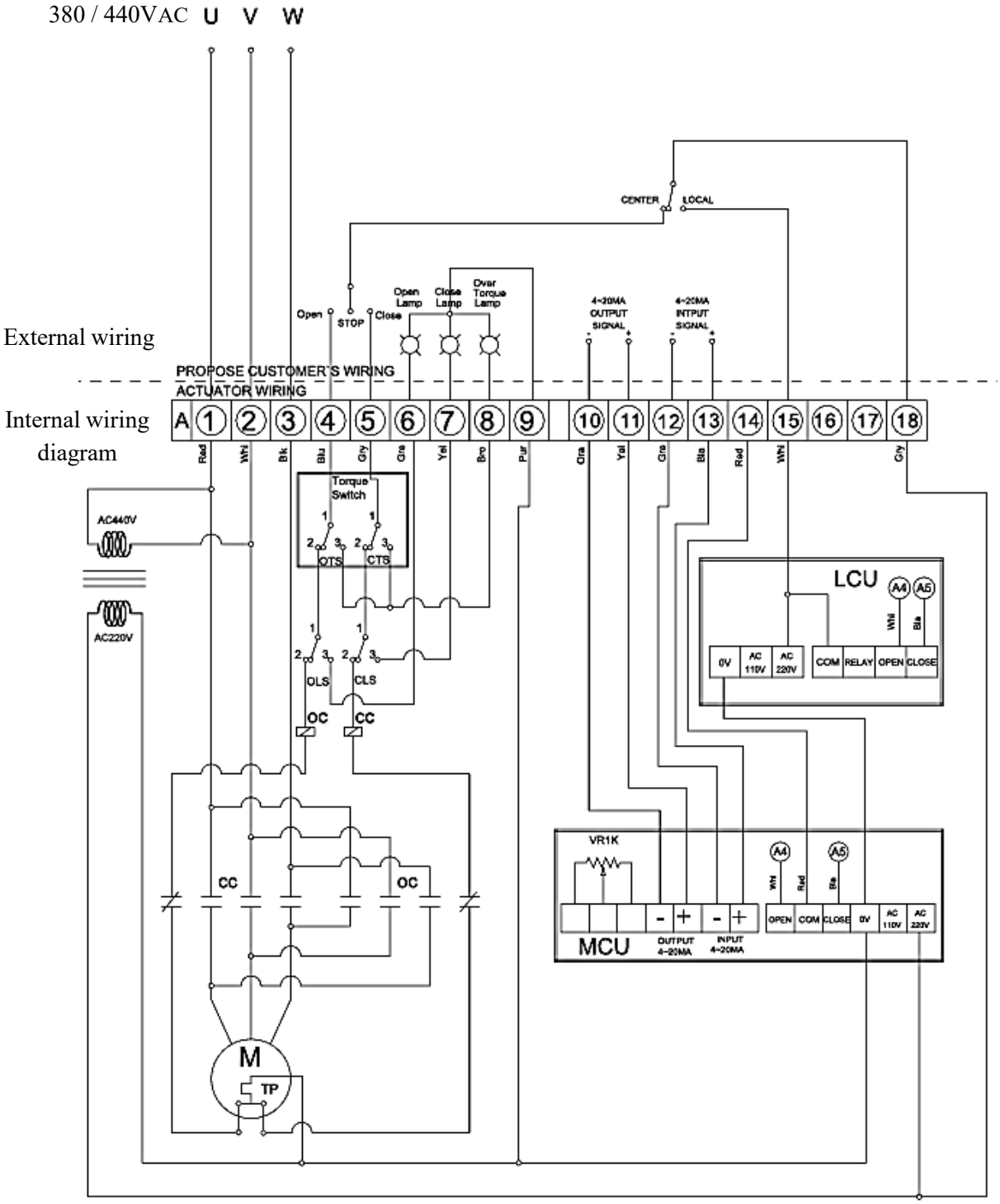
Three phase, electric actuator modulating control unit and local control unit

TP: Thermal Protector
M: Motor
OC: Magnet Contactor for opening actuation purpose.
CC: Magnet Contactor for closing actuation purpose.

OTS: Over-torque Switch (Fully Open)
CTS: Over-torque Switch (Fully Closed)
MCU: modulating control unit
LCU: Local control unit
VR1K: Potentiometer 1KΩ

External wiring

Internal wiring diagram



Wiring Diagram

■ Modulating TYPE

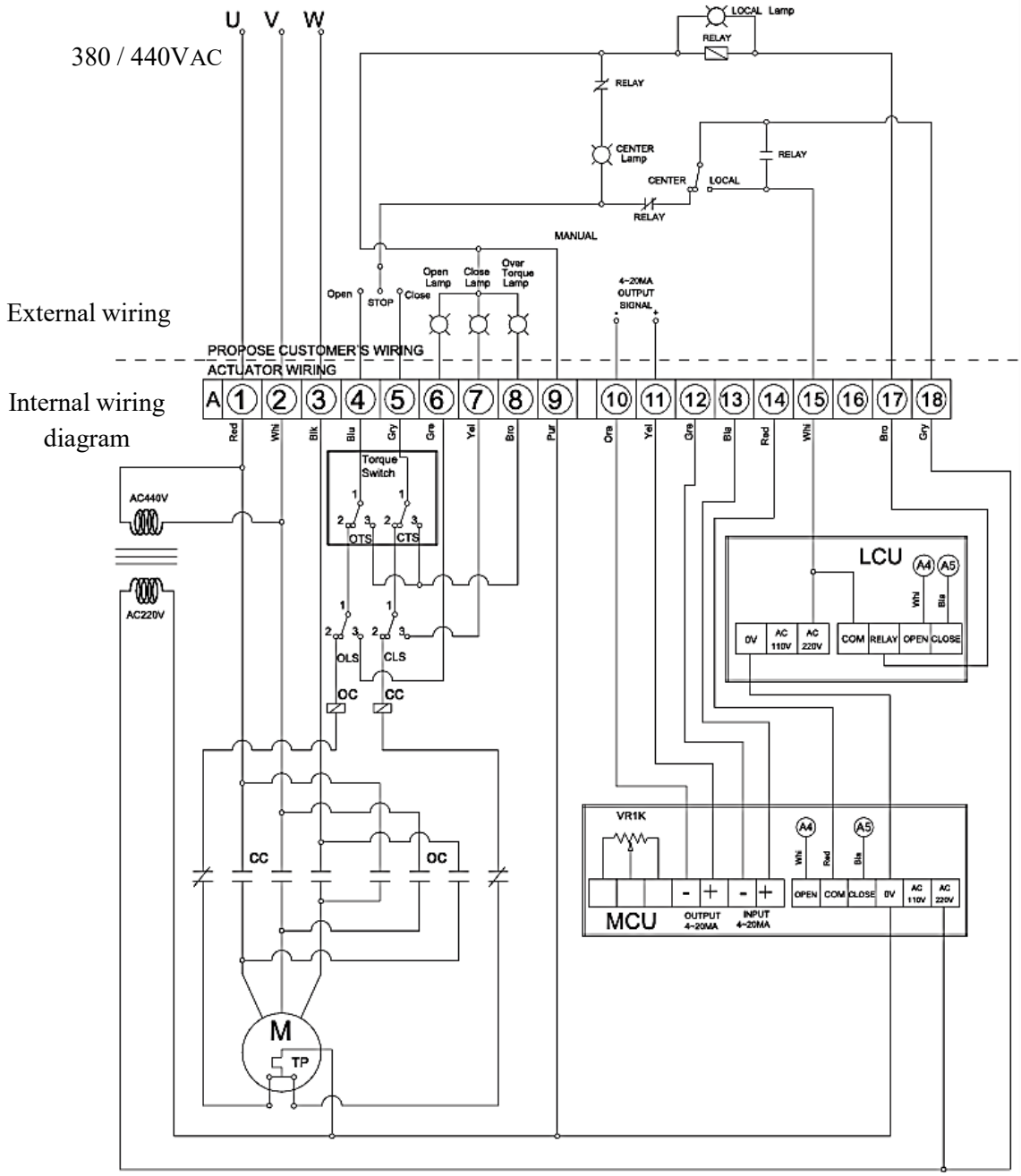
380 / 440 V_{AC} (Three Phase)

Three phase, electric actuator modulating control unit and local control unit

TP: Thermal Protector
M: Motor
OC: Magnet Contactor for opening actuation purpose.
CC: Magnet Contactor for closing actuation purpose.

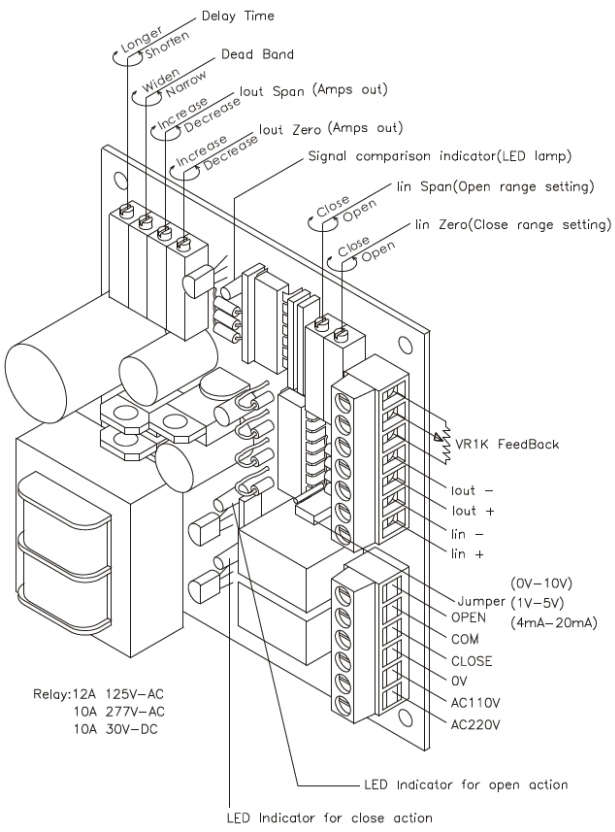
OTS: Over-torque Switch (Fully Open)
CTS: Over-torque Switch (Fully Closed)
MCU: modulating control unit
LCU: Local control unit
VR1K: Potentiometer 1KΩ

This external wiring system to use in the Relay Contacting point of LCU (Local Control Unit / Site Control System), when the external remote controller to change to the site (LCU), after pressing the button of LCU, the priority belongs to Local Control Unit (LCU), After completing operation, and push the remote button, then external wiring system will work.



Wiring Diagram

Modulating Control Unit Operation Manual



The TEC-101 proportional controller allows for three selectable input signals (0~10V, 1~5V, 4~20mA) using a jumper and provides a 4~20mA output signal.

• Six adjustable knobs:

1. **Delay time**: Longer times increase stability; shorter times allow faster response.
2. **Dead band**: Wider bands increase stability; narrower bands enhance precision.
3. **Iout span (Amps out): 20mA**
4. **Iout zero (Amps out): 4mA**
5. **Iin span (open range setting): 20mA**
6. **Iin zero (close range setting): 4mA**

• Three signal indicator lamps

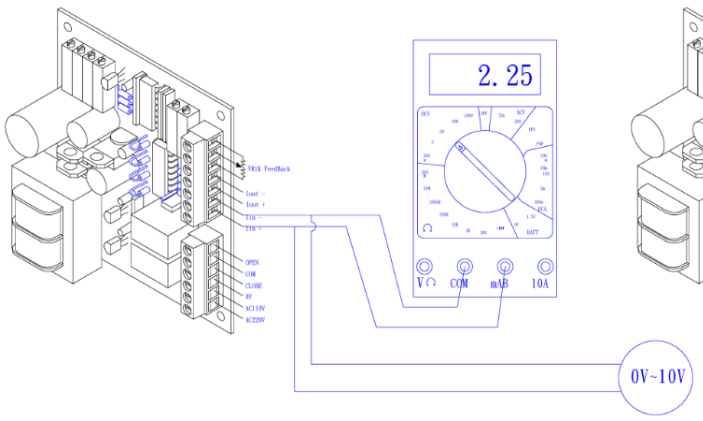
1. Signal comparison indicator.
2. LED indicator for open action
3. LED indicator for close action

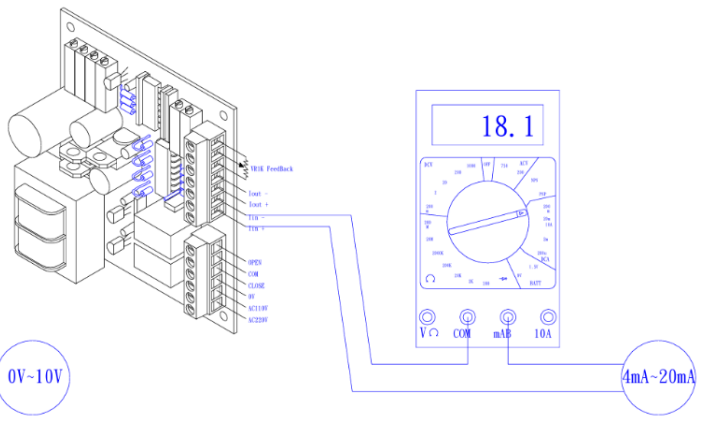
• Two input voltages:

1. AC110V
2. AC220V

Note: When connecting the power supply, ensure the correct voltage is used. Incorrect voltage may damage the circuit board.

- Three input signals: 0V~10V, 1V~5V, 4mA~20mA
- Voltage signals (0V~10V or 1V~5V) are not recommended for long-distance applications as they may attenuate due to line resistance.
- Current signals are suitable for long-distance applications because the voltage increases as line current decreases to maintain the required current.
- Both voltage and current signals are DC. When wiring, pay attention to the polarity. Incorrect wiring will prevent the equipment from functioning but will not cause damage.





For on-site adjustment of voltage signals (0~10V or 1~5V), set a multimeter to the DVC 20V range and connect it in parallel with the INPUT signal to monitor the voltage value, making adjustments more convenient.

For on-site adjustment of current signals (4mA~20mA), set a multimeter to the DCA 200mA range and connect it in series with the INPUT signal to monitor the current value, making adjustments more convenient.

Electric Actuator operating manual and precautions

1. **Specifications**

Model	Torques(N.m)		Electrical Gear Ratio		Manuel Gear Ratio	Motor Power (W)	Time for 90˚ (sec)		Weight (kg)
MK 21	68	34	2360	1080	68	80	22	10	7.5
MK 22	225	112	2360	1080	65	150	22	10	10
MK 23	770	385	2345	1115	72	350	22	10	25
MK 24	2200	1350	7035	3345	216	350	66	30	39

2. **Standard Accessories** : Motor thermal overload protector, torque switch, and manual handwheel device.
   ON/OFF Time:
   - MK21, MK22, MK23 : 22 seconds
   - MK24: 66 seconds
3. **Operation Modes**: ☐ ON-OFF ☐ 4~20mA
   ☐ Local/Remote Control ☐ Dry Contact (limit switch signal)
4. **Power Supply:**
   Single Phase: ☐ AC 110V ☐ AC 220V
   Three Phase: ☐ AC 220V ☐ AC 380V ☐ AC 440V
5. **Precautions** :

A. Installation Position:
The preferred installation position is upright. If vertical installation is required, ensure the wiring entry faces downward to prevent rainwater ingress. If this is not possible, seal the cable entry and mounting bolts with silicone sealant.

B. Manual Operation:
When operating manually (open/close), follow the directional arrow and position indicator. Do not over-rotate the handwheel, as this may damage the conical compression spring.

C. Synchronous Operation:
If two or more actuators are operated simultaneously, each unit must be wired independently. Do not use series or parallel wiring, as this may cause electrical interference.

D. Protection:
Use a 3A fuse for protection. Refer to the wiring diagram located inside the upper cover of the actuator.

E. Environment:
Keep away from LPG, hazardous gases, or corrosive liquids to prevent damage.

F. Duty Cycle:
Allow approximately 10 seconds between open and close operations.

- **Torque Contrast**

1 kgf·m = 86.79 lb·in = 7.233 lb·ft

1 lb·ft = 1.357 N·m

1 lb·in = 0.1131 N·m

1 N·m = 8.8430 lb·in

1 kgf·cm = 0.8679 lb·in

lb = Pounds

Troubleshooting Guide

1. Issue:
The motor is energized in the closed position, and the over-torque cam triggers the torque limit switch (torque switch indicator is ON). *(Abnormal condition)*
Solution:
Adjust the CLOSE cam forward using an external hex wrench, moving it away from the limit position. Retest after adjustment. Repeat if necessary.
Ensure there is no leakage from the valve or damper before performing adjustments.

2. Issue:
The motor moves from the closed position toward open but stops due to overheating.
Solution:
Adjust the CLOSE cam forward using an external hex wrench, moving it slightly away from the limit. Retest and repeat adjustment if required.
Ensure there is no leakage from the valve or damper before performing adjustments.

3. Issue:
Power is supplied to the motor, but it does not operate.
Solution:
a. Verify that the supply voltage and current are within the specified range.
b. Check that wiring connections are correct and not damaged.
c. Confirm the motor is in normal working condition.

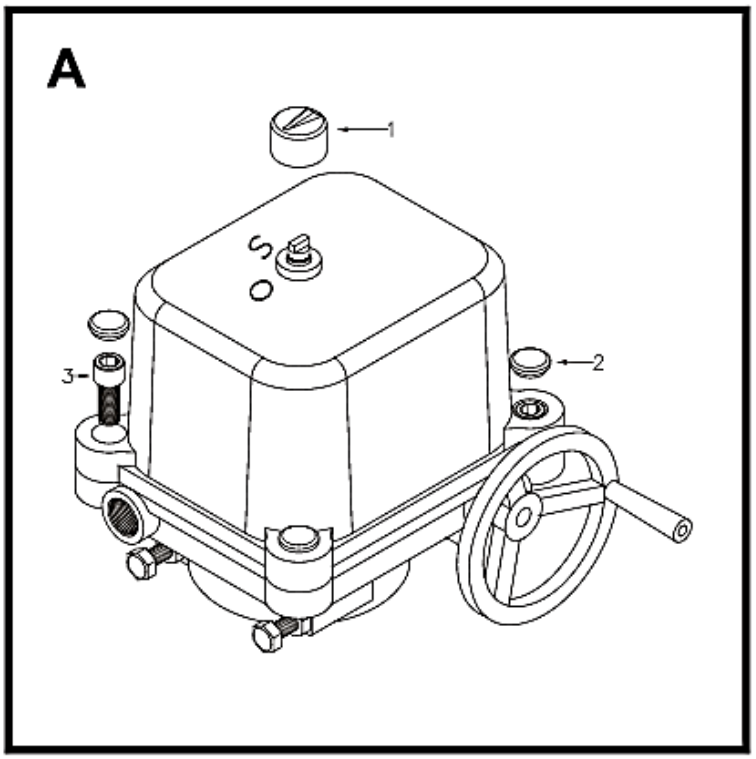
4. Issue:
For MK23 or MK24 electric actuators (3-phase, 380VAC or 440VAC), the rotation direction is reversed after installation.
Solution:
Turn off the power supply. Swap any two phases of the power wiring to reverse the rotation direction. After adjustment, use the handwheel to move the valve or damper to a semi-open position before restoring power.
Close: Clockwise (CW)
Open: Counter-clockwise (CCW)

5. Issue:
The actuator does not operate when using a 4–20 mA modulating (proportional) controller.
Solution:
a. Check the input signal polarity (+ / –).
b. Switch to manual mode to verify operation and confirm correct wiring.

6. Issue:
The motor thermal protection device trips frequently.
Solution:
a. Check for electrical overload conditions.
b. Verify that operation frequency is not excessive.
c. Inspect motor insulation for damage.

7. Issue:
The wiring conduit entry is facing upward, allowing rainwater to enter and causing internal moisture.
Solution:
Electric actuators must be installed according to the manufacturer’s recommended orientation. If water ingress has occurred, return the actuator to the manufacturer for inspection and service.

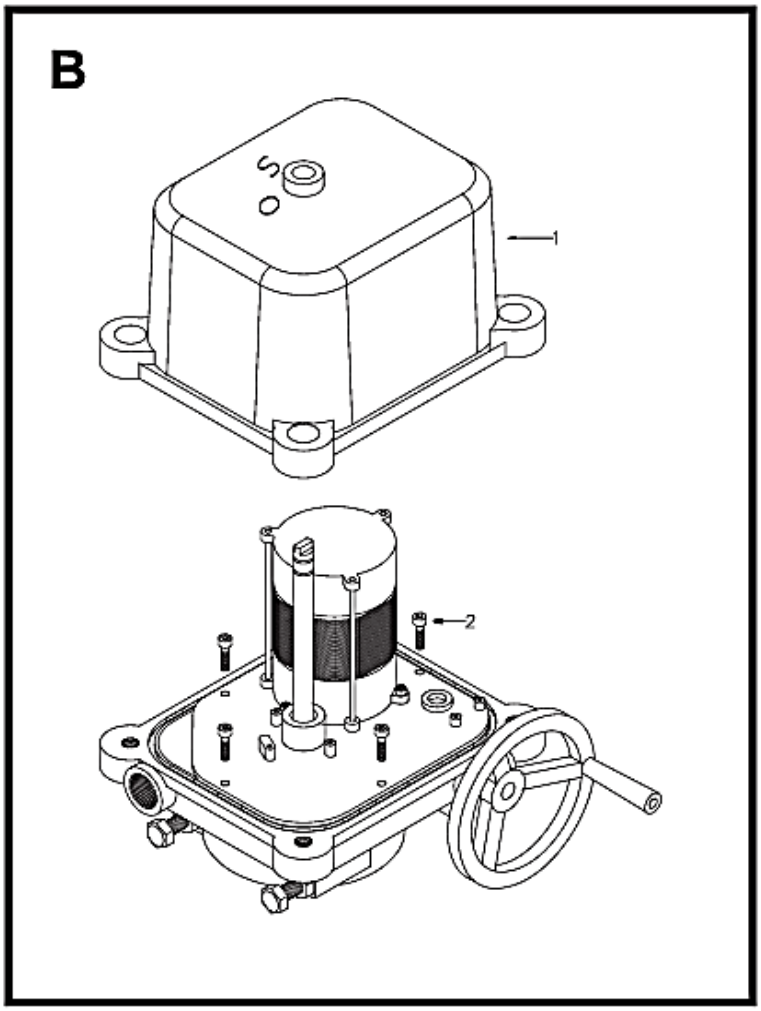
Procedures for disassembling electric actuator



Drawing A

Step 1:
Use a flathead screwdriver to carefully pry off the position indicator (see Drawing A, Item 1) and the black dust cover (see Drawing A, Item 2). Remove both the top position indicator and dust cover.

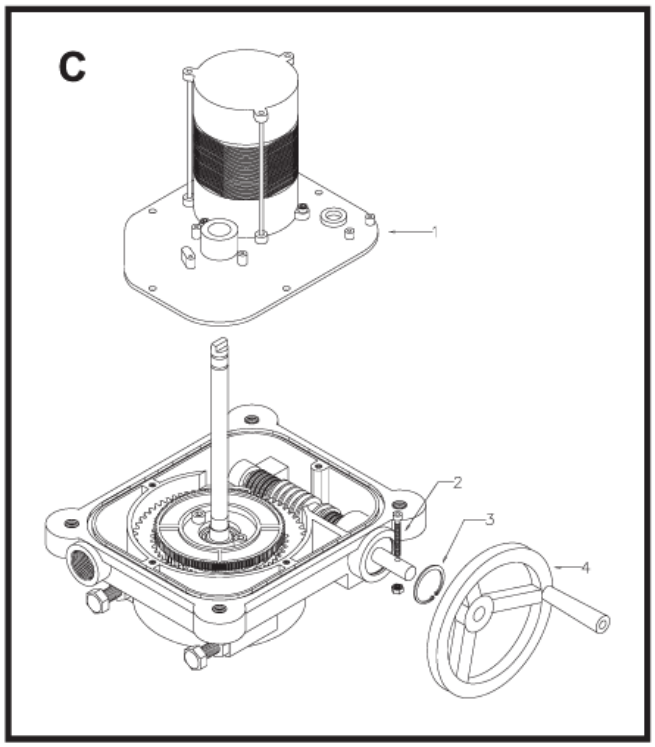
Step 2:
Use a hex wrench to loosen and remove the screw (see Drawing A, Item 3).



Drawing B

Step 1:
Remove the cover by lifting it vertically (see Drawing B, Item 1). Then use a hex wrench to loosen and remove the screws (see Drawing B, Item 2).

Procedures for disassembling electric actuator



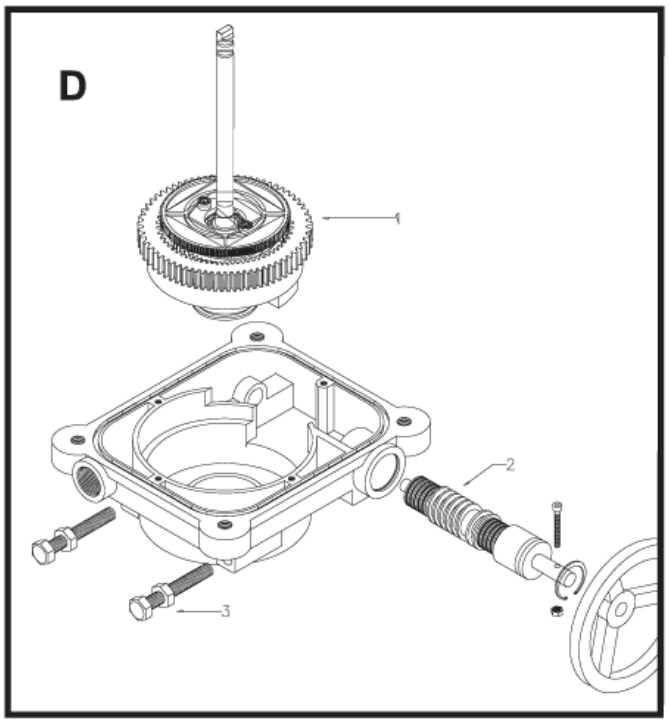
Drawing C.

Step 1: Remove motor and fixed plate (Left Dwg C No. 1) in an upward direction.

Step 2: Use a hexagonal head wrench to loosen the fixed screw of the handwheel (Left Dwg C No. 2).

Step 3: Pull out the handwheel (Left Dwg C No. 4).

Step 4: Remove the retaining ring using a C-shaped clamp (Left Dwg C No. 3).



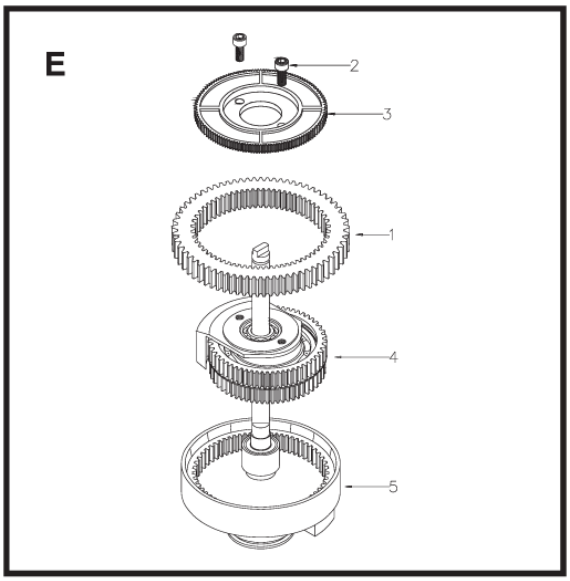
Drawing D.

Step 1: Pull out the gear set (Left Dwg D No. 1) in an upward direction.

Step 2: Pull out the worm gear (Left Dwg D No. 2).

Step 3: Remove the positioning screw (Left Dwg D No. 3) using a spanner or wrench.

Procedures for disassembling electric actuator

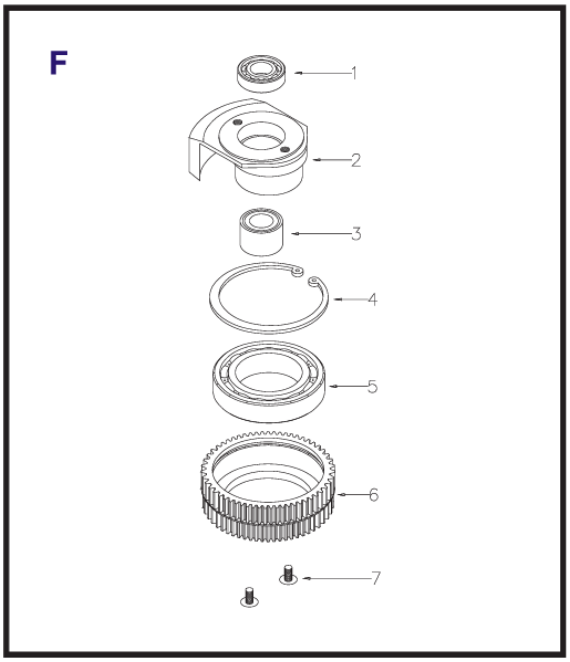


Drawing E. Disassembly gear sets.

Step 1: Use a hexagonal head wrench to loosen two screws (Left Dwg E No. 2).

Step 2: Pull out the gear (Left Dwg E No. 3).

Step 3: Pull out the gear (Left Dwg E No. 1) and separate the gear sets (Left Dwg E No. 4 and No. 5).

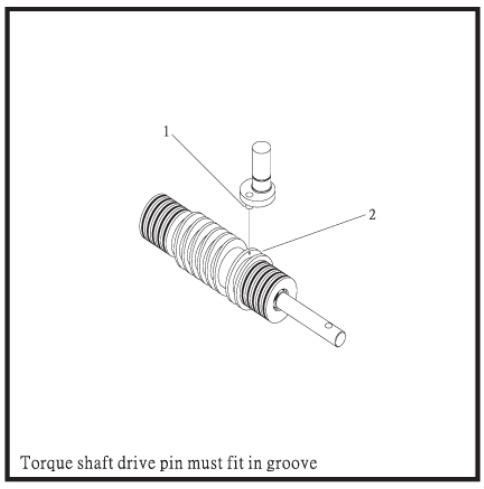


Drawing F. Disassembly gear sets (Refer to upper left Dwg E No. 4).

Step 1: Remove two screws (Left Dwg F No. 7) using a Phillips screwdriver, then pull out the gear (Left Dwg F No. 2).

Step 2: Use a C-shaped clamp to remove the retaining ring (Left Dwg F No. 4), then separate the bearing (Left Dwg F No. 5) and gear (Left Dwg F No. 6).

Step 3: Separate the gear (Left Dwg F No. 2), bearing (Left Dwg F No. 1), and bearing (Left Dwg F No. 3).



Reassembly of the electric actuator must be carried out in the reverse order of disassembly.
Special notice: Ensure the torque shaft drive pin is properly seated in the groove.