

MULTI – TURN ACTUATOR OPERATION & MAINTENANCE MANUAL

for TM - 3, 6, 12



enerotork

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⚠ CAUTIONS prior to installation

<p>*Connect power to space heaters if actuators are to be stored in a damp place for long period prior to installation.</p> <p>*Check name plate and confirm the actuator have been provided as described in the specification.</p> <p>*Tighten cable gland to prevent rain water infiltration.</p> <p>*Do electrical wiring in accordance with wiring diagram. Incorrect wiring may cause damages to actuator and/or valve.</p> <p>*Connect power leads(R, S, T) correctly to the motor terminal(U, V, W)</p>	<p>*Do setting and trial operation after bringing actuator manually to the intermediate position.</p> <p>*Close tightly switch cover and terminal cover after wiring, adjusting and setting. Loose fastening of the cover bolts may cause rain water infiltration.(Check and clean the mating faces and V-packings before closing the covers)</p> <p>*Do not manually operate actuator with devices other than installed handwheel. Using additive force devices(bars, wrenches or the like) on the handwheel or change lever may cause personal injury and/or damage to the actuator or valve</p> <p>*Avoid outdoor wiring works in the rain.</p>
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© **Prior to disassembling**, adjusting and/or changing the part(s) or the sub-assembly of actuator, consult factory first.

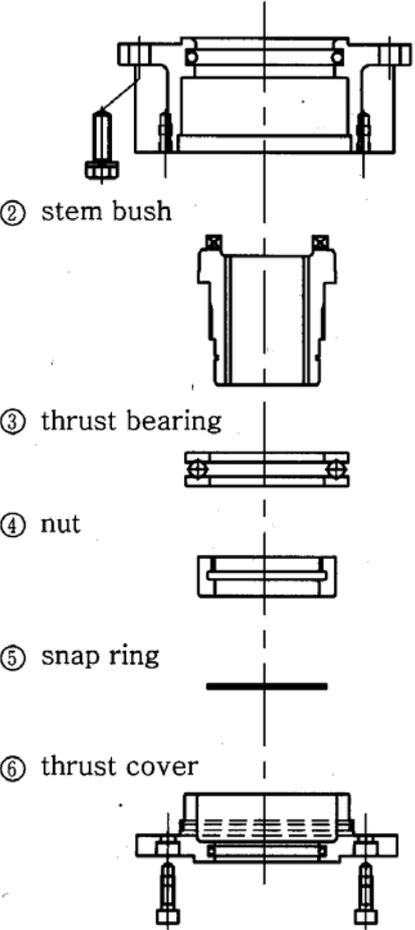
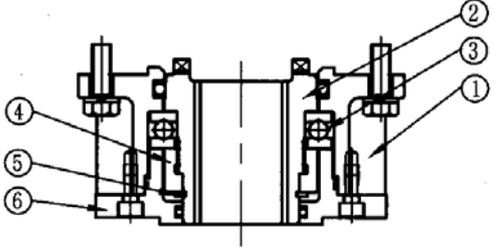
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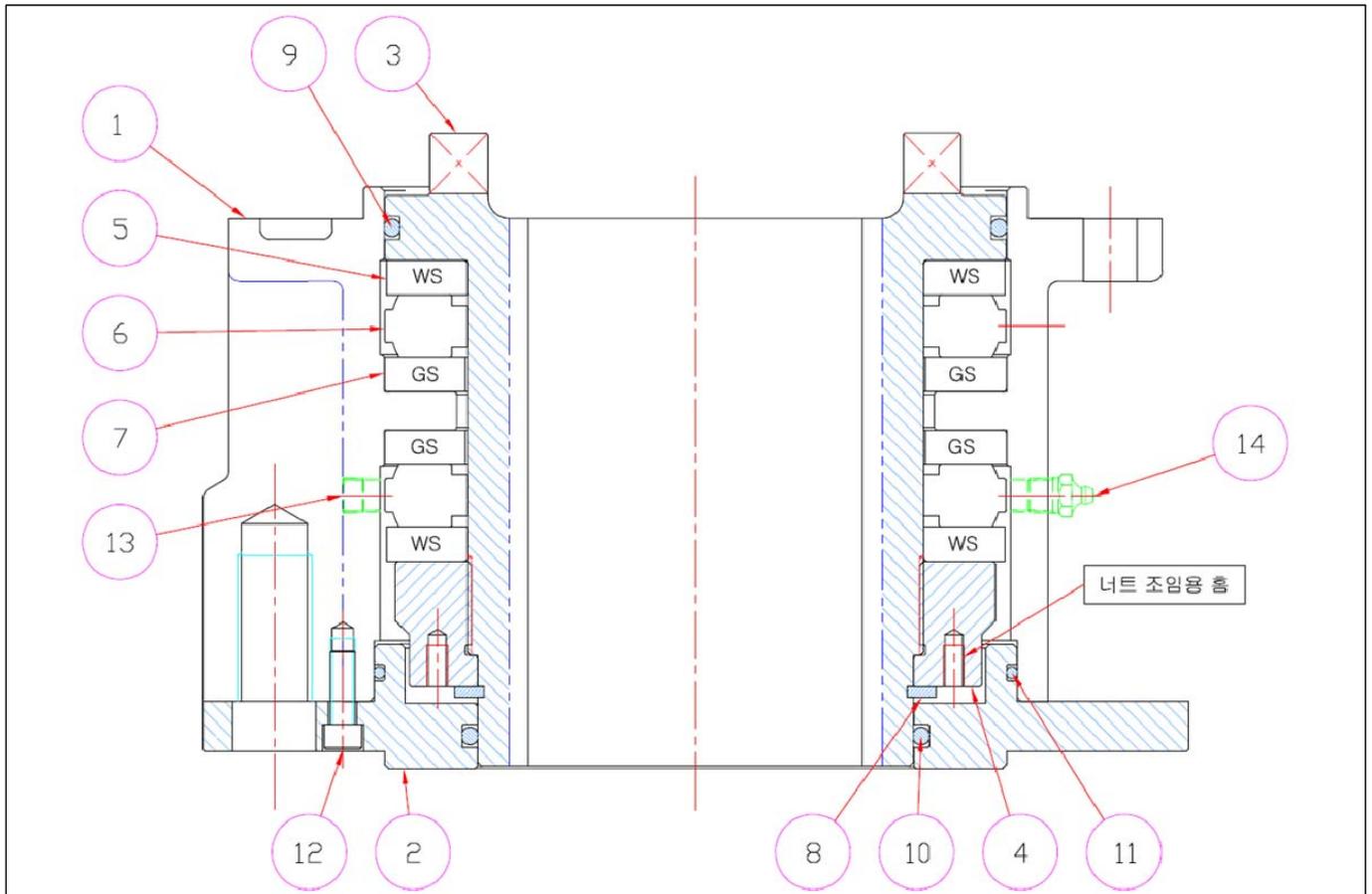
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1. Mounting on the valve (damper)

1-1 Disassembly and assembly of thrust unit (Non-Rising type)

<p>Fig. 1 After disassembled</p> <p>① thrust base</p>  <p>② stem bush</p> <p>③ thrust bearing</p> <p>④ nut</p> <p>⑤ snap ring</p> <p>⑥ thrust cover</p>	<p>Fig. 2 After assembled</p>  <ul style="list-style-type: none">* Grease the machined stem bush②, especially the O-ring contact surface and inner wall.* Grease the thrust bearing③ and insert it into stem bush②.* Fix the nut④ to stem bush, check the snap-ring groove and assemble snap-ring⑤.* Insert the assembled stem bush(②+③+④+⑤) into thrust base①.* Grease the thrust cover⑥ and assemble it.
<p>*CAUTION : KEEP PROCEDURE ABOVE & KEEP ALL THE PARTS CLEAN. FOREIGN OJECTS INSIDE MAY CAUSE DAMAGE TO BEARING, O-RING & OTHER PARTS.</p>	

1-2 Disassembly and assembly of thrust unit (Rising type)



NO	CONTENTS	CAUTION
1	Clean the parts(①②③④) and check the bearing components.	Check that there are no foreign objects. Configuration of bearing : shaft washer(WS)+roller+housing washer(GS)
2	Assemble bearing(⑦⑥⑤) into thrust base(①) as shown in the figure	※Please attention bearing sequence (GS⑦→roller⑥→WS⑤) Apply heavy duty grease(EP#2) to bearing
3	Assemble o-ring(⑨) into stem bush(③).	Apply heavy duty grease(EP#2) to o-ring joint
4	Assemble stem bush(③) into thrust base(①)	Be careful not to damage the o-ring
5	After flip the sub-assembly of thrust base(①), assemble bearing(⑦⑥⑤) in order	※Please attention bearing sequence (GS⑦→roller⑥→WS⑤) Apply heavy duty grease(EP#2) to bearing
6	When assembling stem bush nut(④), screw it until snap-ring(⑧) groove could be exposed	It can more easily be screwed by using a hole for joint of stem bush nut
7	Assemble snap-ring(⑧) into groove	Please make sure that operate smoothly by rotating the stem bush
8	Assemble o-ring(⑩⑪) on inside and outside of the thrust cover(②)	Apply heavy duty grease(EP#2) to o-ring joint
9	After assembling thrust cover(②) into thrust-base(①), fasten with two wrench bolt(⑫)	Be careful not to damage the o-ring
10	If you need grease filling later, loose the plug(⑬), and fill with grease into the grease-nipple(⑭) using a grease gun	

1-3 Mounting on the valve (damper)

- 1) Check the diameter & depth of pilot and p.c.d of valve flange and diameter of valve stem.
- 2) Apply grease to stem and stem bush(inside).

*Grease to be used: general purpose heavy duty grease.

- 3) Mount the thrust unit on the flange of valve and fasten the bolts. (Fig. 3)
- 4) Lift actuator body using eye-bolt and mount it on the thrust unit and fasten the bolts. (Fig. 4)

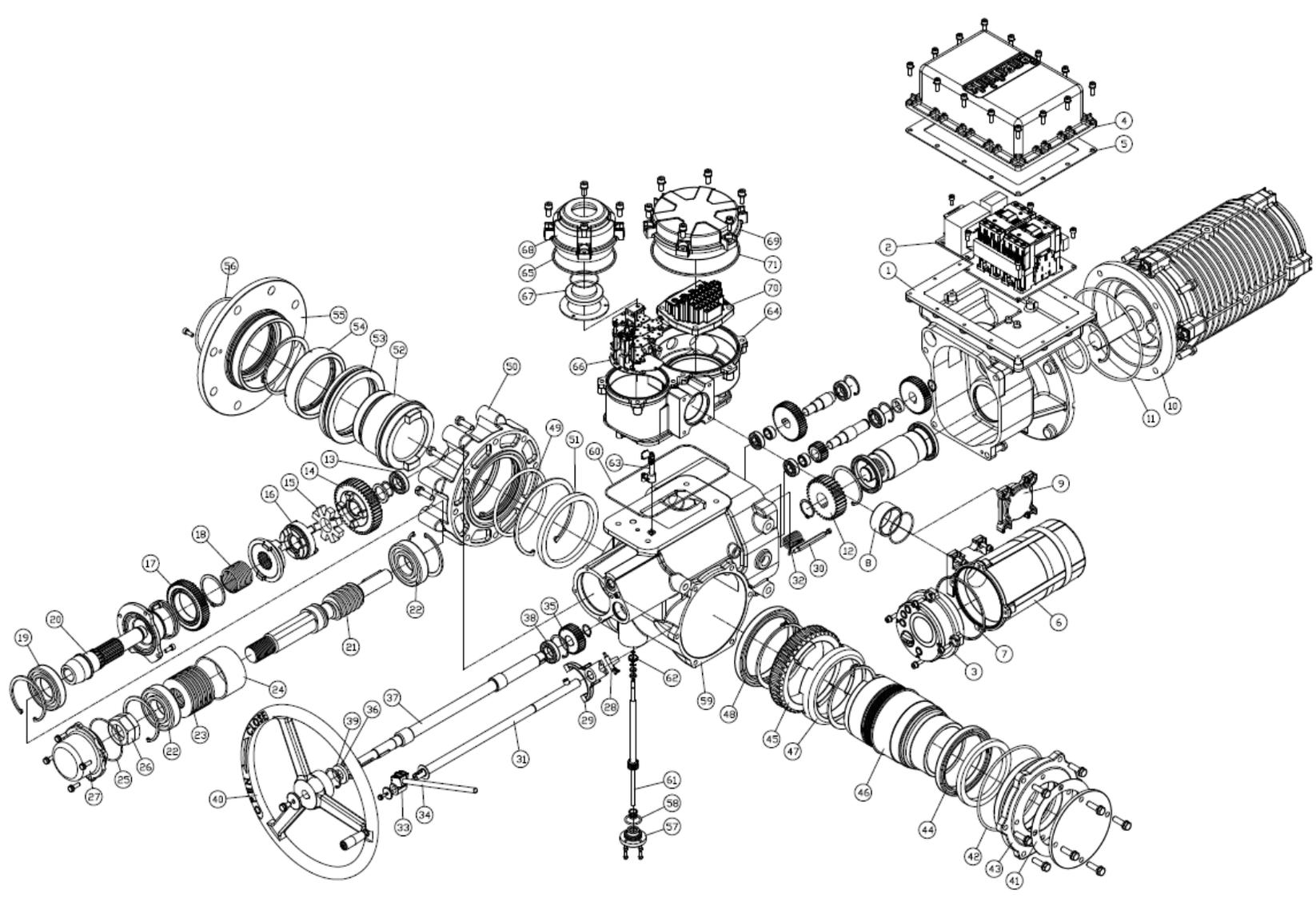
Fig. 3



Fig. 4

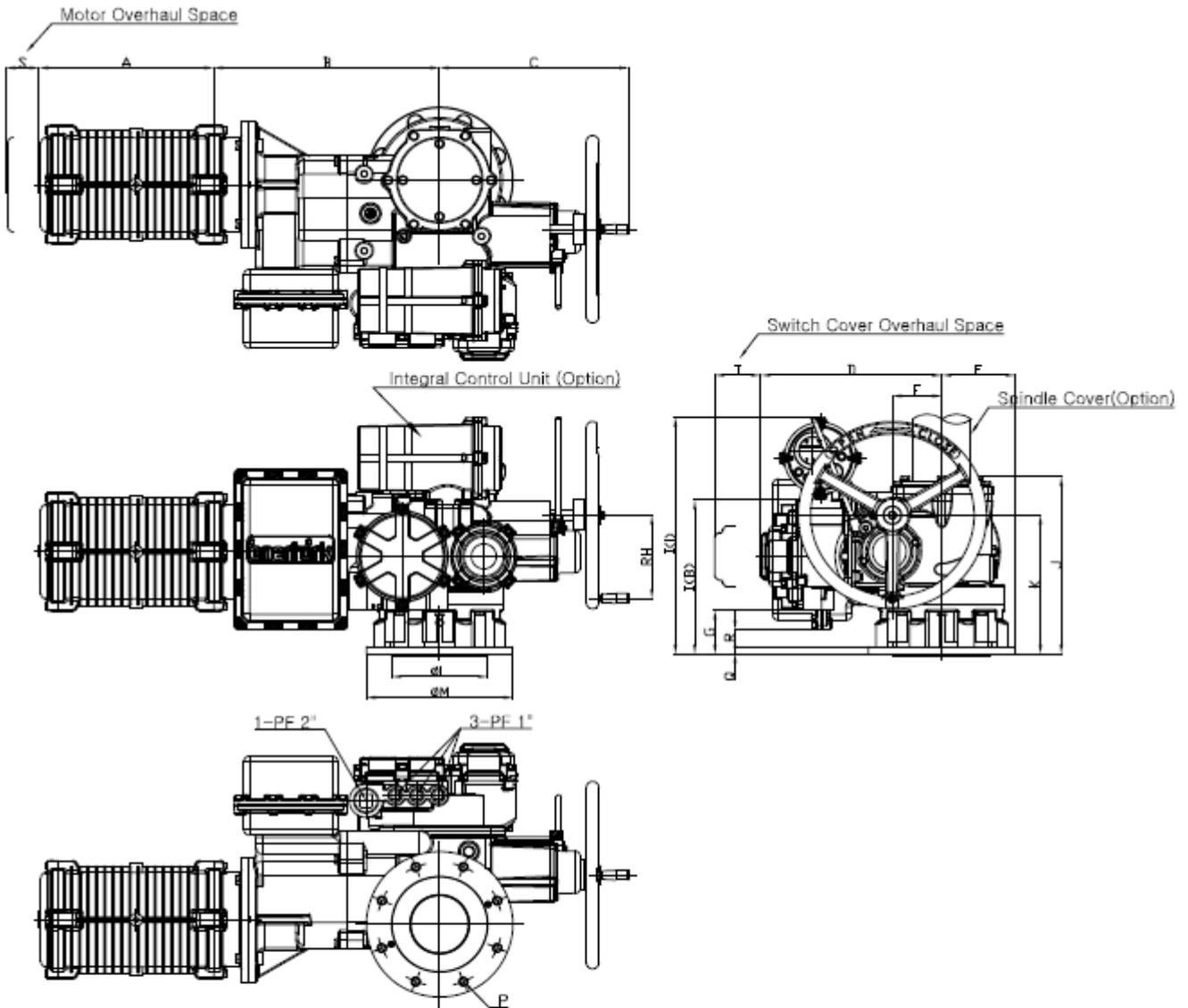


2. Configuration of TM-3, 6, 12



No.	Description
1	Motor Mount Flange
2	Integral Unit
3	Operating Cover
4	Mount Flange Cover
5	Gasket
6	Integral Unit Case
7	V-ring
8	Collar
9	Common Case Cover
10	Motor
11	O-ring
12	Gear 'A'
13	Bearing
14	Gear 'B'
15	Middle Rubber
16	Clutch
17	Manual Gear 'D'
18	Clutch Spring A
19	Bearing
20	'B' Gear Boss
21	Worm
22	Bearing
23	Torque Spring
24	Collar
25	O-ring
26	Power Lock
27	Cover 'B'
28	Lock Lever
29	Shifter
30	Spring Holder
31	Change Shaft
32	Torton Spring
33	Change Lever Boss
34	Change Lever
35	Manual Gear 'A'
36	Bearing
37	Handle Shaft
38	Bearing
39	Oil-seal
40	Hand Wheel
41	Gasket
42	O-ring
43	Bracket
44	Bearing
45	Worm Wheel
46	Sleeve
47	Clutch
48	Bearing
49	O-ring
50	Thrust Base
51	Oil Seal
52	Stem Bush
53	Thrust Ball Bearing
54	Lock Nut
55	Thrust B-Cover
56	O-ring
57	Limit Shaft Cover
58	O-ring
59	Gear Case
60	O-ring
61	Limit Shaft
62	Limit Gear
63	Torque Shaft
64	Common Case
65	V-ring
66	Switch Unit Ass'y
67	Indicator Cap
68	Switch Cover
69	Terminal Cover
70	Terminal
71	V-ring

3. Layout of TM-3, 6, 12



모델	A	B	C	D	E	F	G	H	I(A)	I(B)	J	K
TM-3	500	456	452	432	175	118	104	200	572	373	422	333
TM-6	521	540	593	519	219	178	182	250	725	450	573	335
TM-12	521	645	594	611	265	228	260	315	765	528	723	577

*I(B) 와 I(A)는 Basic과 Integral type을 의미함.

모델	L	M	N	O	P	Q	R	ISO NO.	S	T
TM-3	230	350	5	298	8-M20	17	40	F30	115	100
TM-6	260	415	5	356	8-M30	20	55	F35	115	100
TM-12	300	475	8	406	8-M36	24	70	F40	115	100

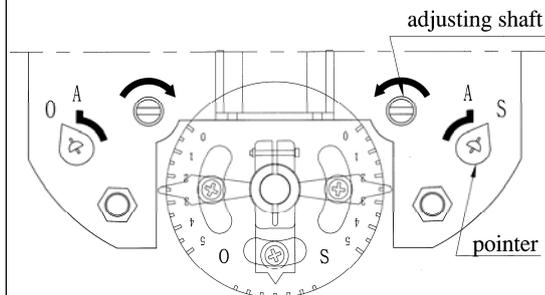
4. Trial operation

4-1 Wiring

- 1) Take off the terminal cover and switch cover from the actuator.
- 2) Connect all the wires to the terminal block referring to the wiring diagram attached to the back of the terminal cover.
- 3) Make sure the sealing of the wire entries.
- 4) Check the direction of rotation pressing the open button. If the direction is opposite, change 2 wires each other out of 3 power wires. **Do checking at the mid-travel of actuator. Torque limit switch may not work at the full open position.**
- 5) After the completion of wiring, clean the mating faces, put on the covers and fasten the cover bolts tightly.

4-2 Setting of the limit switch

* Close Limit Setting



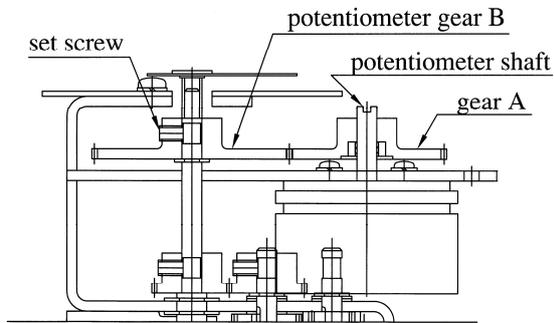
S : Close Limit switch

O : Open Limit switch

- 1) Manually Close the valve(damper) completely. if power is available, for convenience sake, power operate the valve near to full close position and manually close the valve completely.
 - 2) Manually turn the finger of mechanical indicator to Zero point.
 - 3) Press slightly and turn 'S' adjusting shaft with ⊖ screwdriver in the direction of arrow (CCW). Then, the pointer turns in the reverse direction (CW) at every 90 degree.
 - 4) When the pointer comes reach  turn 'S' adjusting shaft very slowly until the pointer reaches  and you hear 'clik' sound. Then, stop turning immediately. Now, close limit setting has been completed
- ※ If the pointer overrun  , repeat the procedure 3) and 4).
- 5) To verify Limit switch actuation, shift change lever to manual operation mode, rotate handwheel to 'open direction' by 1/2 to 1 turn and make sure that pointer move ccw to  And rotate handwheel to 'close direction' by 1/2 to 1 turn and make sure that the pointer move cw to 
 - 6) The same procedure shall be applied for open limit setting.

4-3 Setting the potentiometer and transmitter(R/I converter) - optional parts

Fig. 7



- 1) Fully close valve.
- 2) Connect circuit tester (DC, mA) to, referring wiring diagram attached inside, signal output terminal (+, -) and ;
 - > in case tester reads the value between 3.4 and 4.6mA, set zero point of transmitter or,
 - > in case tester reads the value outside 3.4 ~ 4.6mA, turn potentiometer shaft with ⊖ screwdriver until tester reads value between 3.4 ~ 4.6mA.

*When turning potentiometer shaft with ⊖ screwdriver, tightly grip gear A with another hand so that it should not rotate.

- 3) Set zero point of transmitter, fully open valve and set span. Repeat this procedure 2 ~ 3 times for precise setting.

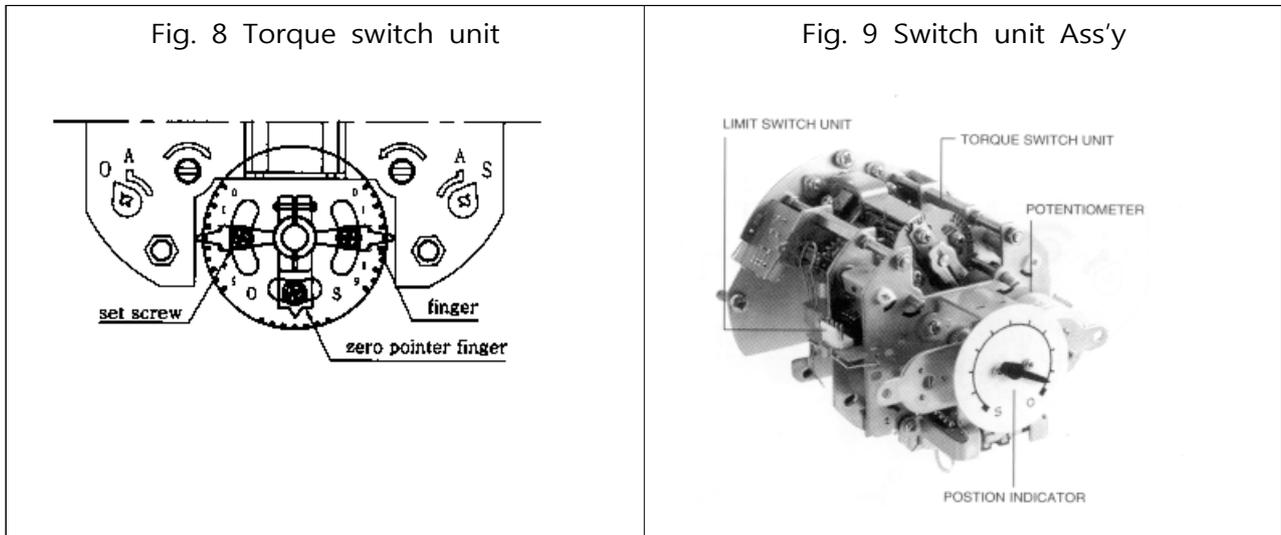
4-4 Trial operation (manual & power operation)

- 1) Push the change lever forward to its maximum position and release the hold change lever returns to its original position and manual operation is ready.
- 2) Confirm the 'direction mark' on the rim of handwheel and turn the handwheel to the direction desired.

*** CAUTION : USING CHEATER BAR OR THE LIKE ON HANDWHEEL MAY CAUSE DAMAGE TO THE ACTUATOR AND/OR VALVE.**

- 3) For power operation, push either open button or close button. The operation mode is automatically changed from manual to power. Repeat this 3~4 times to both directions.

4-5 Setting of the torque switch



- 1) Torque switch is set at the specified value by customer and 'red-marked' on that position of the dial at factory before shipment. No necessity of site adjustment.
- 2) If readjustment at site is required by some reason, loosen the set screw with ⊕ screw driver, move the finger(s) to the desired position on the dial and fasten the set screw (Fig. 8)

*** CAUTION : RESET IN THE ZONE OVER THE RED-MARK WITHOUT CONSULTING FACTORY MAY CAUSE DAMAGE TO THE VALVE AND/OR ACTUATOR.**

4-6 Disassembly and reassembly of the switch unit

- 1) Do not disassemble the switch unit without consulting factory.
*** CAUTION : TORQUE SETTING VALUE MAY CHANGE AND CAUSE TROUBLE.**
- 2) In case site-disassembly is a must, adjust the "zero pointer finger", by power operation, to be positioned at the centre between "O" and "S" of dial and disassemble.
Do the same for reassembly to keep the torque value originally set unchanged.

5. Storage

- Storing actuators indoors is preferable. If outdoor storage is unavoidable for long, store actuators on a raised platform under proper shelter or cover and connect space heaters.

(A dry agent pack is put inside switch unit, Take it out before trial operation)

6. Trouble * Shooting

Trouble	Probable Cause	Remedy
Motor doesn't move	<ul style="list-style-type: none"> *Power off *Voltage doesn't suit motor *Overload by antiphase run (overload relay worked) 	<ul style="list-style-type: none"> *Check power input *Compare input voltage with name plate rating *Manually run actuator to mid position and change the phases(reset overload relay)
Motor stops during operation	<ul style="list-style-type: none"> *Torque switch tripped by overload *EOCR tripped *Improperly lubricated valve stem *Foreign object inside valve *Foreign object on the surface of valve stem (in case of threaded stem) *Valve gland packing too tight 	<ul style="list-style-type: none"> *Check and remove cause of overload. If torque setting value increase needed, consult factory *Readjust EOCR setting value *Clean stem and re-grease *Remove foreign object *Disassemble and check valve *Loosen gland packing and apply grease
Motor runs, but valve doesn't move (indicator works)	<ul style="list-style-type: none"> *Stem bush thread worn (caused by incorrect machining) 	<ul style="list-style-type: none"> *Change stem bush
Limit switch fails to stop motor	<ul style="list-style-type: none"> *Motor runs reversely (no reverse run with integral type) *Limit switch mis-set *Magnet relay doesn't work *Control wire grounded *Micro switch doesn't work 	<ul style="list-style-type: none"> *Manually run actuator to intermediate position and change 2 lead wires out of 3 *Reset *Change magnet relay *Check resistance *Change micro switch & PCB set
Torque switch fails to stop motor	<ul style="list-style-type: none"> *Motor runs reversely (no reverse run with integral type) *Control wire grounded *Micro switch doesn't work 	<ul style="list-style-type: none"> *Manually run actuator to intermediate position and change 2 lead wires out of 3 *Check resistance *Change micro switch & PCB set

7. Maintenance

PRECAUTIONS !

- * After trial operation, check damages on paint and touch-up, if necessary.
- * Before fastening, check V-rings at the covers of switch unit and terminal unit are rightly placed.
- * Use suitable cable gland and fasten tightly to secure IP68 class water tightness and/or flame proofness.

7-1 Lubrication

- 1) TM actuators are filled with Lithium soap grease as shown in the Table. 1 below.
No renewal of grease is necessary for normal operation.
- 2) In case actuators are disassembled for periodic inspection or repair, refill grease as per Table. 1.
- 3) Lithium soap grease of different brands can be used mixed if the chemical bases of them are same each other. Avoid mixing of different bases.

Table. 1. Grease quantity for each model

Model	TM-3	TM-6	TM-12
Grease recommended	SHELL CO : Albania E.P RO , Isu Chem. : TOTAL:MULTIS EPO Ssangyong Oil Ref. : Asaring Grease EPO		
Quantity (kg)	13	27.5	52

- 4) For the threaded part of rising stem valve, apply general purpose heavy duty grease periodically to prevent stem bush from wear

7-2 Others

- For a seldom use valve, periodic test operation of actuator is recommended to secure satisfactory actuation
(E.g. : several times a month)

8. Typical wiring diagram

- Refer to homepage drawing (Frequently updated)