

ELECTRONIC CONTROL ACTUATOR

“ **Nucom Series** ”

ROTARY TYPE

Nucom-10NS

Nucom-10NM

Nucom-10NL

Nucom-10NL-100

Nucom-10NL-150

Nucom-10NL-200

OPERATION MANUAL

Koei Industry Co., Ltd.

FOR YOUR SAFETY

In order for better and safety use of the product for a long period, please observe this “WARNING and CAUTION” carefully.

Here are the specification and operation manual for the product to prevent suffering injury or loss by accidents.

The contents are divided into “WARNING” and “CAUTION” for different degree of risks.

Please strictly observe them, as both of them are very important for your safety.



WARNING: Improper handling of the product disregarding the notes under this mark may cause injury or death to a man.



CAUTION: Improper handling of the product disregarding the notes under this mark may cause injury or material loss.



WARNING

- * This product is not of explosion-proof.
Do not use it in the environment with flammable gas (gasoline etc.) or corrosive gas.
- * Do not dismantle the actuator from the valve during power operation.
- * Do not make wiring work when power is being supplied.



CAUTION

- * Do not drop the product or give a shock to the product, for it may cause defects to the product.
- * Do not get on the actuator, or it may cause defects or an accident.
- * Do not make wiring work in the rain or in splashing water.



CONTENTS



1. GENERAL
2. CONFIGURATION
 - 2-1 Configuration and names of parts
 - 2-2 Dimensions
3. SPECIFICATION
4. OPERATION PRINCIPLE
 - 4-1 Operation principle
 - 4-2 Block diagram
5. INSTALLATION
6. WIRING
 - 6-1 Cables
 - 6-2 Water prevention
7. ASSEMBLY WITH A VALVE
 - 7-1 Names of parts
 - 7-2 Assembly procedures
8. POWER AND SIGNALS
 - 8-1 Power source
 - 8-2 Fuse and breaker
 - 8-3 Input signals
 - 8-4 Wiring diagram
9. CONTROL PACK (Module)
 - 9-1 Names of parts
 - 9-2 Direction mode
 - 9-3 Mode selection during signal interruption
 - 9-4 Sensitivity volume
 - 9-5 ZERO / SPAN adjustment
10. OPERATION
 - 10-1 Manual operation
 - 10-2 Power operation
11. ADJUSTMENT
 - 11-1 Potentiometer and limit switches
 - 11-2 Mechanical stop
12. TROUBLE AND SOLUTION
13. MAINTENANCE
14. OPTIONAL EXTRAS

1. GENERAL

This is a quarter turn electronic control actuator series.

The modulated actuators are operated with 4~20mA DC(or 1~5V DC) direct signals from a computer.

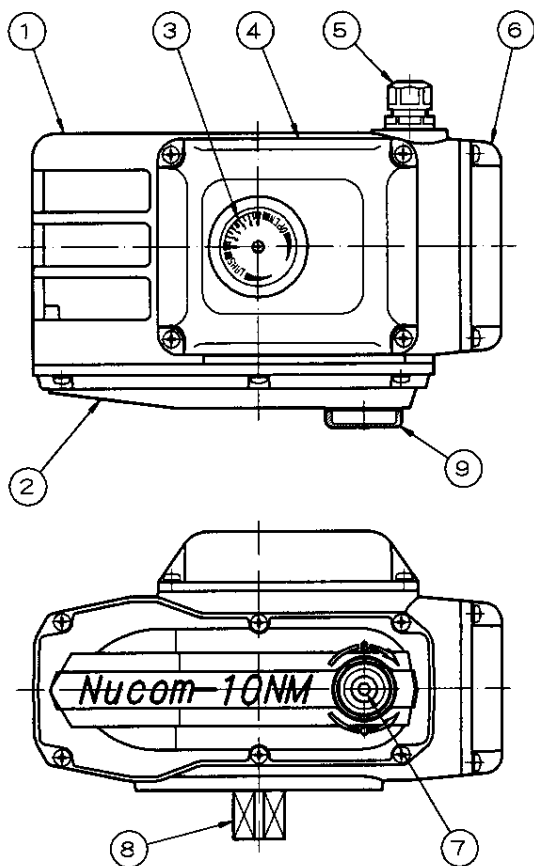
The precision (control resolution) of 1/250 is far higher than those of conventional pneumatic systems.

∞ FEATURES

1. High control resolution of more than 1/250 with the original servo control pack.
2. Compact design with worm drive and robust aluminum die cast body.
3. Easy direction mode setting (Direct or reverse).
4. Easy mode selection (open, close or stop) during signal interruption.
5. Plural protections (thermal motor protector etc.).
6. Water protection: NEMA-4X (to IP-66).

2. CONFIGURATION

2-1 Configuration and names of parts

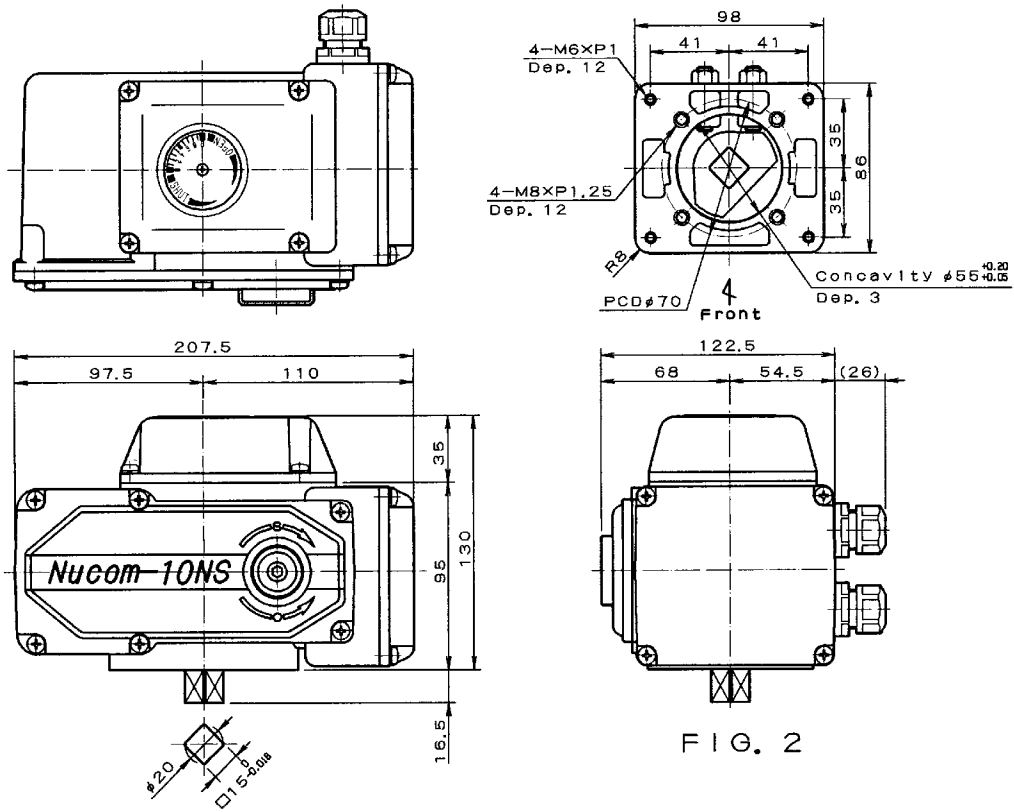


No.	NAME
1	NEMA 4X Housing
2	Gear Cover
3	Valve Position Indicator
4	Valve Switch/Pot. Cover
5	Conduit
6	Terminal Strip Cover
7	Manual Over Ride Socket
8	Male Output Shaft
9	O/R Socket Dust Cover

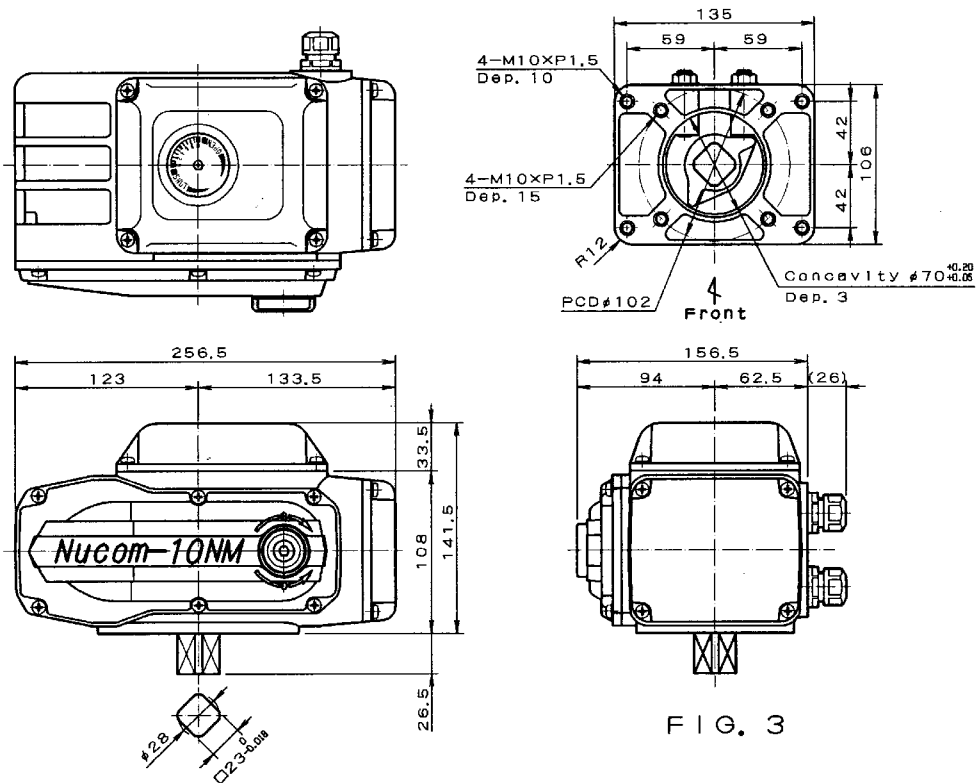
FIG. 1

2-2 Nucom-10NS, 10NM, 10NL external drawings

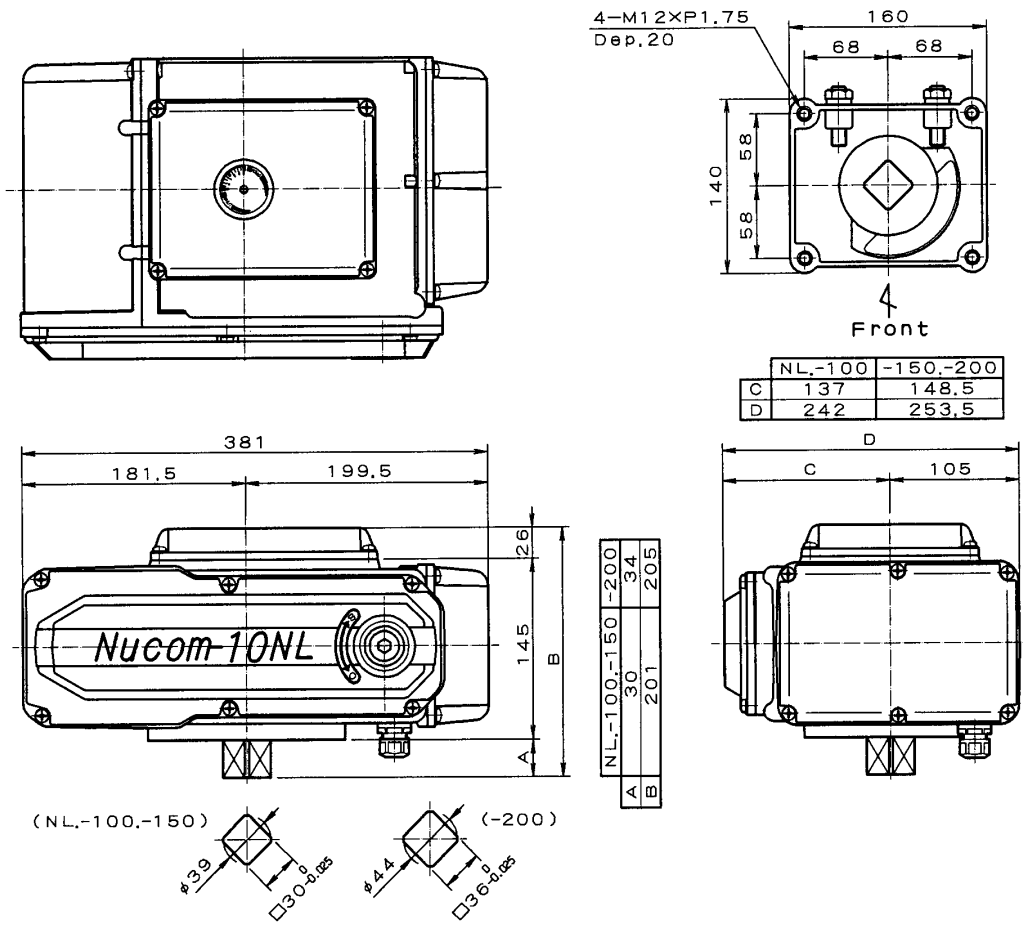
<Nucom-10NS>



<Nucom-10NM>



<Nucom-10NL, -100, -150, -200>



3. FUNCTIONAL SPECIFICATION

ITEM	MODEL	Nucom-10NS		Nucom-10NM	
		STD	SPECIAL	STD	SPECIAL
RATED POWER		AC100·110·115·120V±10% (50/60 Hz) AC200·220·230·240V±10% (50/60 Hz)			
INPUT SIGNAL		4~20mA·DC 4~12/12~20mA·DC		(Standard Specification) (Optional Specification)	
OUTPUT TORQUE		49N·m (5kgf·m)	98 N·m (10 kgf·m)	196N·m (20kgf·m)	392 N·m (40 kgf·m)
OPERATION SPEED		15sec(50HZ)	30sec(50HZ)	15sec(50HZ)	30sec(50HZ)
		12.5sec(60HZ)	25sec(60HZ)	12.5sec(60HZ)	25sec(60HZ)
TRAVEL ANGLE		0~90°			
RESOLUTION		Over 1/250			
DEAD ZONE		Max. 0.5% F.S.			
LINEARITY		Max. 0.5% F.S.			
ACTION MODE		Direct or reverse action selectable			
MODE WHEN SIGNAL "OFF"		CLOSE/STOP/OPEN : selectable			
PROTECTION		OPEN/CLOSE limit switches OPEN/CLOSE mechanical stopper Motor thermal protector (120°C)			
AMBIENT TEMPERATURE		Ambient temperature within: -25~55°C			
RATED CURRENT	AC100V	0.65A		1.8A	
	AC110V	0.70A		2.0A	
	AC115V	0.60A		1.6A	
	AC120V	0.65A		1.8A	
	AC200V	0.35A		0.9A	
	AC220V	0.40A		1.0A	
	AC230V	0.30A		0.7A	
	AC240V	0.35A		0.9A	
MOTOR		20W Reversible		90W Reversible	
INSULATION GRADE		E Class			
RATED OPERATION TIME		Continuous			
POSITION DETECTOR		Potentiometer (Backlash revision type)			
OUTPUT SIGNAL		4~20mA·DC (Standard spec. Maximum load resistance 500 Ω) OPEN / CLOSE limit no-voltage output(Optional extra)			
INSULATION RESISTANCE		Between power terminal – case : 500V·DC / 100MΩ			
WITHSTAND VOLTAGE		Between power terminal – case : 1500V·AC / 1 minute			
SERVO CONTROL UNITS		Resin molded semi-conductors			
MANUAL OPERATION		Detachable crank handle (Standard accessory)			
WIRE INLET		G1/2 × 2 (Water-sealed conduit)			
ENCLOSURE PROTECTION		NEMA-4X (IP-66)			
EXPLOSION PROOF		Non explosion-proof			
MOUNTING ANGLE		360° all directions			
BODY MATERIAL		Diecast aluminum			
COATING		Munsel N-6			
WEIGHT		4.5kg		8.7kg	

ITEM	MODEL	Nucom-			
		10NL	10NL-100	10NL-150	10NL-200
RATED POWER	AC110·115·120V±10% (50/60 Hz) AC220·230·240V±10% (50/60 Hz)				
INPUT SIGNAL	4~20mA DC (Standard Specification) 4~12/12~20mA DC (Optional Specification)				
OUTPUT TORQUE	490N·m (50kgf·m)	980N·m (100kgf·m)	1470N·m (150kgf·m)	1960N·m (200kgf·m)	
OPERATION SPEED	15sec	30sec	45sec	60sec	
	12.5sec	25sec	37.5sec	50sec	
TRAVEL ANGLE	0~90°				
RESOLUTION	More than 1/250				
DEAD ZONE	Max. 0.5% F.S.				
LINEARITY	Max. 0.5% F.S.				
ACTION MODE	Direct or reverse action selectable				
MODE WHEN SIGNAL "OFF"	CLOSE/STOP/OPEN : selectable				
PROTECTION	OPEN/CLOSE limit switches OPEN/CLOSE mechanical stopper Motor thermal protector (120°C)				
AMBIENT TEMPERATURE	Ambient temperature within: -25~55°C				
RATED CURRENT	AC100V	2.4A	2.9A	3.4A	
	AC110V	2.6A	3.0A	3.5A	
	AC115V	2.2A	2.6A	3.2A	
	AC120V	2.4A	2.8A	3.4A	
	AC200V	1.2A	1.5A	1.8A	
	AC220V	1.4A	1.6A	1.9A	
	AC230V	1.1A	1.3A	1.6A	
	AC240V	1.2A	1.4A	1.7A	
MOTOR	100W Reversible				
INSULATION GRADE	E Class				
RATED OPERATION TIME	Continuous				
POSITION DETECTOR	Potentiometer (Backlash revision type)				
OUTPUT SIGNAL	4~20mA·DC (Standard spec. Maximum load resistance 500 Ω) OPEN / CLOSE limit no-voltage output(Optional extra)				
INSULATION RESISTANCE	Between power terminal – case : 500V·DC / 100MΩ				
WITHSTAND VOLTAGE	Between power terminal – case : 1500V·AC / 1 minute				
SERVO CONTROL UNITS	Resin molded semi-conductors				
MANUAL OPERATION	Detachable crank handle (Standard accessory)				
WIRE INLET	G1/2 × 2 (Water-sealed conduit)				
ENCLOSURE PROTECTION	NEMA-4X (IP-66)				
EXPLOSION PROOF	Non explosion-proof				
MOUNTING ANGLE	360° all directions				
BODY MATERIAL	Diecast aluminum				
COATING	Munsel N-6				
WEIGHT	21.3kg		22.0kg		

4. OPERATION PRINCIPLE

4-1 Operation principle

The system makes computation between input signals (4~20mA DC) and position signals, then turns the motor in direction to balance them, and stops the motor when they are balanced.

The motor torque is transmitted through the worm structure to the actuator shaft.

Rotation direction (direct or reverse) is selectable at the setting switch.

The backlash revision type potentiometer detects and feedbacks the shaft position to the control pack.

The system always controls shaft position at the correlated rates with input signals.

< BLOCK DIAGRAM >

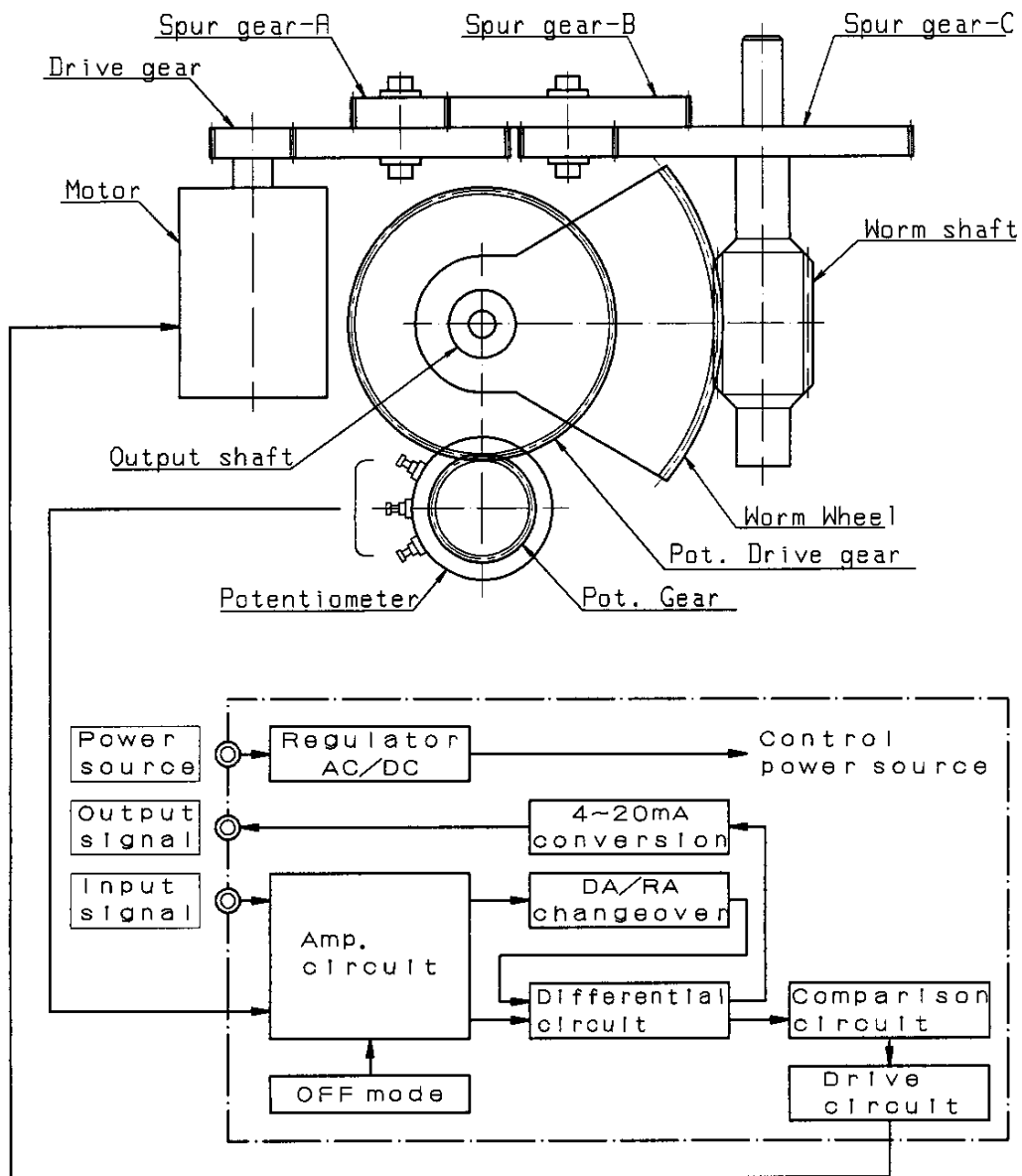


FIG. 5



CAUTION ON ENVIRONMENTAL INSTALLATION CONDITIONS

5.INSTALLATION

5-1 Installation

⊗ Cautions on indoor installation

- * Avoid a hazardous place, as this is not an explosion-proof type.
- * Cover whole the unit, when installing the unit in a place with water or material splashes.
- * It is recommendable to reserve a space for manual maintenance work.
(depends on installation conditions.)

⊗ Caution on outdoor installation

- * To avoid rainwater or direct sunlight, it is necessary to cover or shade whole the unit.
(This concerns temperature rise in the unit, and anti-climate property of seals used.)
- * It is recommendable to reserve a space for manual maintenance work.
(depends on installation conditions.)

ACTUATOR SURFACE MATERIALS AND TREATMENT

PART \ MODEL	Nucom-10NS	Nucom-10NM	Nucom-10NL
BODY BASE	Die cast Aluminum Oxidation treatment Electrostatic coating		
DRIVE UNIT COVER	Die cast Aluminum Oxidation treatment Electrostatic coating		
ELECTRO UNIT COVER	Die cast Aluminum Oxidation treatment Electrostatic coating		
CONTROL UNIT COVER	Die cast Aluminum Oxidation treatment Electrostatic coating		
OUTPUT SHAFT	SUS 303		

5-2 AMBIENT TEMPERATURE / FLUID TEMPERATURE

⊗ Ambient temperature

- * Ambient temperature range : $-25^{\circ}\text{C}\sim 55^{\circ}\text{C}$.
- * A space heater against unit-condensation is available at option.
- * For application beyond the specified range, consult our Sales Dept.

⊗ Fluid temperature

- * For high temperature fluid, that may occasionally overheat the unit, radiation type bracket and coupling are available at option.
- * Standard bracket and couplings : Fluid temperature max. 65°C
- * Radiation type bracket and couplings : Fluid temperature higher than 65°C
- * For application beyond the specified range, consult our Sales Dept.



CAUTION ON WIRING WORK

6. WIRING

6-1 Cables

⊗ Power cable

Use a $\Phi 9\sim 11$ mm (outside diameter) cable for the standard resin connector. (See FIG.6)

For customer connectors, use a proper size cable to match the connector preventing water ingress to the unit.

⊗ Signal cable

Use a sealed cable for signal wiring.

Do not make parallel wiring with power cable.

Note: For all connections use fork crimped-on terminals.

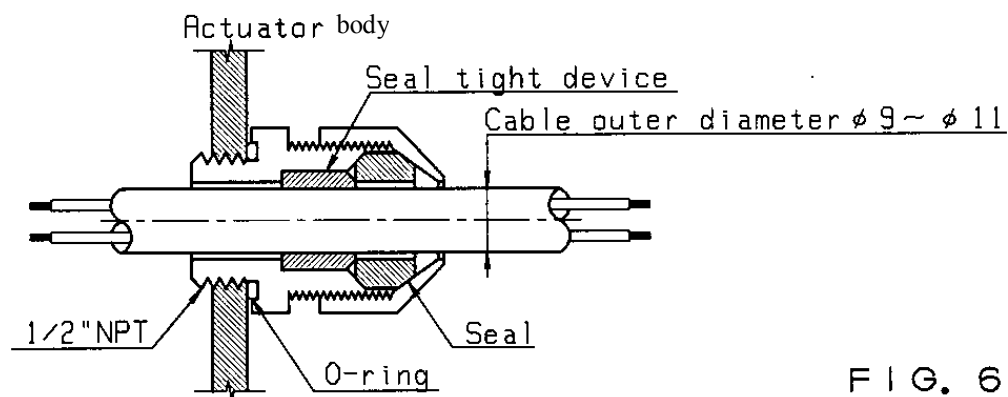


FIG. 6

6-2 Water prevention

Make sufficient water prevention if vinyl tubes or conduits are used. (See FIG.7)

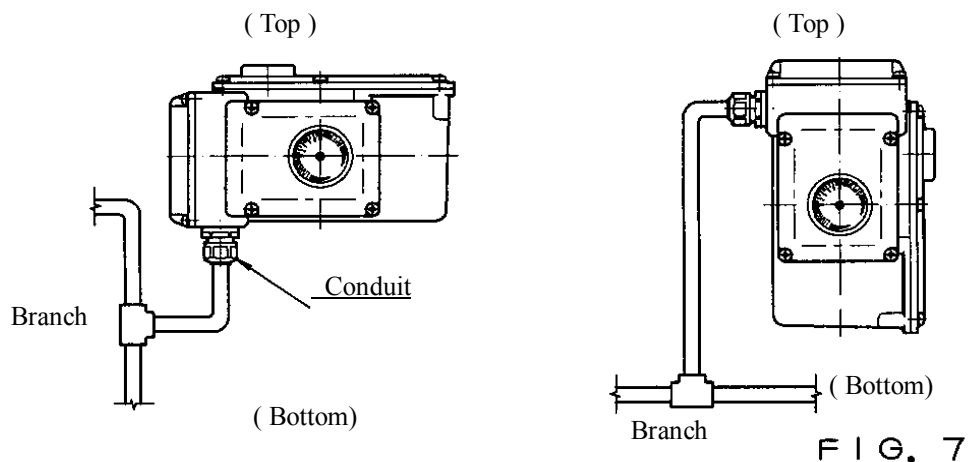


FIG. 7

Note: Conduit not supplied. Seal the cable tightly preventing moisture penetration.

 CAUTION ON ASSEMBLY WITH A VALVE

7. ASSEMBLY WITH A VALVE

7-1 Names of parts

The actuator is removable from a valve, so that it is very easy to replace either part in case of trouble.

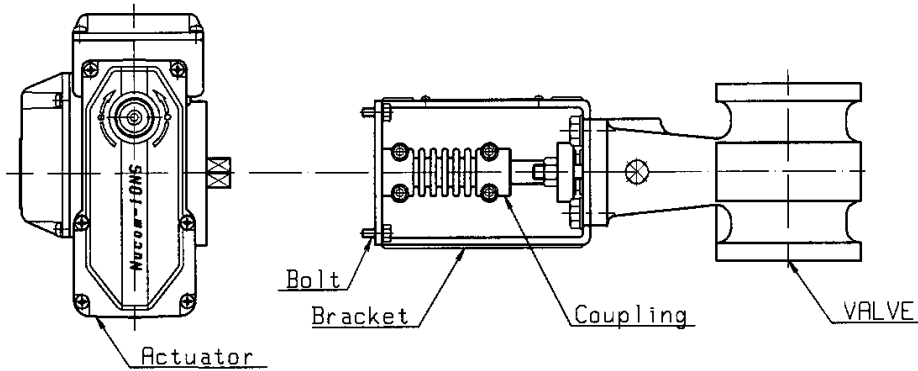


FIG. 8

7-2 Assembly procedure

A: For a valve that does not have a mechanical stop on close side

- A-1. Manually turn the valve and check if it is normal, and position it at full close.
(In case of a ball valve, position it at a full open.)
 - A-2. Bolt a bracket on the valve.
 - A-3. Tentatively bolt the actuator on the bracket.
 - A-4. Position the actuator at 0 % (close), then joint the output shaft and the valve stem with a coupling.
 - A-5. Secure the bolts.
 - A-6. Manually check that the actuator turns smoothly without eccentricity.
- The assembly is over. For disassembly, work to the contrary.

B: For a valve that has a mechanical stop on close side

- B-1. Check that the valve movement is normal, then position it at full close.
Be sure that the position is just inside the valve stop.

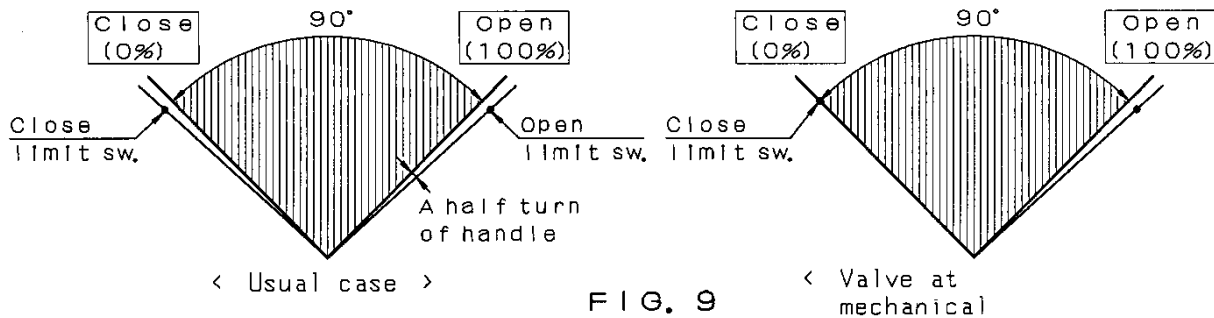


FIG. 9

B-2. Position the actuator at 0 % (full close), and set the actuator limit switch so as to work at 0 %.

(Note that the limit switch should normally be set to work at a half turn of manual handle past the full close of signal rate.) (See FIG.9)

B-3. Bolt a bracket on the valve.

B-4. Tentatively bolt the actuator on the bracket.

B-5. Position the actuator at 0% (close), then joint the actuator shaft and the valve stem with a coupling.

B-6. Secure the bolts.

B-7. Manually check that the actuator turns smoothly without eccentricity etc.

Confirm that the limit switch works at 0 % before the shaft touches at the stop.

(If the shaft touches at the valve stop before the limit switch would function, the actuator may be locked, and may overheat.

In such a case, the thermo protector will stop the motor, but the case may cause damages to the unit.)

8. POWER AND SIGNALS

8-1 Supply voltages

Standard	AC 110, 115, 120, 220, 230, 240V $\pm 10\%$ (50/60Hz)
Option	AC 24V, DC 24V $\pm 10\%$ (50/60Hz)

For other voltages than the above, refer to our Sales Dept.

8-2 Fuse and breaker

Recommendable fuse/breaker capacities

Model	Capacity of fuse/breaker	Motor capacity
Nucom-10NS	5A	20W
Nucom-10NM	7A	90W
Nucom-10NL	10A	100W

8-3 Input signals

Standard	4~20mA (or 1~5V) DC
	4~12mA (or 1~3V) DC
	12~20mA (or 3~5V) DC

For other signal rates, please refer to our Sales Dept.

8-4 Wiring diagram

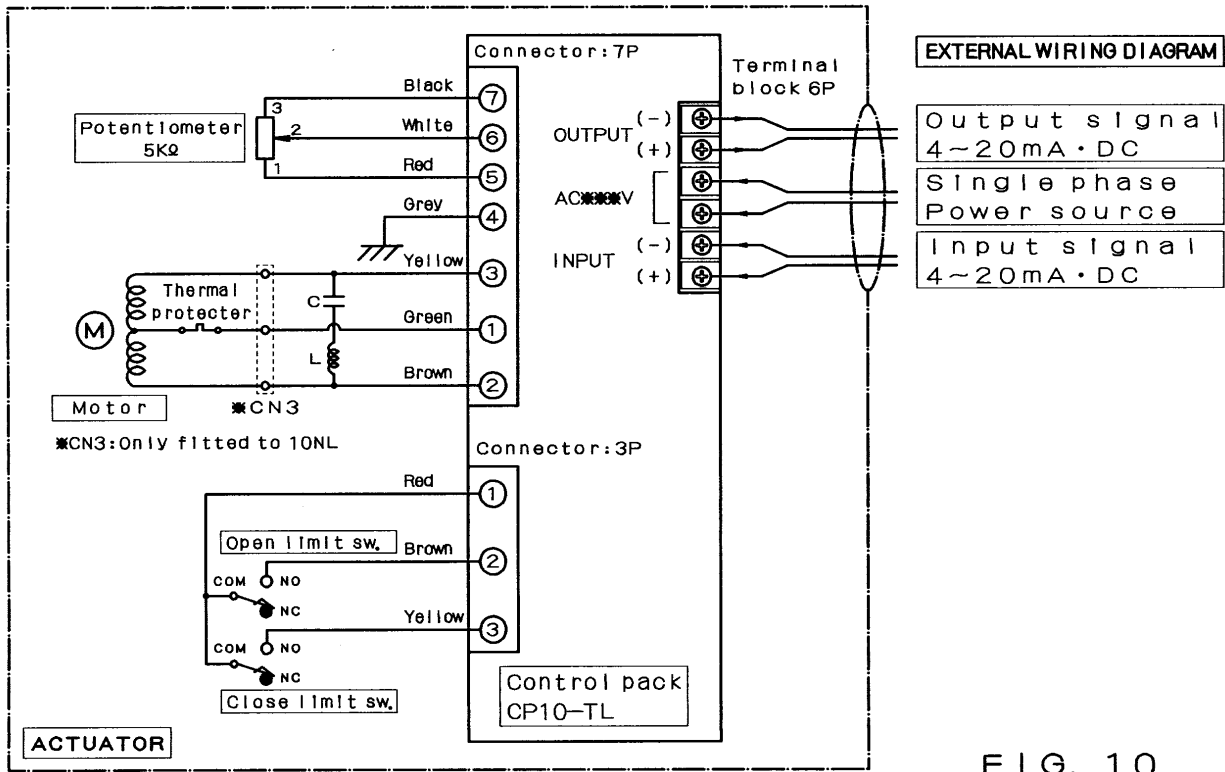


FIG. 10

CAUTION ON USE

9. CONTROL PACK

9-1 Names of parts

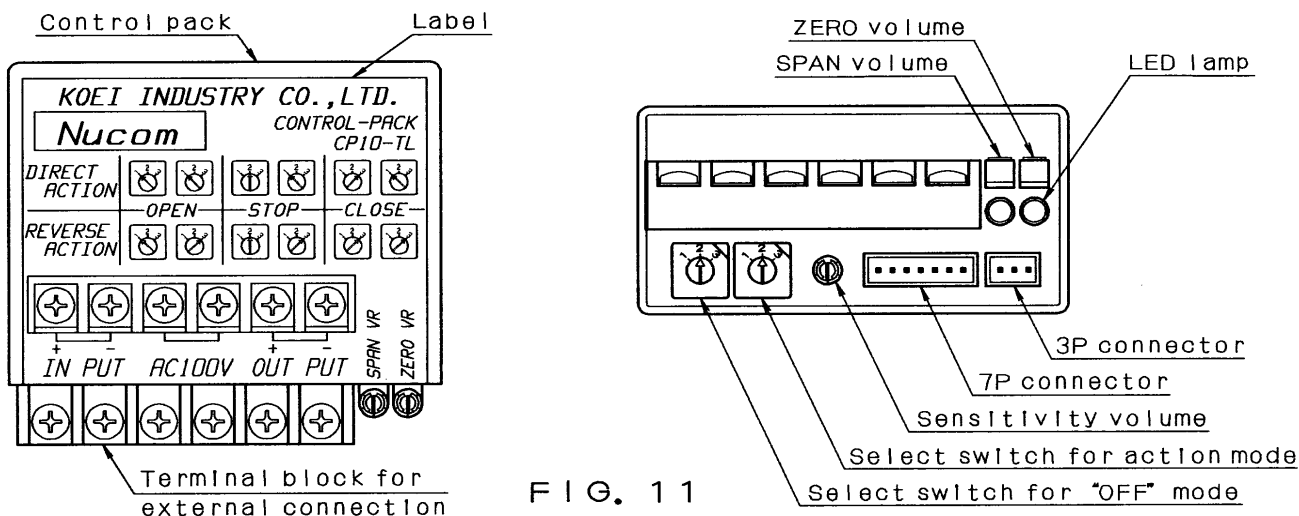


FIG. 11

(Note) The packs with green labels or with Serial No, "SP0000" marked on the side are fitted with an exterior type 250 Ω resistor, and no need to be connected.

Take special care when wiring actuator. AC connectors are in the middle of terminal strip.

9-2 Direction mode

Either direct or reverse action is selectable at this switch.

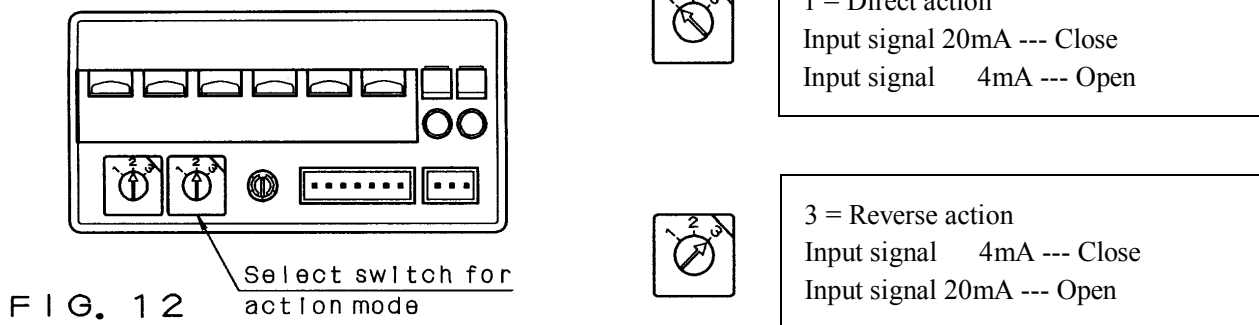
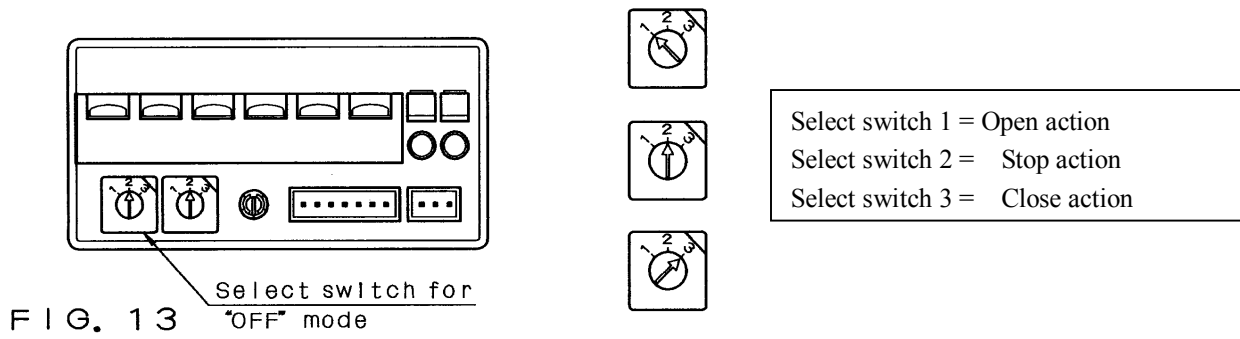


FIG. 12

9-3 Selection of a mode during signal interruption

A mode among open/stop/close is selectable at this switch in case of signal interruption.



Setting of direction (DA/RA) and mode in signal interruption are available in 6 combinations as shown in FIG.14.

(Note) The actuators are normally set in the following combination unless otherwise instructed.

Direction	Reverse (RA mode)
In case of signal interruption	STOP mode

DIRECT ACTION					
	OPEN		STOP	CLOSE	
REVERSE ACTION					

FIG. 14

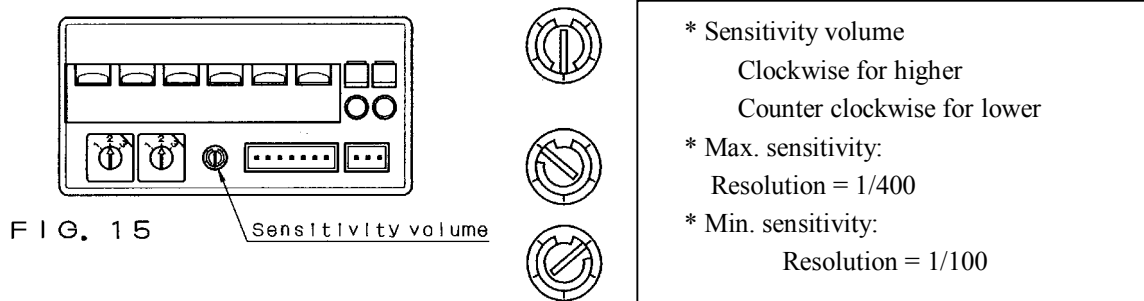
* For US users

Our "Direct Action"	=	US "Reverse Action"
Our "Reverse Action"	=	US "Direct Action"

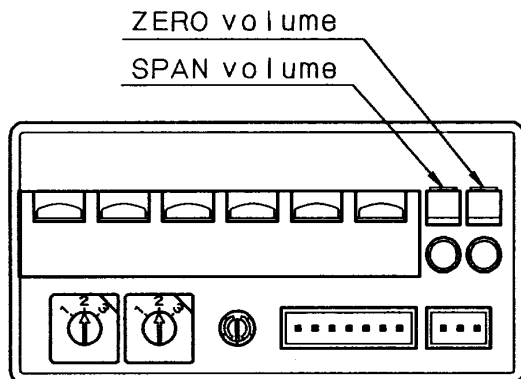
(Note) When input signal rates drop below 0.2mA, the actuator will recognize as "signal interrupted", and will automatically act according to the mode as preset.

To prevent such undesired action, input signals should be exactly adjusted.

9-4 Sensitivity volume



9-5 ZERO/SPAN Setting




* ZERO volume
 CW = To increase (to OPEN direction)
 Adjustable range - 25 ~ +25 %

* SPAN volume
 CW = To increase (to OPEN direction)
 Adjustable range - 50 ~ +200 %

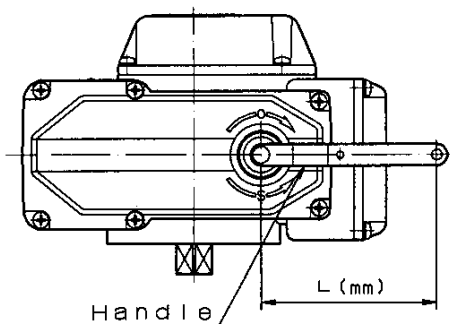
FIG. 16

- *Zero/Span volumes are appropriately adjusted before shipment. Do not adjust it after shipment unless imperatively required. For adjustment, use a trimmer driver of less than 300 g/cm torque, for an excessive force may cause a trouble.
- *First adjust Zero, then adjust Span based on the Zero rate.

 Confirm that power is OFF before making manual operation

10. OPERATION

10-1 Manual operation



Manual operation procedures

1. Remove the rubber cap from the actuator.
2. Insert the attached handle lever into the hexagonal hole.
3. Turn the handle CW for close, CCW for open.
 It is 15 turns between full close to full open.

* Do not turn the handle beyond the Valve position indicator's "OPEN", "CLOSE" gauges, or the shaft will touch at the stop.
 Excessive force may cause a defect.

<SIZE(mm)>	10NS	10NM	10NL
Allen Key SIZE	5	6	10
No. of handle turns	15	15	15
Length of handle	100	120	350

FIG. 17

 CAUTION

When making manual operation, be sure that power is off. If power is on while manual operation, the handle will suddenly return !



Confirm that power is OFF before making power operation

10-2 Power operation

1. Before starting power operation, check the following if they are appropriate.

- * Installation conditions
- * Ambient temperature and fluid temperature
- * Engagement with valve
- * Positions at full close and full open
- * Wiring
- * Water prevention at conduit tube
- * Voltage and input signals (check against specification sheet)

2. Supply power and signals.

3. Check the actuator action with input signals (4~20mA /Reverse action)

4mA	20mA	12mA
Full close	Full open	50 % opening

4. Stop the actuator at an optional signal position, and you may check the control resolution referring to the following example.

[Example]

In case of 4~20mA:

Resolution	Minimum change in input signals
1/250	0.064mA
1/200	0.08mA

The resolution is normally preset at 1/250 before shipment. If necessary to change, adjust it by sensitivity volume (See 9-4).

When raising the sensitivity volume, it is occasional that noises on signals may actuate the unit, if they are not strictly eliminated.

After the checking is over, start operation.

11. ADJUSTMENT

11-1 Potentiometer and limit switches

1. Position the Valve position indicator at 50 % manually, and the shaft will come to the position as shown in FIG.19. (See that the shaft is parallel with the actuator bottom)
2. Connect the adjuster. (FIG.20) :
3. CN1 with control pack, CN2 with actuator
4. Shift the adjuster switch to "ADJ".
5. Supply power and signals to control pack.
6. Unscrew and loosen the sleeve.
7. Set the input signal at 12mA, then turn and fix the sleeve at the position where both the adjuster 2 lamps go off.
8. Shift the adjuster to "ACTION". If the input signal position is not matching with the potentiometer (as either adjuster lamp is on), the shaft will self-turn to revise the gap.
9. If the gap is very slight, revise it with ZERO VR at the control pack.
10. Fix the valve position indicator at 50 % position.
11. Set the input signals at 4mA and 20mA, and confirm that the respective shaft positions are matching to the Valve position indicator.
12. Now the potentiometer adjustment is over.

Adjust the limit switches (OP/CL) as follows :

Loosen the limit cams and adjust the limit switches (Upper = CL, Lower = OP), so as to function at a half turn of manual handle past 4mA and 20mA points, respectively.

*Ascertain that the mechanical stops will function only at a half turn of manual handle past the limit switches functional points.

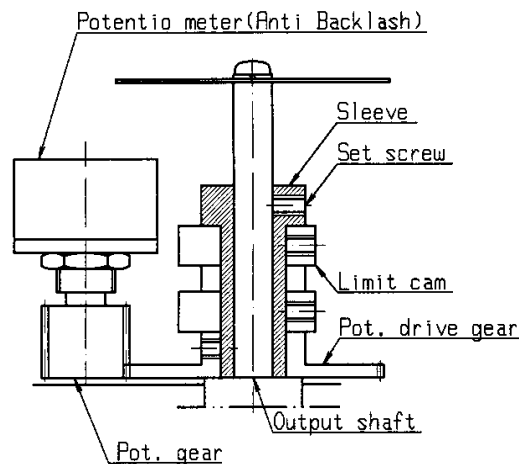


FIG. 19

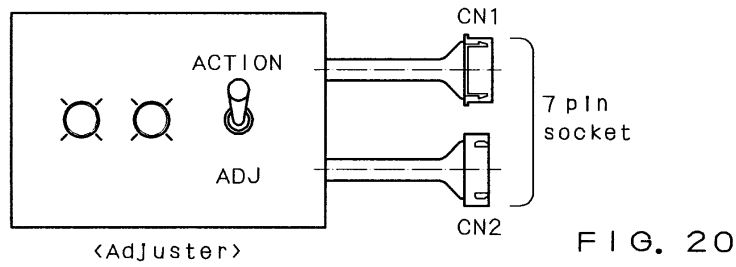


FIG. 20

11-2 Mechanical stop

1. Referring to Fig.21, adjust the mechanical stops with the stops' bolts and nuts as follows.

Set the limit switches functional points at a half turn with handle past input signal OP/CL positions. Set the mechanical stop positions at a half turn with handle past limit switches functional points.

2. Adjusting procedure

Loosen the locknuts allowing the stop bolts to turn.

Fix the stop bolts as shown in FIG.21, and secure them with locknuts.

* If the mechanical stops are adjusted to function before limit switches OP/CL positions, the actuator may possibly be locked during power operation, causing overheat and stall by the motor thermal protector.

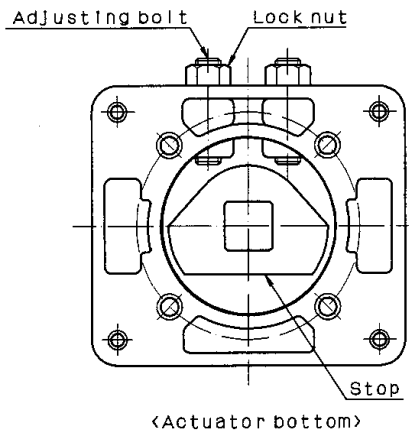
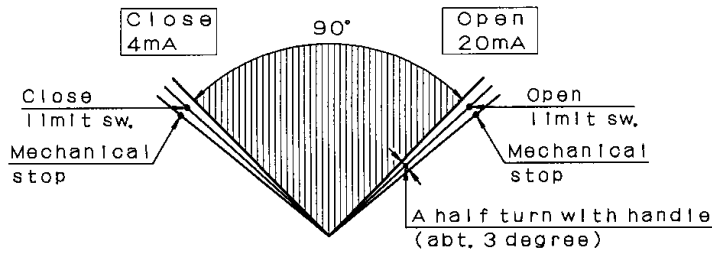


FIG. 21

12. TROUBLE SHOOTING

TROUBLE AND PROBABLE CAUSE	SOLUTION
☼ Motor does not start up	
Power failed or dropped	Check and supply power
Signal failed or dropped	Check and input signals
Wire broken or disconnected	Change the wire or re-connect the terminal
Thermal protector functioned	Lower the ambient temperature or decrease duty rate. Eliminate overload at valve
Limit switches functioned at an intermediate position	Re-adjust the limit cam
Motor advancer defective	Change advancer (condenser)
Control pack defective	Change control pack
☼ Aperture unfixable (Hunting)	
Noise on signal line	Check input signal
Noise on potentiometer	Change potentiometer
Potentiometer and opening gear loose	Check the fixing screws
☼ Aperture does not match input signal	
A wrong signal input	Check the input signals
Improper adjustment of ZERO/SPAN	Re-adjust ZERO/SPAN
Potentiometer slipped	Re-adjust the aperture on the potentiometer
☼ Aperture signal does not output	Check the wiring connection

* For other situation of troubles than the above, please refer to our Sales Dept.

13. MAINTENANCE AND INSPECTION

Refer to separate "Maintenance Manual".

14. OPTIONAL EXTRAS

- * Non-standard voltages
- * Split range signals
- * OP/CL output contact (= extra limit switches)
- * Torque limiter
- * Space heater
- * Potentiometer
- * R/I converter