INSTRUCTION

FOR

DAMPER ACTUATOR

TYPE

DMR-0205 ~ DMR-12005

SHIN HWA ENG . CO., LTD

(80B-2L) 242, Cheongneung-daero, Namdong-gu,
Incheon , Korea

Tel : 82-32-817-8030
Fax : 82-32-815-8036
E mail : 8030@seg.co.kr
http://www.seg.co.kr

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1. STRUCTURE

1-1 CONSTRUCTION

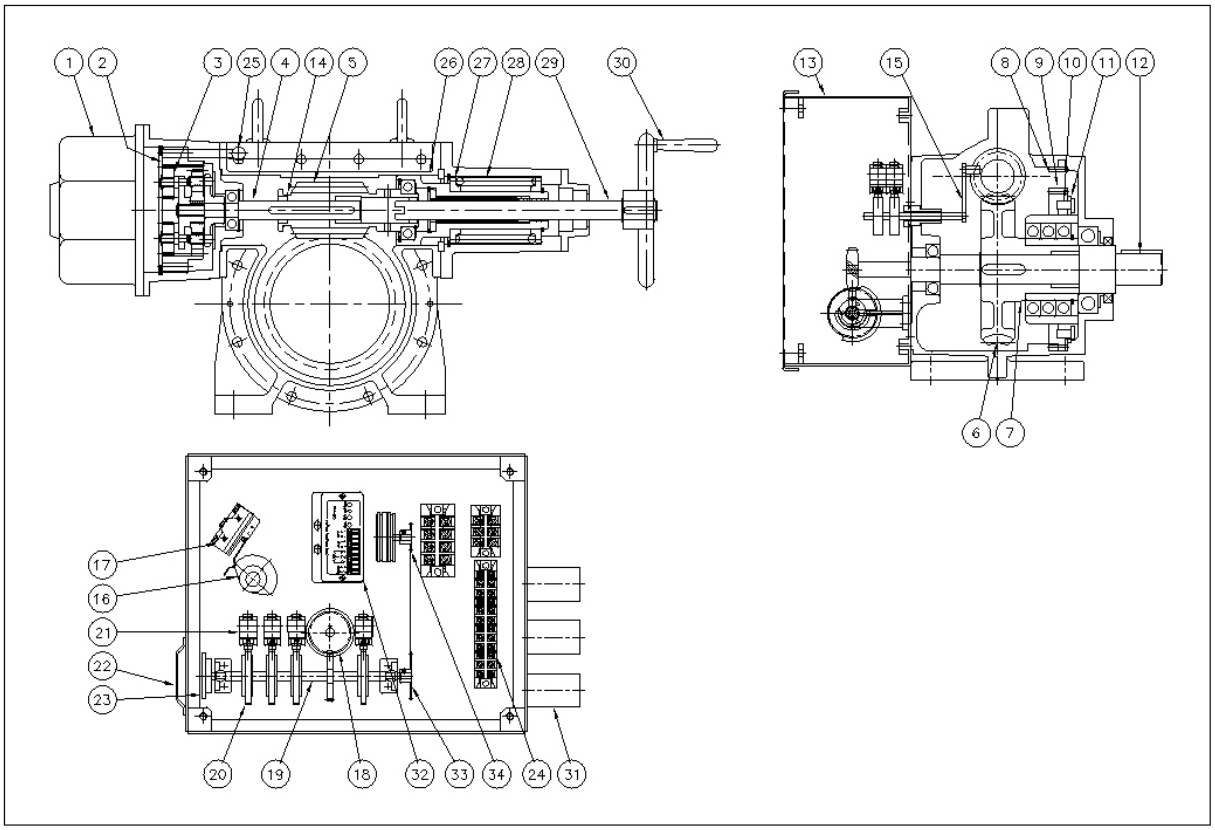


Fig.1 : Damper Actuator

① Drive Motor
② Internal Gear
③ Planetary gear
④ Worm shaft
⑤ Worm
⑥ Worm wheel
⑦ Eccentric shaft
⑧ Internal gear
⑨ Eccentric gear
⑩ Coupling pin
⑪ Arm
⑫ Output shaft (B-shaft)
⑬ Limit switch box
⑭ Cylindrical rack
⑮ Pinion
⑯ Torque switch cam
⑰ Torque switch
⑱ Cam shaft drive gear
⑲ Cam Shaft
⑳ Cam position L/S
㉑ Position L/S
㉒ Indicator
㉓ Indicator dial
㉔ Terminal Block
㉕ Auto change over knob
㉖ Sliding shaft
㉗ Spring retainer
㉘ Torque switch spring
㉙ Manual operation shaft
㉚ Manual handle
㉛ Lead outlet
㉜ Transmitter
㉝ Cam shaft gear
㉞ Potentiometer pinion

1-2 Construction & Main Parts Description

(1) Speed reduction gear

a. DMA 1005-12005 (Figure-1)
Reduction ‘s first stage consist with ③Planetary gear.
Second stage consists with ⑤Worm & ⑥Worm wheel, Third stage consists with ⑦ Eccentric shaft, ⑧Internal gear, ⑨Eccentric gear.

b. DMR - 0205~0805
They consist that the first stage is Planetary gear, Second stage is worm and worm wheel And third stage is Eccentric gear device.

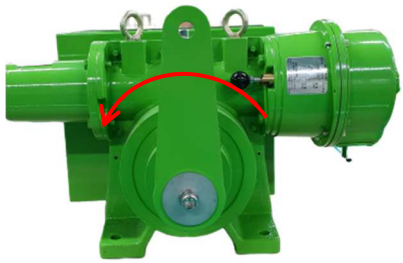


Fig.2 : Forward direction ‘s rotation of output shaft

(2) Direction of rotation of output shaft (Fig.2)

a. When viewing from front direction of output shaft, rotation counter-clock is forward (or opening direction) as standard.

b. It is impossible to change actuator direction randomly which was dispatched from our factory.
(Ex : If needs to change operation direction, please contact our company)

(3) Torque Switch

a. Torque switch is protection device which can be block our completely operation circuit of motor when overloading or detained extremely on 0% or 100% position operation.

b. Principle of torque switch operation (Figure-1 referred)

- When overloading, output shaft is engaged with ⑥worm wheel.
- The excessive thrust force shall be applied in the spring power for ㉘torque switch and ⑤worm which is constrained ate the balance position.
- Therefore worm shall be move into new balance position with abstracting spring for torque switch as the same as manual shaft which is fixed worm.

c. Torque switch position

- Torque switch is assembled by micro-switches two sets for each direction of micro-switches(0 % or 100%) as in Fig 3.
- Arrangement procedure starts from box inside

  * When output shaft rotate into clock direction, overload signal (Switch "A" contact) Contact 1-2 rotate into counter-clock direction.

  * When output shaft rotate into clock direction, overload stop signal (Switch "B" contact) Contact rotate into counter-clock direction.

  * When output shaft rotate into counter-clock direction, overload stop signal (Switch "B" contact) Contact 5-6 rotate into counter-clock direction.

  * When output shaft rotate into counter-clock direction, overload stop signal (Switch "A" contact) Contact 7-8 rotate into lock direction.

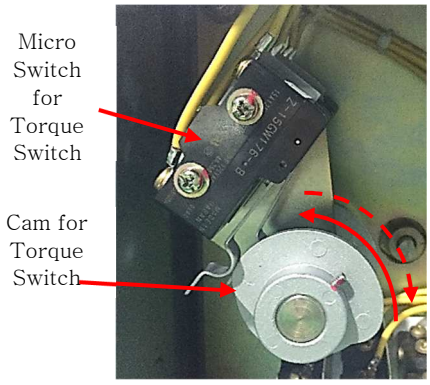


Fig.3 : Torque switch position

d. Moving Direction of manual operation shaft (Fig.3)

- When manual shaft move owing to overload, the movement direction is as followings.
- When output shaft move into forward (opening) direction, manual shaft move into outside direction.
- When output shaft move into reverse (closing) direction, manual shaft move Inside direction.

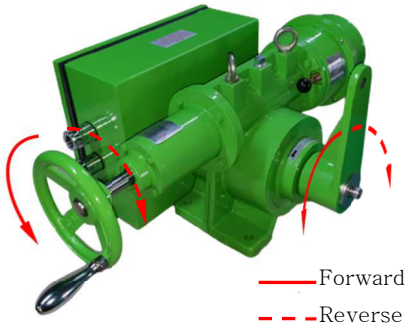


Fig.4 : Direction of manual operation shaft

(4) Position Limit Switch

a. Position Limit switch consists of several micro-switches. Standard consist into 4 contact point and it can be mounted into 6-8 contacts as option function.

b. Position Limit Switch operation Principle

- In case that ⑫output shaft drive ⑱cam shaft drive gear, screw gear which is connected to reverse side, ⑲cam shaft rotate output shaft at the same time, and operate micro-switch after rotating equal number of ⑳position limit switch cam which is connected into cam shaft.

c. Usage of position limit switch

- Two contacts among the position limit switch has switch ("B" contact) and other 2 contacts are using with signal switch ("A" contact) in 0% or 100% position.
- Normal and Reverse limit switch may be blocked out motor operation circuit wire even any contacts owing that they are connected to torque switch with serial type.

d. Limit Switch arrangement

- As figure 5 arrangement, arrangement procedure is left contacts point 11-12 (100% position "B" contact point), 13-14 (100% "A" contact point)
  15-16 (0% "A" contact point) and 17-18 (0%, "B" contact point)

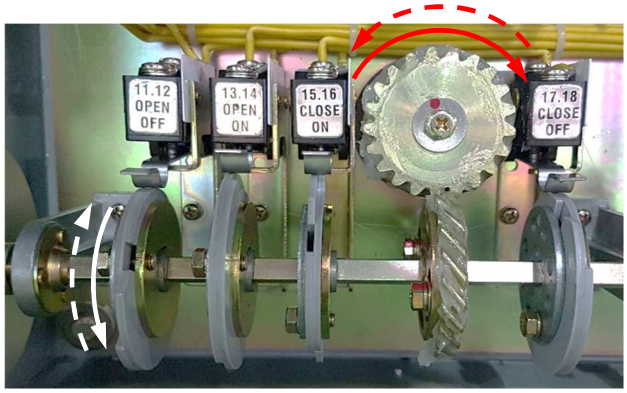


Fig.5 : Position limit switch

e. Direction of CAM operation

- In case that output shaft rotate with "CW" direction CAM rotate into line arrow as figure 5.
- In case that output shaft rotate with "CCW" direction CAM and CAM indicator (Note figure-8) rotate into dotted-line arrow as figure 5.

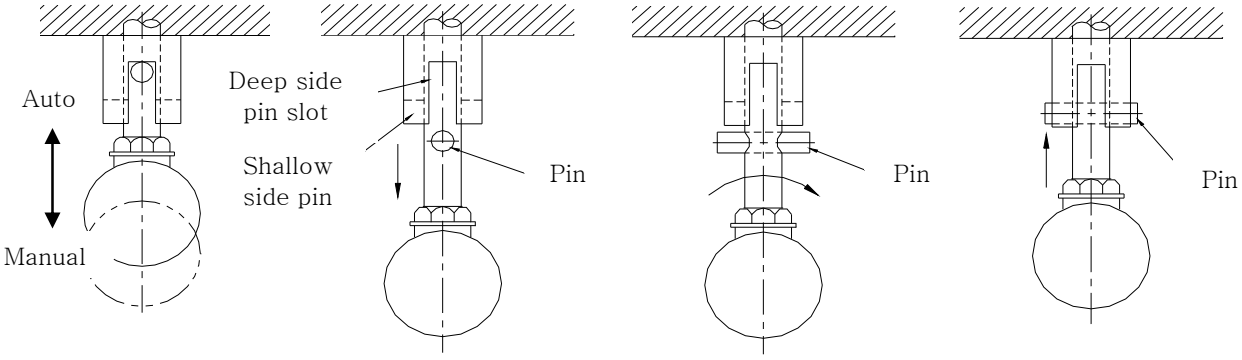


Fig.6 : How to convert auto to manual

(5) Manual Operation Mechanism

a. When ㉕auto-manual toggle switch change into manual direction, manual operation is possible.

b. When doing repeat auto operation, please operate with AUTO mode after ㉕auto - manual toggle switch must be reverted into auto position.

c. In case that auto convert into manual mode

- As figure 6, after ㉕auto-manual toggle switch change into manual direction, rotate about 90degree and shat pin shall be inserted into pin slot of shallow direction.
- If ㉚manual handle press into body direction, gaped slot in edge of ④worm shaft and gaped slot in edge of 29 manual shaft edge part can be fitted together.
- If ㉚manual handle press and turn in one side direction, manual handle combines for manual operation.
- After completing combination, ㉚make rotate manual handle and ⑫output shaft can rotate randomly.

d. Direction of rotation of manual handle .

- As fig.7, output shat is required to rotate into line-arrow direction (forward direction or opening direction), make rotation into lined-arrow direction (counter-clock direction) after pushing in manual handle as figure.
- As fig.7, output shat is required to rotate into dotted line -arrow direction (reverse direction or closing direction), make rotation into dotted line-arrow direction (clock direction) after pushing in manual handle as figure

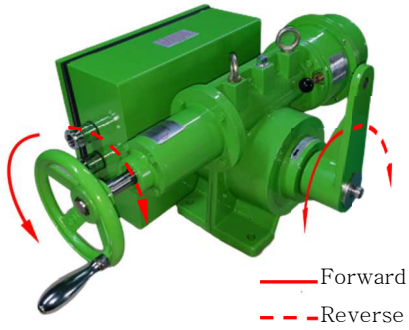


Fig.7 : Direction of manual operation shaft

e. In case that auto convert into manual mode

- When hand is off the ㉚manual handle, ㉚manual handle and ㉙manual shaft are released from combination owing that spring is pulled out with outside direction from body automatically..
- And then as fig.6, process acting should be reverse, ㉕auto-manual toggle switch must be inserted in auto arrow direction as fig.6 together pin.
- If electric operation shall be done without this process, make sure that the first stage reduction gear and devices may not be damaged.

f. Relation between control devices.

- Even manual operation, if there is overload, torque limit switch shall be operated and owing that motor's operation circuit or wire shall be blocked out , the auto operation can not be executed toward that direction.
- In manual operation, if indicator's instruction operate over adjusting skip from 0% to 100%, make caution that the auto operation may not come back.

(6) Instruction device

a. The opening of the damper coupled to output shaft shall be read with coincidence point of ㉒ checking indicator's red line through ㉓ opening instruction device(Standard graduation is 0~100%)

b. When mounting other currency instruction device as option, the instruction can be even in remote distance.

2. Installation

2-1 Caution on Installation

(1) Ambient Temperature

Please make caution that Installation ambient temperature for motor, control device, lubrication etc's heat resistance may not pass 10~40°C.

(2) Connection to load

a. In order to fit each ㉑Position limit switch control and instruction device, The position relation between Output shaft and load shaft must be fitted.

b. ⑫output shaft and middle position of load shaft's operation angle must be leveled.

c. Turn ㉚manual handle, and ㉓opening instruction device must be positioned into 80% and also load shaft must be located into 50% position and after adjusting it, please make connection.

Fig.8 : Indicator

(3) Installation angle

The damper of oil lubrication type is mounted in oil gauge, so installation site must be leveled by horizontal.

And keep level when transporting

2-2 Wiring

(1) General contents.

a. ⑬Limit switch box's internal wiring was completed in our company.

b. Main wiring is 3line cap dia. cable, control wiring is 600V polyvinyl chroride, Insulting wire (1.5 mm yellow).

c. Interconnection such as ⑬terminal block inside limit switch box and electronic switch, operation device, signal device etc. should be worked according to "4 control wiring diagram".

(2) Wiring Outlet.

a. ⑬outlet wire for limit switch box is using PF 3/4 socket.

(3) Standard connection

a. In case that standard connection is wired according to "4.control diagram" following reasonable control condition can be obtained.

b. Lamp will be lighted even on when it is positioned 0% or 100% location.

c. Lamp is lighted on when Torque switch was operated.

d. Motor stop whichever ⑰torque switch or ㉑position limit switch are operated.

e. Even though operation motor is flowing on overload current, EOCR shall be operated and operation motor shall be stopped.

2-3 Preparation for operation

(1) Confirmation of interconnection.

Make sure that interconnection between damper actuator and control diagram have been executed exactly.

a. Please make manual handle rotate and instruction indicator's position must be move into 50%.

b. In case of open signal, output shaft shall be rotated into pen direction and it is normal condition if indicator move into open direction of 50% over.

c. If they rotate with reverse direction, it means that operation motor's rotation direction is reverse, and in this case, please revise rotation direction according to "(2)Rotation direction confirmation".

d. If actuator shall be operated into 100%, please do "OPEN" signal again while position limit switch had operated and stopped.

e. It is normal condition until motor shall. not be operated after sending above signal. If there happens operation condition, there is problems on control diagram's interconnection, and in this case, please make sure that there is connection or not after powering off immediately.

f. 0%(Close) direction should be executed as above described test method.

(2) Confirmation on rotation direction.

As described in above (1)'s confirmation of interconnection , if rotation direction is reverse status as "c" article, please change U.V interconnection among the control box's outlet terminal U.V.W as described fig.9, or R.S terminal among power R.S.T must be changed into dotted line

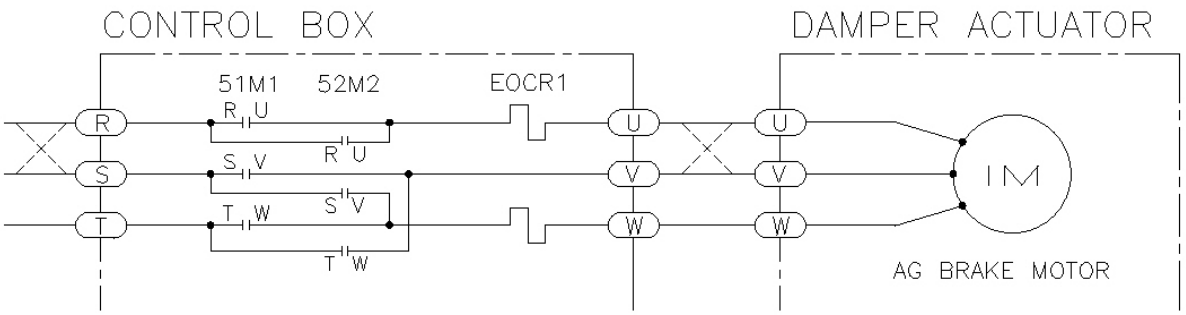


Fig.9 : Rotation direction

2-4 Cam Adjustment

(1) Contact arrangement

Our position limit switch is using as NC contact type.

a. NC Contacts : NO-CAM status while operating 11-12 / 17-18

b. NC Contacts : NO-CAM status while operating 13-14 / 15-16

(2) Cam Operation type

Viewing on local box, standard is when the clock rotation direction is Open

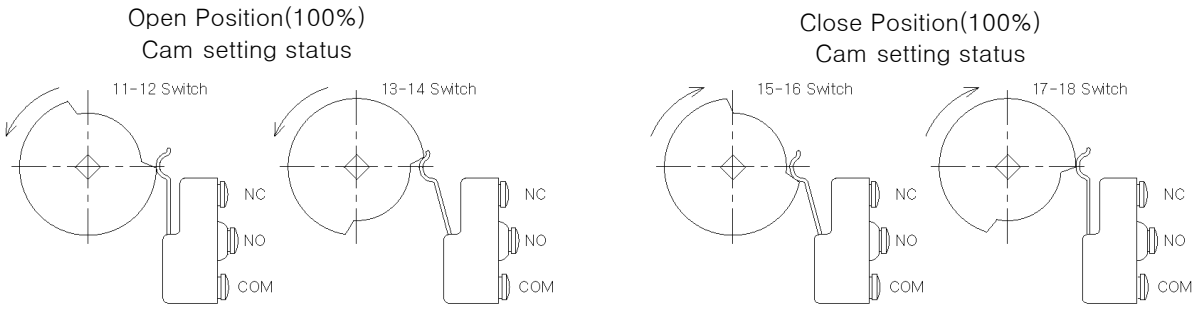


Fig.11 : the principle of cam operation

(3) Cam Adjustment Method

a. Rotate cam shaft with manual or auto until "forward direction range" so that fixed bolt may be positioned in center. (Fig.12-A)

b. As described in Fig.12-B use the tool or spanner when loosening fixed bolt one time, work 90 degree with 4 times, total turn it around and loosen.
(if not full enough loosen or over-loosen, it is not so good. It will be sufficient to do exact turning it around one time only.)

c. As described Fig.12-C, Cam must be hold firmly and turn it slowly so that it may be required to adjust.

d. Please check whether limit switch's "operation lever" may be moved into cam well or not.

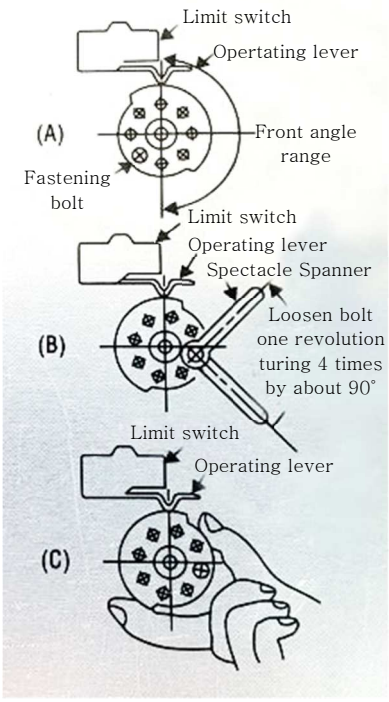


Fig.12 : Cam adjustment method

2-5 Adjustment of Potentiometer (J-50G)

(1) Actuator should be located on 50% position after operating with auto or manual mode.

(2) As described Fig.13, if screw set are removed, potentiometer gear's each operation can be executed.

(3) With using multi-tester, connect Potentiometer's S1 terminal and S2 terminal.

(4) Potentiometer gear shall be reached into 500Ω and rotate and adjust.

(5) Tighten set screw again and potentiometer gear may be connected with cam shaft again.

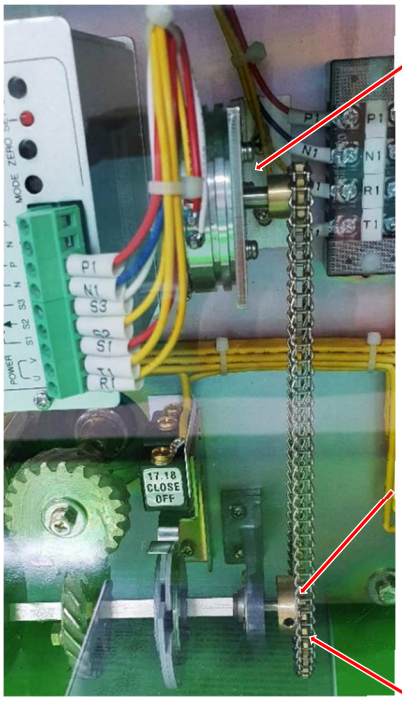


Fig.13 : Adjustment of Potentiometer

2-6 Adjustment of Current Transmitter

(1) This current transmitter is conversion device that input signal resistance is changed into output electric current signal.

(2) Make sure that power is connected or not. When power is on, it is normal condition if SET LED is light off 0.5 second interval.

(3) Actuator should be operated in complete closing position with manual.

(4) Make sure that "2-5 adjustment of resistance" should be executed and adjusted well.

(5) After measuring current between terminal P and N, make sure that it is DC 4mA or not.

(6) If not appear DC 4mA, please push for 3-4 seconds interval R/I converter Zero setting switch.

(7) And then, make manual handle rotate and locate while actuator should be completely open mode.

(8) Again measure P1 and N1 terminal's current, make sure whether it reaches into DC20mA or not.

(9) If not appear DC 20mA, please push for 3-4 seconds interval R/I converter SPAN adjustment press switch.

(10) Again after actuator is located on closing mode completely, measure P1 , N1 current, and if not appear DC 4mA, repeat above procedure and if it reaches into approximately DC 4mA, the adjustment is completed.

(11) Generally, zero span setting value is executed by above process, but in case that installation place, device etc. has tolerance, please do minute adjustment as below described method.

(12) ZERO, SPAN value adjustment value press MODE SWITCH and adjustment KEY change is as followings.

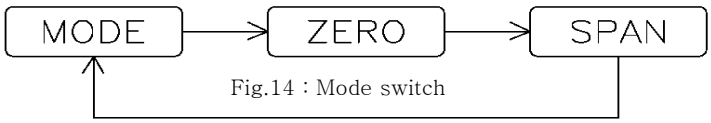


Fig.14 : Mode switch

(13) If press MODE switch, Zero switch changes Down function, Span switch change into Up function.

(14) After actuator close completely, press Mode switch one time and adjust minutely in 0% position(4mA) by adjusting Up and Down with Zero/Span switch.

(15) After above (14) process, actuator must be opened completely, and press Mode switch one time again, and with Zero/Span switch, adjust 100% position(20mA) minutely.

(16) After completing minute adjustment, press Mode switch one time again, and escape.

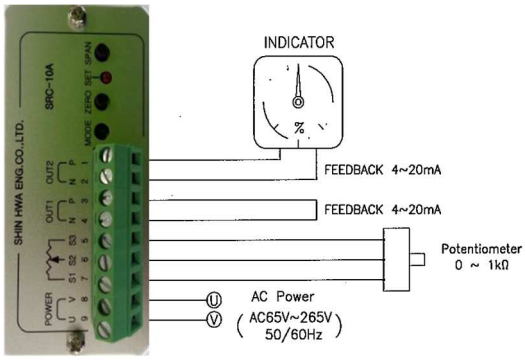


Fig.15 : Adjustment of resistance

2-7 Adjustment of SBR-10A (Balancing Relay)

(1) After completing indicator, limit switch, set of resistance, execute SBR-10A adjustment.

(2) Actuator move into 50% open position by manual

(3) Press "Scan" button switch for 3-4 seconds interval.

(4) "RLY2" lamp will be lighted on and actuator should be operated into Open direction.
* In case that rotation direction is reverse(close), change terminal line of No 8 and No 10 in SBR-10A

(5) While operating above scan Auto lamp extinguish 1 second interval.

(6) After completing Auto Scan, Auto lamp with 1 second interval's flash shall be lighted off.

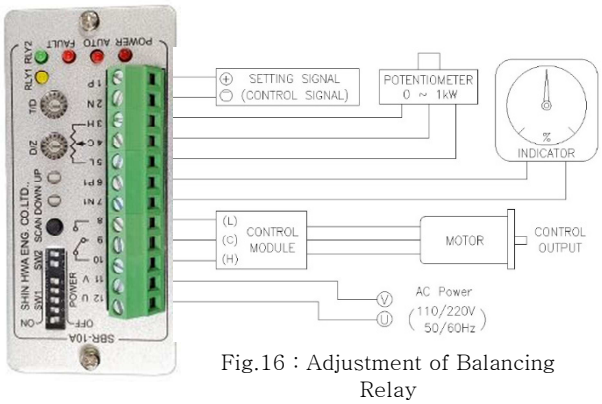
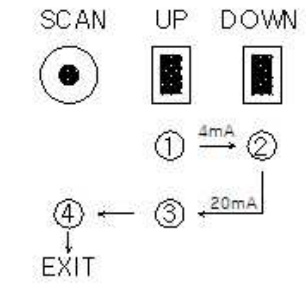


Fig.16 : Adjustment of Balancing Relay

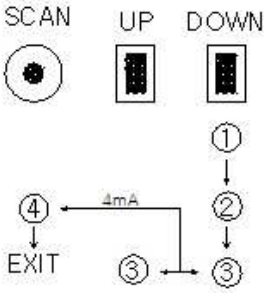
(7) Minute adjustment of SBR-10

INPUT SIGNAL 4-20mA SETTING



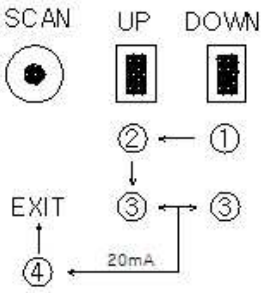
① UP PUSH (3-4sec)
INPUT SIGNAL 4mA SETTING
② DOWN PUSH (1time push)
INPUT SIGNAL 20mA SETTING
③ UP PUSH (1time push)
④ SCAN PUSH (1time push)

FEED BACK SIGNAL 4mA SETTING



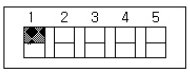
① DOWN PUSH (3-4sec)
② DOWN PUSH (1time push)
③ 4mA set up by UP, DOWN
④ SCAN PUSH (1time push)

FEED BACK SIGNAL 20mA SETTING

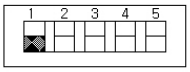


① DOWN PUSH (3-4sec)
② UP PUSH (1time push)
③ 20mA set up by UP, DOWN
④ SCAN PUSH (1time push)

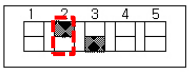
SW1



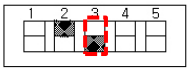
INPUT SIGNAL 4-20mA



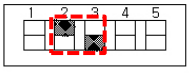
INPUT SIGNAL 1-5V



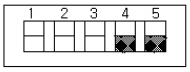
Resistance direction converting switch



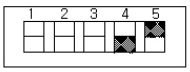
Motor rotation direction converting switch



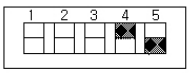
Actuator Action converting switch



INPUT SIGNAL FAIL LOCK UP POSITION



INPUT SIGNAL FAIL OPEN POSITION



INPUT SIGNAL FAIL CLOSE POSITION

SW2

LINEAR

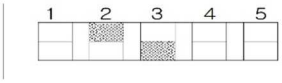
SQUARE

SQUARE ROOT

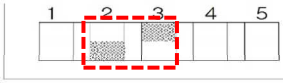
①Actuator action direction converting switch

※ When opening/closing is changed convert switch 2 and switch 3 from the current position in the opposite direction

Ex)Current position



Opposite



(8) Time Delay

a. They are used to prevent hunting operation caused by continuous noise or sound.
※General setting position is “0”

b. It can be selected from upper of switch to 0~F(16 decimal) Per each step, 0.3 second shall be increased and make setting until 5 second.

c. If setting “0” initially, actuator shall be operated forward/reverse operation, but basically it has 0.5 second delaying time.

d. Normal signal or noise signal’s variation shall be detected, and the operation shall be done by initial variation value only, and control out put value does not change.

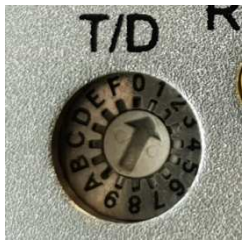


Fig.18 : Time Delay

e. For example, if time setting value is 3 second, actuator keep 50% condition, and then set point value is made by 60%, the actuator operate “ OPEN “ immediately.

f. And previous setting time value, that is, if set point value is changed into 40% within 3 second, the actuator shall be stopped immediately, and the actuator shall be operated CLOSE mode after passing 3 second, and actuator shall not be operated until passing 3 second which is set time.

g. Implementing of this operation does not have many factors that can be changed suddenly in the case of a normal signal, but since external noise is unpredictable So by implementing such an operation, it will not overload the actuator.

(9) Dead Zone

a. It is required to adjust actuator operation in case of setting below value toward set point and potentiometer signal deviation value.
That is, Dead zone is called the range which does not operate in control signal input within setting value. If this is adjusted, it can be prevented to do hunting operation caused by motor’s inertia or control signal’s minute variation.

b. For example, when Dead Zone setting value is 2%, Set point value is 50% Potentiometer value will be 48.5% and deviation value will be 1.5%.

Fig.19 : Time Delay

c. In this time, actuator does not operate. But if set point value is 50% and Potentiometer value is 47.5%, the deviation value shall be 2.5%, so in this case actuator operate with “OPEN” mode.

d. It can be selected from upper of switch to 0~F(16 decimal) Per each step , 0.3 second shall be increased and make setting until 5 second.

e. Generally setting position should be “0”.

Setting	T/D (sec.)	D/Z (%)	Setting	T/D (sec.)	D/Z (%)	Setting	T/D (sec.)	D/Z (%)
0	0.5	0.5	6	2.3	2.3	B	3.8	3.8
1	0.8	0.8	7	2.6	2.6	C	4.1	4.1
2	1.1	1.1	8	2.9	2.9	D	4.4	4.4
3	1.4	1.4	9	3.2	3.2	E	4.7	4.7
4	1.7	1.7	A	3.5	3.5	F	5.0	5.0
5	2.0	2.0						

2-8 EOCR's setting

(1) Motor overload can be protected when adjusting EOCR in reversible electronic switch of damper actuator operation.

(2) EOCR setting value is described as following table and make it set.

Type	Rated output of drive motor KW	Full load current A (50/60Hz)	
		200 / 220V	400 / 440V
DMR - 0105	0.1	1.10 / 1.00	0.55 / 0.50
DMR - 0205	0.1	1.10 / 1.00	0.55 / 0.50
DMR - 0505	0.1	1.10 / 1.00	0.55 / 0.50
DMR - 0805	0.1	1.10 / 1.00	0.55 / 0.50
DMR - 1005	0.2	1.42 / 1.28	0.71 / 0.64
DMR - 2005	0.4	2.20 / 2.00	1.10 / 1.00
DMR - 4005	0.75	4.20 / 3.70	2.10 / 1.85
DMR - 8005	1.5	8.30 / 7.30	4.15 / 3.65
DMR - 12005	2.2	10.9 / 9.40	5.45 / 4.70

Table-1 : Drive motro's full load current variation

3. Maintenance

3-1 Lubrication

(1) Supplying oil or lubrication should be provided in maintenance.

(2) Damper actuator's lubrication parts and standard supplying oil quantity is described as following table 2.

(3) Please use and adjust table 2 after checking actual frequency usage or caution condition, maintenance standard in your company.

Parts of lubrication		Inside of Reduction gear case		manual operation shaft	Planetary gear device	Inside of position limit witch box	Inside of position limit switch box
		grease system	oil bath system				
Parts to be lubricate or material		gears and bearing	gear and bearing	FC-20	gear	gear	oil included alloy bearing
lubrication type and name		lithium base grease	high pressure gear oil #90	Spindle oil #60	Lithium-base grease	Lithium-base	60 Spindle oil #60
Lubrication method		Coating on gear tooth	Pouring	Pouring	coating on gear teeth	coating on gear teeth	Pouring
Initial feed amount after disassemblying		Variation depended models	see not bellows	3 gram	20gram	Coating on gear tooth thinly	3 gram
Oil change	Oil q'ty	At disassembly and cleaning	dis-assembly and cleaning	disassembly and cleaning	disassembly and cleaning	At checking	disassembly and cleaning
	Time or standard	Variation on models		3 gram	20 gram	Coating on gear tooth thinly	3 gram
Supply	time or standard	At dis-assembly and cleaning	Range period showing on oil gauge	Every 3 month 1 time	At dis-assembly and cleaning	Every 3 month 1 time	Every 3 month 1 time
	quantity	-	Up to center of gauge	3 gram	20 gram	Coating on gear tooth thinly	3 gram

Oil quantity for oil bath system

DMR - 2005	2.5 liter
DMR - 4005	5.0 liter
DMR - 8005	6.0 liter
DMR - 12005	2.5 liter

Table-2 Lubrication table

4. Control diagram

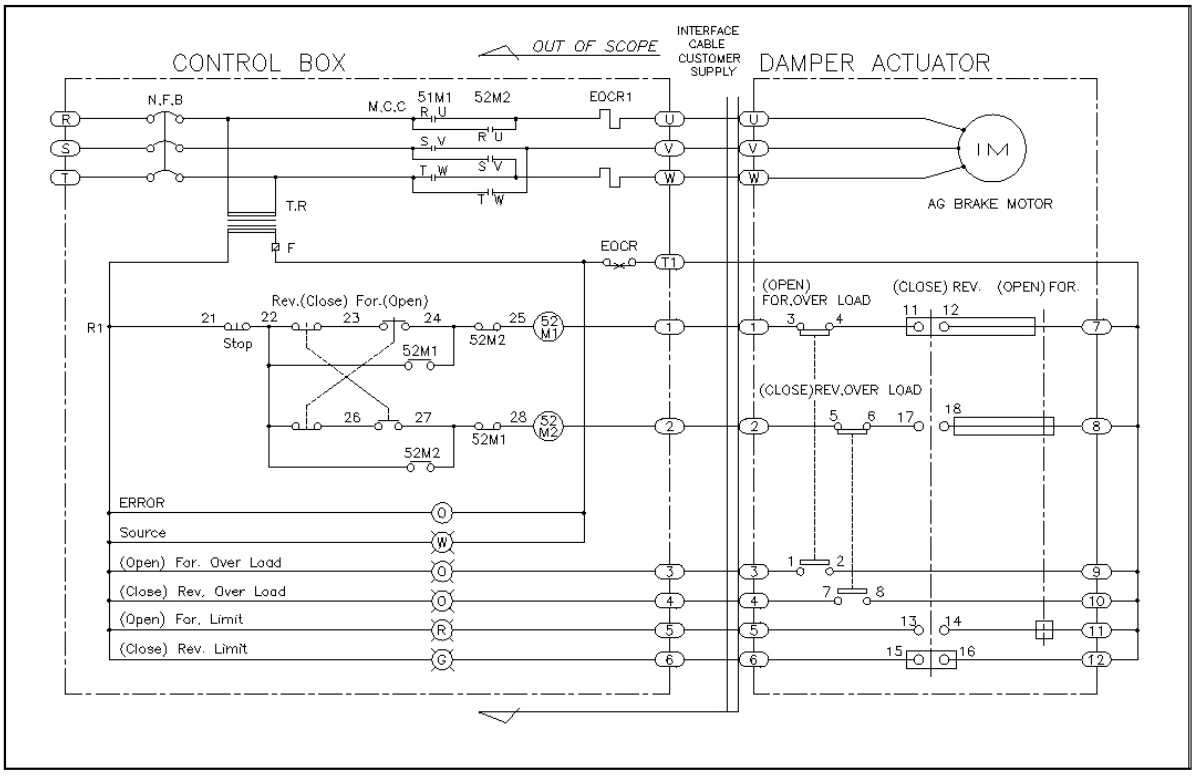


Diagram-1. ON-OFF control

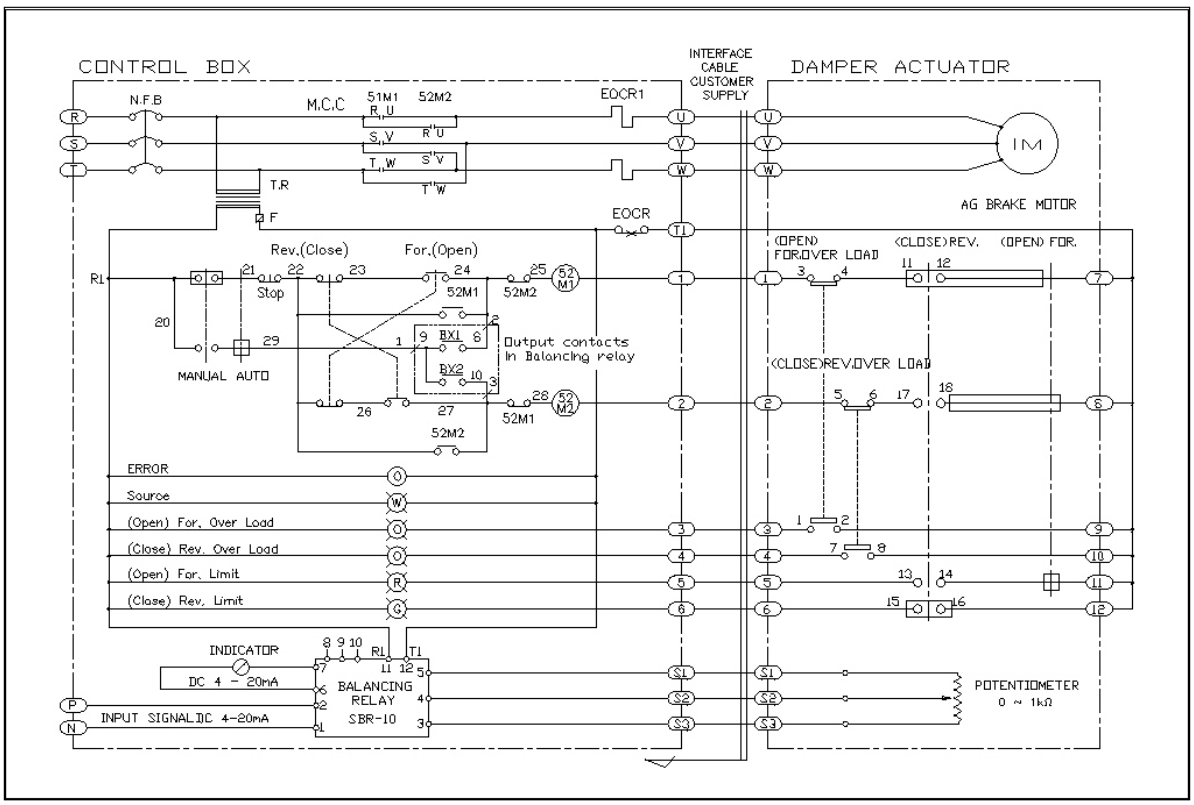


Diagram-2. FEEDBACK SIGNAL 0~1kΩ

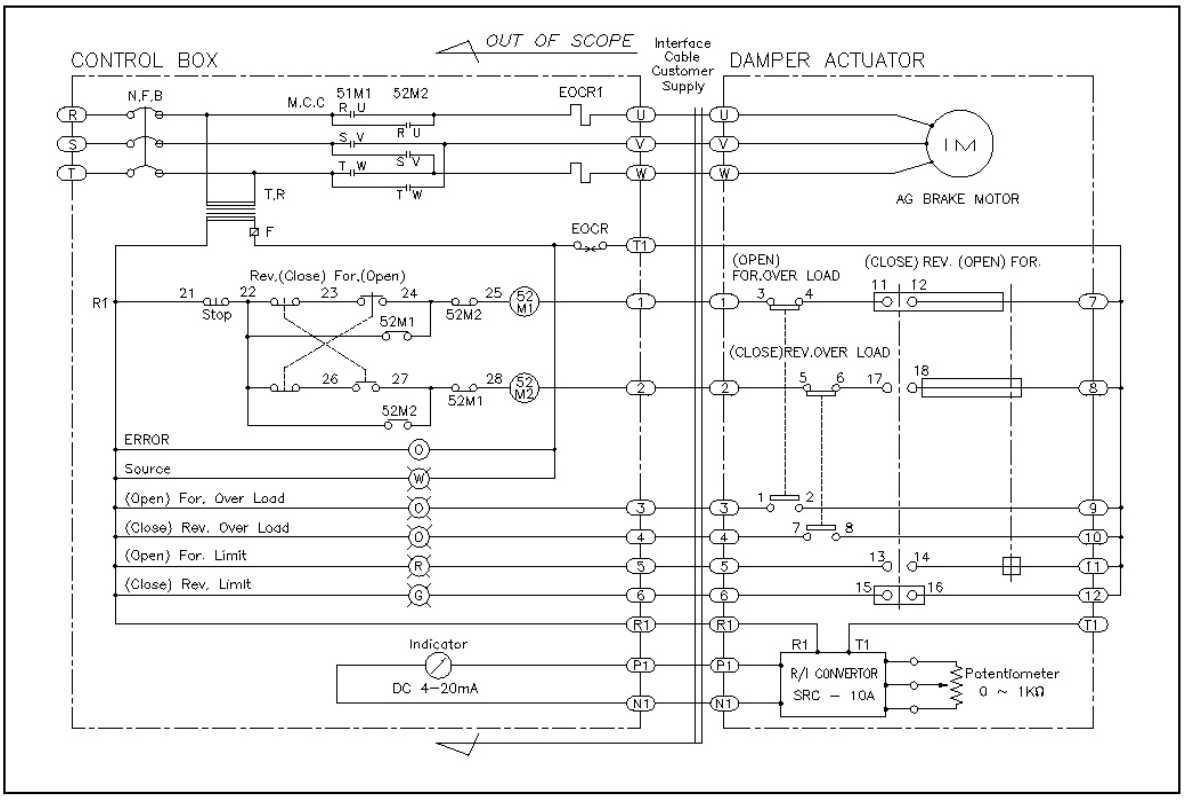


Diagram-3. FEEDBACK SIGNAL 4~20mA DC

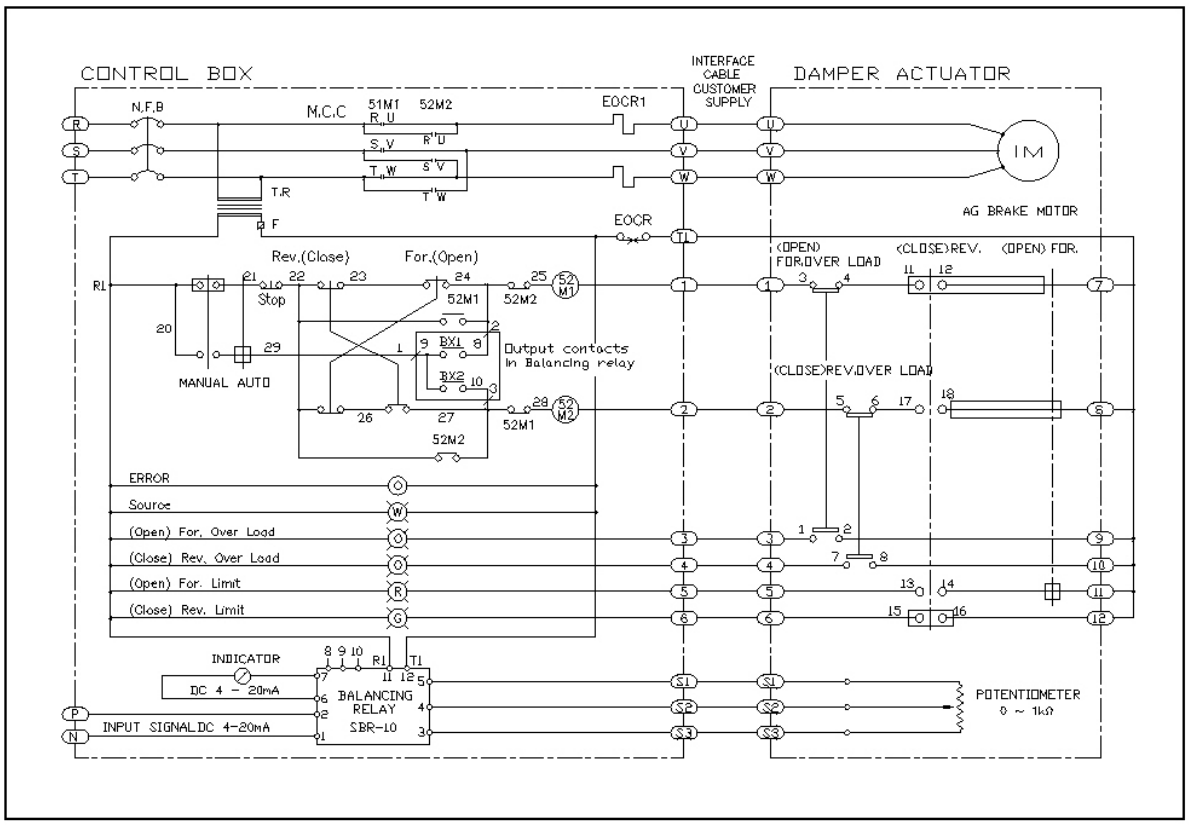


Diagram-4. Auto Type