NIPPON VALVE CONTROLS, INC.

Instruction manual

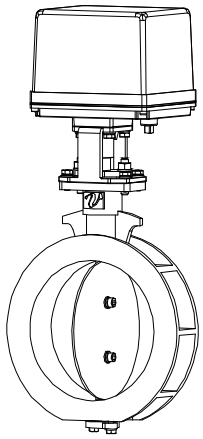
Electric Actuated Butterfly Damper WT

SP-1519

Please read this manual before installation and use.

GENERAL

Flanged-end butterfly damper with high-power electric actuator.



Actuator

- AD1 : For AC power
- AD2 : For AC / DC power
- AD0 : For DC power
- HD1 : For AC power (High speed)
- HD2 : For AC / DC power (High speed)
- HD0 : For DC power (High speed)
- AE1 : For AC power
- AE2 : For AC power

Damper

WT type With heat-resistant damper material this series can be used at fluid temperatures ranging from -40 °C to +550 (600) °C.

PRODUCT CODE

WT type	(Without seat)		W	T			2	T	G	0	-		-	
	(With SUS316 seat)		W	T			2	T	G	S	-		-	
		(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)		(9)		(10)

(1) Actuator
AD1 AD2 AD0
HD1 HD2 HD0
AE1 AE2

(2) Damper
WT

(3) Voltage
1 : 100 / 110 V AC
2 : 200 / 220 V AC
0 : 24 V DC

(4) Sizing code
0 : Standard
1 : Light
2 : Heavy

(5) Connection
2 : JIS 5K

(6) Body material
T : SCS13A

(7) Packing material
G : Expansion graphite

(8) Seat material
0 : (Zero) None
S : SUS316

(9) Size [mm]
ex. 80 A → 080

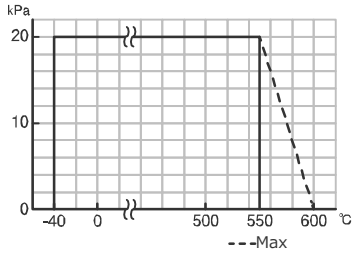
(10) Option
L0 : Auxiliary limit switch
L2 : Auxiliary limit switch
M0 : Manual lever handle
XT : For high / low temperatures (AE1, AE2)

DAMPER SPECIFICATIONS

Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

Damper type		WT (Without seat)		WT (With SUS316 seat)
Design		2-way, Wafer		2-way, Wafer
Connection		JIS Flanges 5K		JIS Flanges 5K
Fluid				
Max pressure		20 kPa		20 kPa
Size [mm]		040 to 250	300 to 400	040 to 400
Material	Body	SCS13A		SCS13A
	Disc	SUS420J2	SUS420J1	SUS410S / SUS420J2
	Seat	None		SUS316
Stem seal	Packing	Expansion graphite		Expansion graphite

PRESSURE & TEMPERATURE RATING



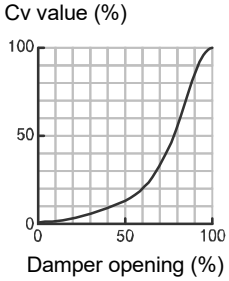
Temperature range : -40 to 600 °C

Note) If the fluid temperature is more than +250 °C or less than -20 °C, the option (XT) is required. (AE1, AE2)

SEAT LEAKAGE VOLUME

	Damper size [mm]	Remarks
WT-2TG0 (Without seat)	040 to 050	Less than 2 % of rated Cv.
	065 to 400	Less than 1 % of rated Cv.
WT-2TGS (With SUS316 seat)	040	Less than 1 % of rated Cv.
	050	Less than 0.5 % of rated Cv.
	065	Less than 0.2 % of rated Cv.
	080 to 400	Less than 0.1 % of rated Cv.

INHERENT FLOW CHARACTERISTIC



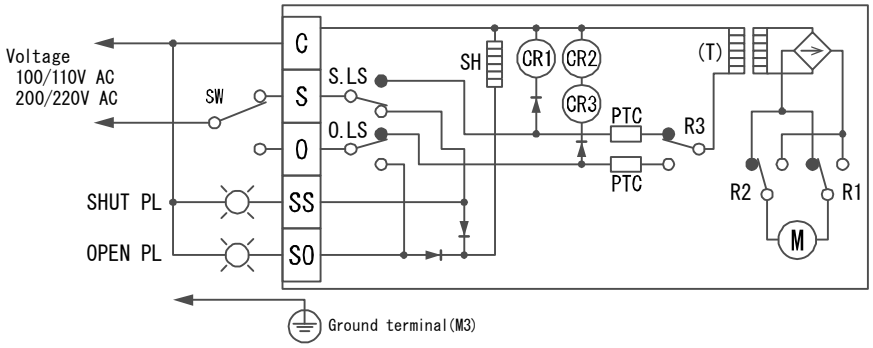
Range ability 50:1

ELECTRIC ACTUATOR SPECIFICATIONS

AD1 HD1 type

Actuator type (☐:Voltage code)	AD1-300-☐	AD1-700-☐	HD1-300-☐	HD1-700-☐	HD1-02K-☐	HD1-06K-☐
Voltage	100 / 110 V AC ±10 % 50/60 Hz (Code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Code: 2)					
Rated torque [N·m]	30	70	30	70	200	600
Operation time [s]	3 to 4	6 to 10	1 to 2	3 to 5	8 to 15	24 to 45
Power consumption (Max) [VA]	100		150			
Motor	DC motor					
Overload protection	Thermistor					
Method of operation	Transfer input type					
Operation	Power to S → SHUT (SHUT PL is lit.) Power to O → OPEN (OPEN PL is lit.)					
Output signal rating	Resistance load 10 A 250 V AC (Minimum 27 mA)					
Duty cycle	20 % 15 min. (When ambient temperature is over 50 ºC, 10 % 15 min.)					
Ambient temperature	-20 to 55 °C					
Space heater	0.8 W					
Manual operation	Manual over-ride with clutch. (Direct operation / 06K: Operation by manual shaft.)					
Enclosure	Equivalent to IP65 (IEC 60529)					
Housing material	Aluminum alloy diecast (acrylic resin baking finish)					
Wire connection	Terminal Block: M3, Ground terminal: M3					
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.					

WIRING

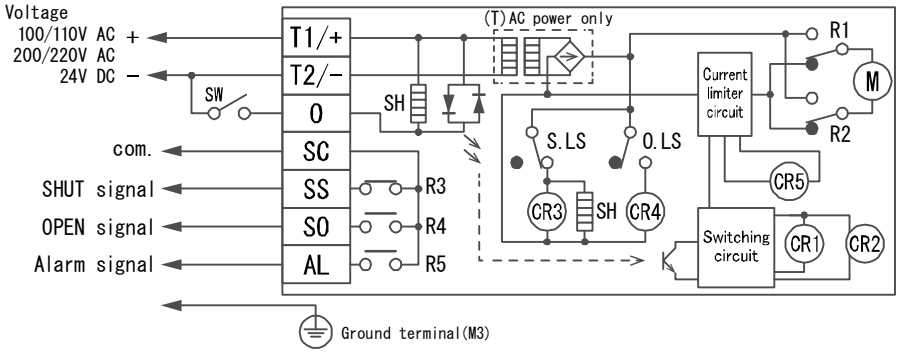


ELECTRIC ACTUATOR SPECIFICATIONS

AD2 HD2 type

Actuator type (☐:Voltage code)	AD2-300-☐	AD2-700-☐	HD2-300-☐	HD2-700-☐	HD2-02K-☐	HD2-06K-☐
Voltage	100 / 110 V AC ±10 % 50/60 Hz (Code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Code: 2) 24 V DC (Code: 0)					
Rated torque [N·m]	30	70	30	70	200	600
Operation time [s]	3 to 4	6 to 10	1 to 2	3 to 5	AC: 8 to 15 DC: 12 to 17	AC: 24 to 45 DC: 36 to 50
Power consumption (Max) [VA]	AC: 100 DC: 80		AC: 150 DC: 120			
Motor	DC motor					
Overload protection	Current limiter					
Method of operation	a-contact input type, with built-in relay					
Operation	SW is OFF → SHUT (R3 SW is ON) SW is ON → OPEN (R4 SW is ON) Over torque → R5 SW is ON					
Input signal current	10 mA 100 V AC / 6.5 mA 200 V AC / 38 mA 24 V DC (Leakage current in SW: less than 1 mA) *O terminal input: Photo coupler					
Output signal rating	Resistance load 0.5 A 125 V AC 1 A 24 V DC					
	Micro load 1 mA 5 V DC					
Alarm signal	Output when the motor protection circuit operates by the overload. (it returns by power supply OFF or reverse operating signal)					
Duty cycle	20 % 15 min. (When ambient temperature is over 50 ºC, 10 % 15 min.)					
Ambient temperature	-20 to 55 °C					
Space heater	0.8 W					
Manual operation	Manual over-ride with clutch. (Direct operation / 06K: Operation by manual shaft.)					
Enclosure	Equivalent to IP65 (IEC 60529)					
Housing material	Aluminum alloy diecast (acrylic resin baking finish)					
Wire connection	Terminal Block: M3, Ground terminal: M3					
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.					

WIRING



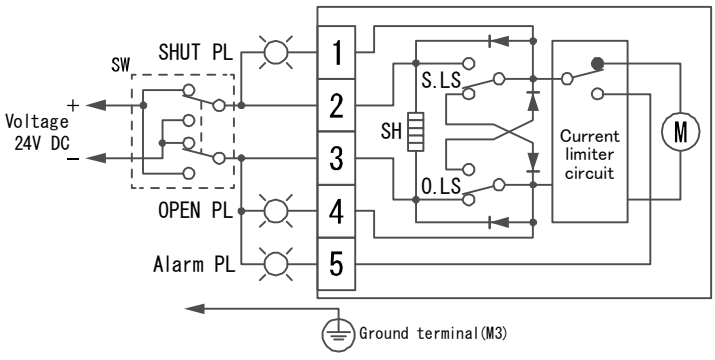
Note) Leakage current in SW: less than 1 mA.

ELECTRIC ACTUATOR SPECIFICATIONS

AD0 HD0 type

Actuator type	AD0-300-0	AD0-700-0	HD0-300-0	HD0-700-0	HD0-02K-0	HD0-06K-0
Voltage	24 V DC					
Rated torque [N·m]	30	70	30	70	200	600
Operation time [s]	3 to 4	6 to 10	1 to 2	3 to 5	12 to 17	36 to 50
Power consumption (Max) [VA]	80		120			
Motor	DC motor					
Overload protection	Current limiter					
Method of operation	Switching polarity type					
Operation	[2] + [3] - → SHUT (SHUT PL is lit.) [3] + [2] - → OPEN (OPEN PL is lit.) Over torque → Alarm PL is lit.					
Output signal rating	Resistance load 1 A to 35 mA 24 V DC					
Duty cycle	20 % 15 min. (When ambient temperature is over 50 ºC, 10 % 15 min.)					
Ambient temperature	-20 to 55 °C					
Space heater	3 W		Space heater			
Manual operation	Manual over-ride with clutch. (Direct operation / 06K: Operation by manual shaft.)					
Enclosure	Equivalent to IP65 (IEC 60529)					
Housing material	Aluminum alloy diecast (acrylic resin baking finish)					
Wire connection	Terminal Block: M3, Ground terminal: M3					
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.					

WIRING

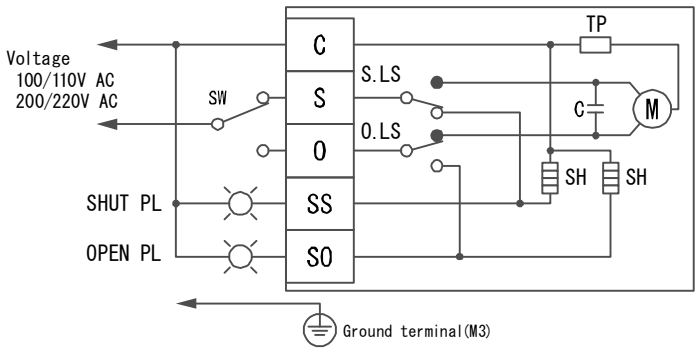


ELECTRIC ACTUATOR SPECIFICATIONS

AE1 type

Actuator type (☐:Voltage code)	AE1-120-☐	AE1-300-☐	AE1-600-☐	AE1-02K-☐	AE1-06K-☐
Voltage	100 / 110 V AC ±10 % 50/60 Hz (Code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Code: 2)				
Rated torque [N·m]	12	30	60	200	600
Operation time [s]	10 / 8.5 (50/60 Hz)	7.2 / 6 (50/60 Hz)	15 / 12 (50/60 Hz)	30 / 25 (50/60 Hz)	
Power consumption [VA]	19	60		110	350
Motor	Synchronous motor	Reversible motor self-contained mechanical brake			
Overload protection	Thermal protector				
Method of operation	Transfer input type				
Operation	Power to S → SHUT (SHUT PL is lit.) Power to O → OPEN (OPEN PL is lit.)				
Output signal rating	Resistance load 3 A 250 V AC (Minimum 0.1 A)				
Duty cycle	20 % 15 min.				
Ambient temperature	-20 to 55 ºC				
Space heater	3 W				
Manual operation	Manual shaft				
Enclosure	Equivalent to IP65 (IEC 60529)				
Housing material	Aluminum alloy diecast (acrylic resin baking finish)				
Wire connection	Terminal Block: M3, Ground terminal: M3				
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.				

WIRING



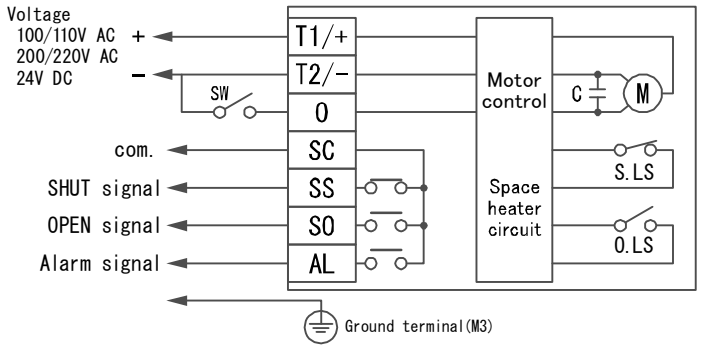
Note) Control switch should be prepared one by one for actuator.
Do not operate two or more actuator from one switch. It might malfunction.

ELECTRIC ACTUATOR SPECIFICATIONS

AE2 type

Actuator type (☐:Voltage code)	AE2-120-☐	AE2-300-☐	AE2-600-☐	AE2-02K-☐	AE2-06K-☐
Voltage	100 / 110 V AC ±10 % 50/60 Hz (Code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Code: 2)				
Rated torque [N·m]	12	30	60	200	600
Operation time [s]	11 / 9.5 (50/60 Hz)	8.2 / 7 (50/60 Hz)	16 / 13 (50/60 Hz)	31 / 26 (50/60 Hz)	
Power consumption [VA]	26	60		110	350
Motor	Synchronous motor	Reversible motor self-contained mechanical brake			
Overload protection	Timer				
Method of operation	a-contactinput type, with built-in relay				
Operation	SW is OFF → SHUT (SHUT signal is output.) SW is ON → OPEN (OPEN signal is output.) Overtorque → Alarm signal is output				
Input signal current	9 mA (O-terminal) Leakage current in SW: less than 1 mA				
Output signal rating	Resistance load 0.5 A 125 V AC 1 A 24 V DC				
	Micro load 1 mA 5 V DC				
Alarm signal	Output when the motor protection circuit operates by the overload. (it returns by power supply OFF or reverse operating signal)				
Duty cycle	20 % 15 min.				
Ambient temperature	-20 to 55 ºC				
Space heater	3 W				
Manual operation	Manual shaft				
Enclosure	Equivalent to IP65 (IEC 60529)				
Housing material	Aluminum alloy diecast (acrylic resin baking finish)				
Wire connection	Terminal Block: M3, Ground terminal: M3				
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.				

WIRING



Note) Do not use control switch with current leakage (more than 1 mA) such as TRIAC or relay with CR.

ELECTRIC ACTUATOR SPECIFICATIONS

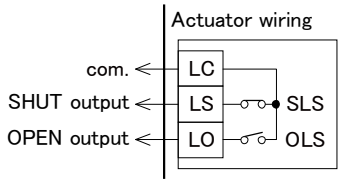
OPTIONAL PARTS

Specifications		Code No.	AD	HD	AE	Remarks
Auxiliary limit switch	Select limit switch depending on the load	L0	○	○	○	For standard signal
		L2	○	○	○	For micro load signal
OPEN/CLOSE speed control board		I0	○			Set the operating time between 1.5 and 30 times.
Manual lever handle		M0	○	○		Mounted on the drive shaft. (except 06K)

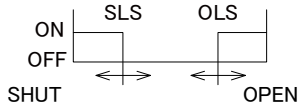
*Auxiliary limit switch: Please refer to the specifications.

WIRING (OPTION)

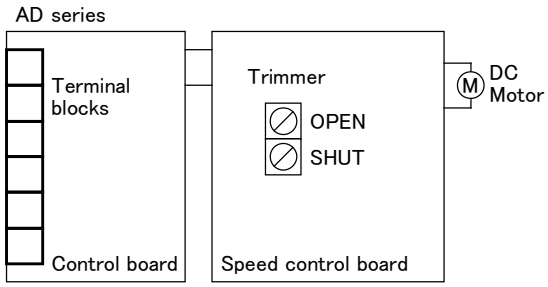
L0, L2	Auxiliary limit switch	I0	Speed control board (only for AD series)



At CLOSE side, LC and LS is ON.
At OPEN side, LC and LO is ON.



ON point can be reset by adjusting the cam.



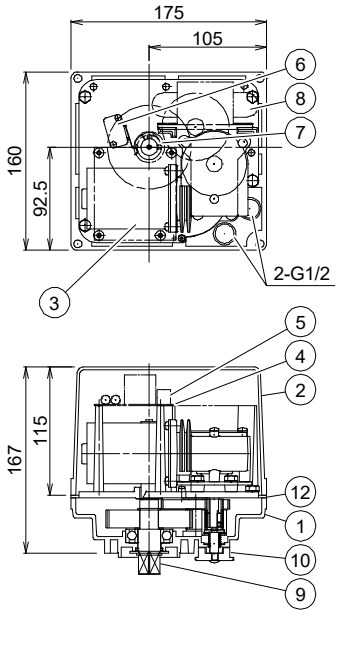
Operating speed (OPEN/CLOSE) can be adjusted by "OPEN"/"SHUT" trimmer. Turning clockwise increases the operating time.

ELECTRIC ACTUATOR SPECIFICATIONS

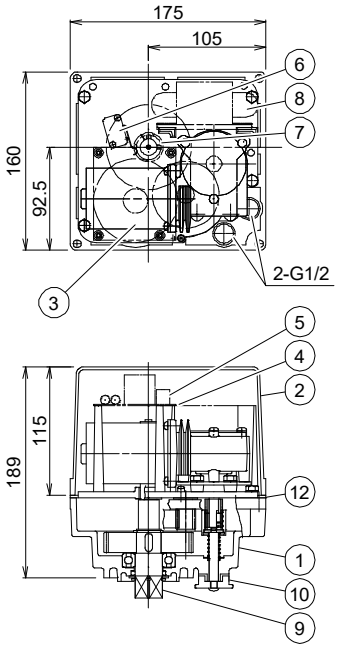
DIMENSIONS

AD, HD

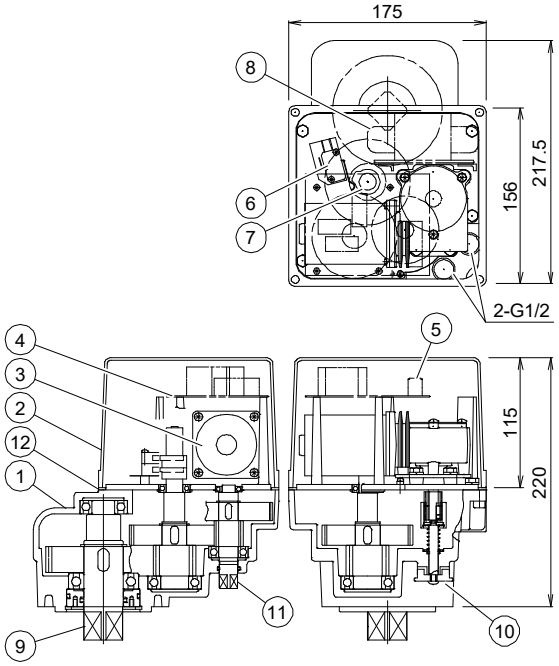
AD-300, 700 HD-300, 700



HD-02K



HD-06K

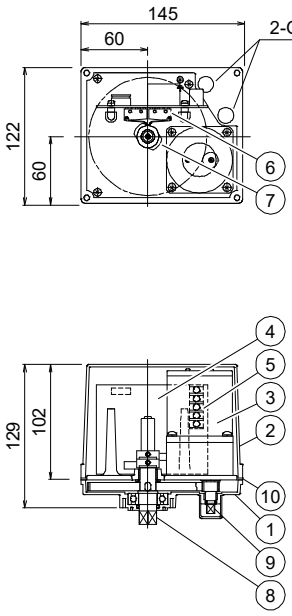


Parts name

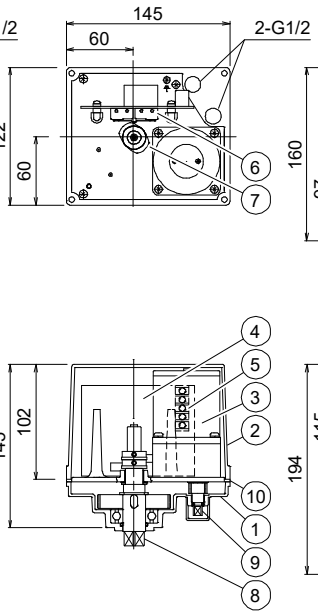
1	Body	6	Limit switch	11	Manual shaft (For 06K)
2	Motor cover	7	SW setting cam	12	Rubber packing
3	Motor	8	Transformer		
4	Control board	9	Drive shaft		
5	Terminal block	10	Manual clutch		

AE

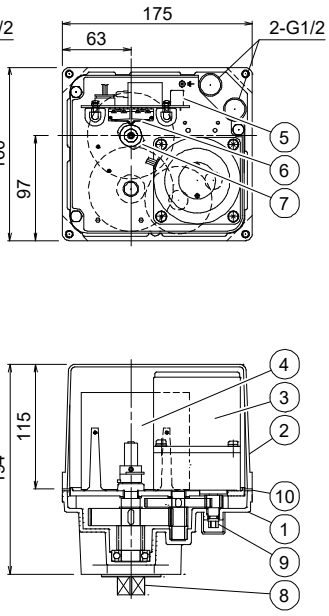
AE-120, 300, 360



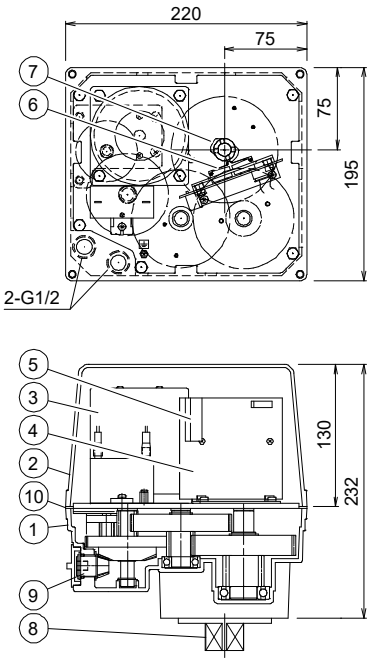
AE-600, 700



AE-02K



AE-06K



Parts name

1	Body	5	Terminal block	9	Manual shaft
2	Motor cover	6	Limit switch	10	Rubber packing
3	Motor	7	SW setting cam		
4	Control board	8	Drive shaft		

HANDLING & STORAGE

①HANDLING

Do not drop or throw the product as it may break.

②STORAGE

- Store away from dust, moisture and direct sunlight. If possible, store in the original package.
- Do not remove a dust proof cap until the piping.

③CHECKING

- Check the product code, power supply, and voltage before installation.
- Make sure that the bolts are not loose.

INSTALLATION

①PRECAUTIONS

- Flush the pipeline carefully before installing the damper. Foreign particles, such as sand or pieces of welding electrode, will damage the disk and seats.
- For dampers with specified flow direction (WT), check the arrows on the product before piping.
- Damper is shipped closed. (allows quick piping.)
- Disc interference may also occur when damper is installed in pipeline with smaller than normal inside diameter such as thick wall pipe, or lining pipe. Suitable corrective measurement must be taken (taper boring the pipe or pipe liner, etc.)

②PIPING FLANGES

- Gasket should be selected appropriately to suit the fluid, pressure and temperature. Use spring washer to prevent from decreasing surface pressure gasket when the temperature change happens frequently.
- Wafer type butterfly damper is put between two seats of flanged-end and tightened with long bolts.
- Before bolts are tightened, damper should be centered within the bolts to prevent possible disc interference or damage by contact with the pipe or flange.
- Tighten all bolts using crossover method to load the joint evenly.

③ENVIRONMENT

- Do not install in place where corrosive gas is present or where vibration is heavy (0.5 G or more).
- When radiant heat causes the surface temperature of the control unit to exceed 50°C, provide an appropriate shielding plate.
- If there is a possibility that the fluid and drive part freeze, please take measures to prevent freezing.

④POSITIONING

Should be positioned through 90° upward from horizontal. Provide space around the product to allow manual operation, inspection and replacement work.

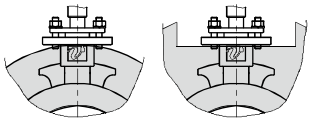
Maintenance space for upper part of actuator.	
AE (120 / 300 / 600)	More than 105 mm
AE (02K / 06K) AD HD	More than 120 mm

⑤OTHER NOTES

Until the wiring is completed there must be no condensation or flooding in the interior of the actuator, after piping. Protective caps on the cable gland are not waterproof.

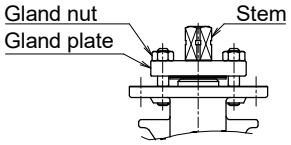
⑥INSULATION WORK

- For maintenance of gland packing, insulation should be below the ground part.
- The upper part of the ground plate part is a heat dissipation part, do not insulate it.



TIGHTEN THE GLAND NUTS

- Check that there is no leakage from the gland packing.
- If it leakage, tighten gland nuts by alternately. Do not over-tighten the gland nuts.



Damper size [mm]	Recommended torques [N·m]
040 050 065	1
080 100 125	2
150 200 250 300	5
350 400	8

WIRING

①PRECAUTIONS

- Remove the actuator cover before wiring.
- Two G1/2 electrical connections are provided with a cable gland and plug. Usable cable size is Φ6 to 12 mm.
- When using a flexible tube, dew condensation may occur inside the actuator due to respiration from the inside of the tube and malfunction may result. Seal the flexible tube connector part with a sealant.
- Sealants that affect the electrical contacts should not be used inside the electric actuator.
- If long distance wiring or low voltage operation, check that terminal voltage is in the proper range.

②CONNECTION

- Do not wiring outdoors on a rainy day.
- Check the power supply and voltage.
  Connect the signal as shown in the wiring diagram.
  Do not connect unnecessarily terminal.
- Actuator should be electrically grounded.
  Use the terminal marked (⏚) inside the actuator.

PREVENT DEW CONDENSATION

- When installing the cover after wiring, perform the bolt by the temporary tightening procedure and the permanent tightening procedure to tightly and securely tighten the rubber packing so that water does not enter from the outside.
- Tighten the cable gland nut so that there is no leakage from the wire entrance.

CONTROL

①AE1

Each control switch should be prepared one by one. Do not operate two or more from one switch at the same time.

②AD2, HD2, AE2

When using control switch with current leakage (more than 1 mA) such as TRIAC or relay with CR, it can cause malfunction.

③DC POWER SUPPLY

- Battery or full wave rectification can be used.
- Consider an inrush current of motor.
  (It is 1.5 to 3 times of consumed current.)
- When using a DC voltage, be selected the wire thickness by the wiring distance.
- Do not use power supply that require more than 1 second with rise and fall time.

④USE OF OPEN/SHUT SIGNALS

Use signals within the capacity of output signal rating.

OPERATION

①TESTING

- Make sure that power supply voltage is correct. Also check operating position, wiring, speed and signals.
- During trial operation, check that damper movement and OPEN and SHUT signals are correct.

②DUTY CYCLE

Confirm that the operation frequency is within the specified duty cycle.
Use beyond the load time rate range will affect product life. Also, it may cause burnout.

> Duty cycle is a value that regulates the opening / closing frequency of the actuator. The meaning of 20 % 15 minutes for Duty cycle is that 3 minutes (20 % of 15 minutes) operation is possible.
> The calculated value obtained by dividing 3 minutes by the operation time is the number of times of operation within 15 minutes.

③ATTENTION

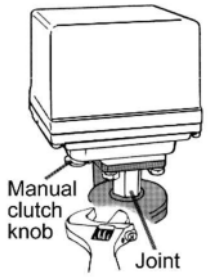
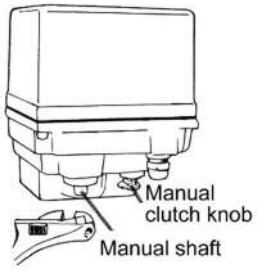
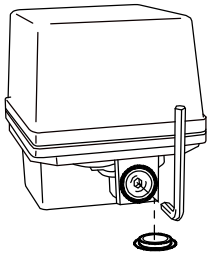
- Keep power supplied for built-in space heater to prevent condensation inside actuator.
- Do not touch the moving parts of actuator in operation.
- Do not insert a reverse signal during operation.
  It may shorten the life of product.
- Never put anything on the actuator or make it into a foothold.

MANUAL OPERATION

①PRECAUTIONS

- Be sure to turn off the power before manual operation.
- Operate manually with reference to the opening degree label. Do not turn beyond the fully open / fully closed position. Operation failure may occur during automatic operation.

②THE WAY OF OPERATION

AD HD	HD (06K)
	
Manual operation can be possible by pulling down manual clutch knob. Set the knob to manual position and operate the joint by using an adjustable wrench in the SHUT/OPEN direction. When it becomes in the position besides the range of operation in the case of manual operation, it may stopped automatic moving. In case the manual clutch knob is not easy to pull down, try moving joint or manual shaft to the opposite direction by wrench. For automatic operation, reset the knob to automatic position. Be sure to confirm that knob is reset completely.	
AE	AE (06K)
	
Turn manual shaft slowly with an adjustable wrench.	Remove the cap. Turn manual shaft solely with M8 hexagon socket screw keys.

Before automatic operation, be sure to remove wrench.

MAINTENANCE

- To prevent electric shock, be sure to turn off the power when removing the actuator cover.
- Do the routine maintenance at least once in half a year.

Inspection items

- Confirm operation of opening and closing.
- Confirm that an actuator is not hot excessively.
- Confirm existence of abnormal noise and vibration during operation.
- Confirm whether screws are loose or not.
- Confirm that water or condensation no remains in the actuator.
- Confirm the fluid temperature or pressure.
- Confirm the leak from damper stem.
- Confirm the bolt tightening torque.

TROUBLE SHOOTING

Problem	Cause	Solution
Actuator does not move.	Faulty wiring.	Correct the wiring.
	No voltage is coming.	Check the voltage.
	Incorrect voltage.	When it's burned out by excess voltage, replace the actuator.
	Short the circuit, contact failure.	Review wires and connection.
	Motor is too old.	Replace the actuator. Repair in our factory.
Operation is unstable.	Excess surge or voltage was applied.	• Replace the control board or limit switch. (Repair in our factory) • Replace the actuator.
	Rainwater entered the actuator.	• Dry the inside. • Replace the actuator.
	Added high harmonics noise from an inverter.	Attachment a filter for each inverter maker option.
	Effect of high level noise.	Use the shielded wire and ground the wiring. Separate signal wire from power line.
	Two or more dampers operated by the same switch. AE1	Each control switch should be prepared one by one.
	Switch leakage current is large. AD2 HD2 AE2	Current leakage should be less than 1 mA.

Problem	Cause	Solution
Stop in the mid position.	There is a foreign object in the damper.	Remove a foreign object.
	Damper is distorted.	Replace the damper.
	Overload protector runs because of over-torque.	Turn off the power for about 3 minutes to remove a heat from motor protection circuit. AD1 HD1 AE1
		Motor protection circuit returns by the signal of operation of an opposite direction. Turn on the power again. AD2 HD2 AE2 AD0 HD0
Received the alarm signal. AD2 HD2 AE2		
Stop automatic moving after manual operation. AD HD	Manual clutch knob is not reset.	Reset manual clutch knob.
	Out of operating range. (06K)	Reset by manual operation.
Leakage from damper gland	Gland packing is worn or distorted.	Tighten the gland nut.
		Replace the gland packing.

For more information contact
NIPPON VALVE CONTROLS, INC. for consultation.

NIPPON VALVE CONTROLS, INC.
1-21-19 Meieki minami, Nakamura-ku, Nagoya 450-0003 JAPAN
TEL: 81-52-582-6435 FAX: 81-52-582-6439