NIPPON VALVE CONTROLS, INC.

Instruction manual

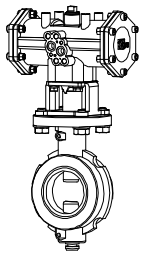
Pneumatic Actuated Butterfly Valve F FN FE FP

SP-1511

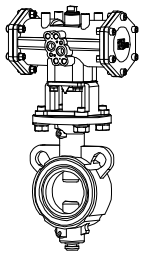
Please read this manual before installation and use.

GENERAL

It composed of wafer type butterfly valve and pneumatic actuator.



F



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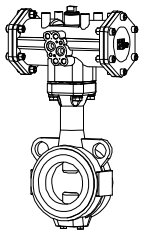


FE

Actuator

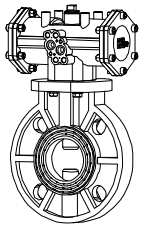
Double-acting type

PND / TAD

Single-acting type

PSO / TAO (Airless SHUT)

PSC / TAC (Airless OPEN)



FP

Valve

F	type	FCD450 body.
FN	type	FCD450 body.
FE	type	Aluminum alloy diecast body. (lightweight)
FP	type	For Corrosion resistance. (Polypropylene body)

PRODUCT CODE

F type (JIS 10K)			F	-	9		1	D			-			-			-	
FN type (JIS 5K / 10K)			F	N	9		1	D			-			-			-	
FE type (JIS 10K)			F	E	9		1	L	T		-			-			-	
FP type (JIS 10K)			F	P	9		1	Q	Q	E	-			-			-	
	(1)		(2)		(3)	(4)	(5)	(6)	(7)	(8)		(9)			(10)			(11)

(1) Actuator
- PND TAD
- PSO TAO
- PSC TAC

(2) Valve
- F- FN
- FE FP

(3) Voltage
- 9 : Air

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

(5) Connection
- 1 : JIS 10K
- 1 : JIS 5K / 10K

(6) Body material
- D : FCD450
- L : ADC12
- Q : PP

(7) Ball material
- D : FCD450
- U : SUSF316 / SCS14
- A : CAC703
- T : SCS13A
- Q : PP

(8) Seat material
- E : EPDM
- B : NBR
- V : FKM

(9) Size [mm]
- ex. 80 A → 080

(10) Option
- FR : Filter Regulator Unit
- LB : Limit Switch Box
- EP : Positioner
- EX : Smart Positioner
- ES : Smart Positioner
- ER : Smart Positioner

(11) Positioner control pattern (TAD)
- A : SHUT by 4 mA ↔ OPEN by 20 mA
- B : SHUT by 20 mA ↔ OPEN by 4 mA

(11) Positioner control pattern (PSO / TAO)
- C : OPEN by 20 mA ↔ SHUT by 4 mA (Airless SHUT)
- D : OPEN by 4 mA ↔ SHUT by 20 mA (Airless SHUT)

(11) Positioner control pattern (PSC / TAC)
- E : SHUT by 4 mA ↔ OPEN by 20 mA (Airless OPEN)
- T : SHUT by 20 mA ↔ OPEN by 4 mA (Airless OPEN)

VALVES SPECIFICATIONS

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

F FN FE FP type

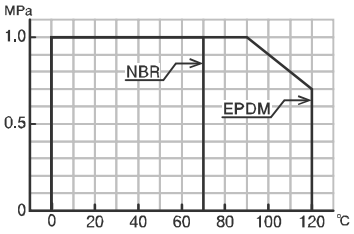
Valve type		F		FN	FE	FP	
Design		Wafer type		Wafer type	Wafer type	Wafer type	
Connection		JIS Flanges 10K		JIS Flanges 5K / 10K	JIS Flanges 10K	JIS Flanges 10K	
Fluid							
Max pressure		1 MPa	0.5 MPa	1 MPa	0.98 MPa	1 MPa	0.7 MPa
Size [mm]		050 to 250	300	050 to 200	040 to 300	040 to 150	200 to 300
Material	Body	FCD450		FCD450	ADC12	PP	
	Disc	FCD450 (CNi) CAC703 SUSF316 / SCS14		FCD450 (CNi) CAC703 SUSF316 / SCS14	SCS13A	PP	
	Seat	EPDM NBR FKM		EPDM NBR	EPDM NBR	EPDM	
Stem seal	O-ring	NBR FKM		NBR	NBR	EPDM	

PRESSURE & TEMPERATURE RATING

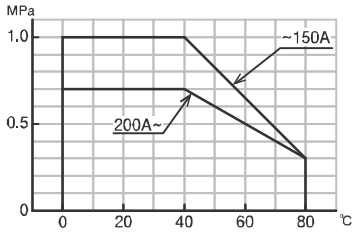
F / FN

Seat material	Fluid temp.	Use
EPDM	-20 to +80 °C	
NBR	-10 to +60 °C	
FKM	-5 to +80 °C	

FE



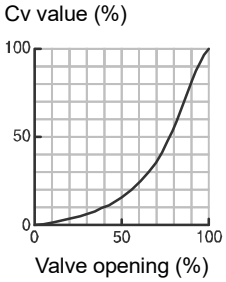
FP



NOTE) • EPDM is not recommended for hydrocarbon-based oil or grease.
• Hot water can be used at temperatures of up to 80 °C (FE: 90 °C). Steam cannot be used.
• CAC703 and EPDM are suitable for seawater. (F / FN)

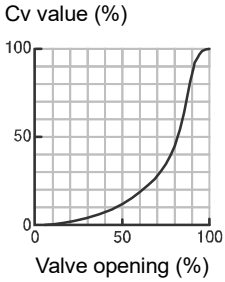
INHERENT FLOW CHARACTERISTIC

F / FN



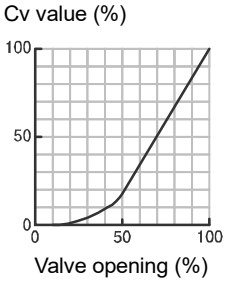
Range ability 30:1

FE



Range ability 30:1

FP



Range ability 30:1

PNEUMATIC ACTUATOR SPECIFICATIONS

PND type

Classification	Double-acting type			
Actuator type	PND-03S	PND-03D	PND-04D	PND-05D
Weight [kg]	0.2	0.3	0.5	0.8
Air consumption [ℓ] (round-trip)	0.05	0.08	0.19	0.35
Operation time [s]	Less than 1.			
Operation	SHUT by air to port A. ↔ OPEN by air to port B.			
Air pressure	0.4 to 0.7 MPa			
Piping connection	Rc 1/8			
Method of operation	Scotch yoke			
Housing material	PPS resin			
Ambient temperature	-10 to 50 °C (Please be careful when you use in 5 °C or less, so that there no freeze.)			
Manual operation	Operates the upper shaft of the actuator directly.			

PSO PSC type

Classification	Single-acting type (Spring-return)				
Actuator type	PSO - 03S PSC - 03S	PSO - 03D PSC - 03D	PSO - 04D PSC - 04D	PSO - 05D PSC - 05D	PSO - 05W PSC - 05W
Weight [kg]	0.2	0.4	0.6	1.2	1.8
Air consumption [ℓ] (round-trip)	0.03	0.04	0.1	0.2	0.53
Air exit	One side	Both sides			
Operation time [s]	Less than 1.				
Operation	PSO : OPEN by air to intake port. ↔ SHUT by spring-return. (Airless SHUT) PSC : SHUT by air to intake port. ↔ OPEN by spring-return. (Airless OPEN)				
Air pressure	0.4 to 0.7 MPa				
Piping connection	Rc 1/8				
Method of operation	Scotch yoke				
Housing material	PPS resin				
Ambient temperature	-10 to 50 °C (Please be careful when you use in 5 °C or less, so that there no freeze.)				
Manual operation	No manual operation.				

PNEUMATIC ACTUATOR SPECIFICATIONS

TAD type

Classification	Double-acting type						
Actuator type	TAD-040	TAD-050	TAD-063	TAD-080	TAD-100	TAD-125	TAD-160
Weight [kg]	0.9	1.3	2.1	3.4	6.1	9.8	18.2
Air consumption [ℓ] (round-trip)	0.11	0.18	0.34	0.66	1.36	2.72	5.56
Operation	SHUT by air to port A. ↔ OPEN by air to port B.						
Air pressure	0.4 to 0.7 MPa						
Piping connection	Rc 1/8	Rc 1/4					
Method of operation	Rack-and-pinion	Scotch yoke					
Housing material	Aluminum alloy						
Ambient temperature	-10 to 50 °C (Please be careful when you use in 5 °C or less, so that there no freeze.)						
Manual operation	Operates the upper shaft of the actuator directly.						

TAO TAC type

Classification	Single-acting type (Spring-return)						
Actuator type	TAO-040 TAC-040	TAO-050 TAC-050	TAO-063 TAC-063	TAO-080 TAC-080	TAO-100 TAC-100	TAO-125 TAC-125	TAO-160 TAC-160
Weight [kg]	2.3	3	4.9	8.5	16.4	27.6	51.2
Air consumption [ℓ] (round-trip)	0.23	0.34	0.67	1.26	2.62	4.44	8.77
Operation	TAO : OPEN by air to intake port. ↔ SHUT by spring-return. (Airless SHUT) TAC : SHUT by air to intake port. ↔ OPEN by spring-return. (Airless OPEN)						
Air pressure	0.4 to 0.7 MPa						
Piping connection	Rc 1/4						
Method of operation	Rack-and-pinion	Scotch yoke					
Housing material	Aluminum alloy						
Ambient temperature	-10 to 50 °C (Please be careful when you use in 5 °C or less, so that there no freeze.)						
Manual operation	No manual operation.	Option: MT (Manual handle unit)					

PNEUMATIC ACTUATOR SPECIFICATIONS

OPTIONAL PARTS

Classification			Code	PND	PSO	PSC	TAD	TAO	TAC
Speed Controller with bypass valve (Housing material: PPS)			BS				○		
FR Unit (Regulator with Filter) TA2-FR (KONAN)			FR	○	○	○	○	○	○
Limit Switch Box (Standard load signal)			LB	○	○	○	○	○	○
Explosion Proof Limit Switch / VCX7001 (azbil) Ex d e II C T6			LR				○	○	○
Speed Controller (with One-touch Fitting) One set			SE	○	○	○	○	○	○
Speed Controller (with One-touch Fitting) Two sets			SS	○			○		
Speed Controller (with One-touch Fitting) Dual Speed Controller			SF		○	○		○	○
Manual handle unit (for TAO-050 to 160 / TAC-050 to 160)			MT					○	○
Sealing the spring unit. (Oil-free)			92					○	○
Smart positioner for PSO / PSC (Except 03S)			EX		○	○			
Explosion Proof Electro-Pneumatic Positioner Ex dmb II B T5 (TIIS)			EP				○	○	○
Smart positioner			ES				○		
			ER					○	○
Smart positioner (with 4 to 20mA output)			ET				○		
			EU					○	○
Positioner operation	SHUT by 4 mA. ↔ OPEN by 20 mA.		A				○		
	SHUT by 20 mA. ↔ OPEN by 4 mA.		B				○		
	OPEN by 20 mA. ↔ SHUT by 4 mA. (Airless SHUT)		C		○			○	
	OPEN by 4 mA. ↔ SHUT by 20 mA. (Airless SHUT)		D		○			○	
	SHUT by 4 mA. ↔ OPEN by 20 mA. (Airless OPEN)		E			○			○
	SHUT by 20 mA. ↔ OPEN by 4 mA. (Airless OPEN)		T			○			○
Smart positioner SHUT by loss of signal	SHUT by 4 mA. ↔ OPEN by 20 mA.		A				○		
	SHUT by 20 mA. ↔ OPEN by 4 mA.		B				○		
	OPEN by 20 mA. ↔ SHUT by 4 mA. (Airless SHUT)		C					○	
	OPEN by 4 mA. ↔ SHUT by 20 mA. (Airless SHUT)		D					○	
	SHUT by 4 mA. ↔ OPEN by 20 mA. (Airless OPEN)		Y						○
Smart positioner OPEN by loss of signal	SHUT by 20 mA. ↔ OPEN by 4 mA.		W				○		
	OPEN by 4 mA. ↔ SHUT by 20 mA. (Airless SHUT)		X					○	
	SHUT by 4 mA. ↔ OPEN by 20 mA. (Airless OPEN)		E						○
	SHUT by 20 mA. ↔ OPEN by 4 mA. (Airless OPEN)		T						○
5-Port Solenoid Valve		Voltage: 100 V AC	1S	○	○	○			
(with speed controller, silencer, DIN connector)		Voltage: 200 V AC	2S	○	○	○			
		Voltage: 110 V AC	3S	○	○	○			
		Voltage: 220 V AC	4S	○	○	○			
VZ3190-□D-X213		Voltage: 24 V DC	5S	○	○	○			

SOLENOID VALVE (Applicable Pneumatic Actuators: PND-05D, TAD TAO TAC)

Classification (☐: Voltage code)			Code	
5-port Solenoid Valve Return (with bypass valve)	Lead wire	4N3S102K-L☐	N43SL☐	☐: Voltage 1 : 100V AC 3 : 200V AC 5 : 24V DC
	DIN Connector	4N3S102K-D☐	N43SD☐	
	DIN Connector (with lamp)	4N3S102K-N☐	N43SN☐	
	Watertight cover	4N3S102K-W☐	N43SW☐	
5-port Explosion proof solenoid valve Return (with bypass valve)	Conduit	4N4S102K-E01-H☐B0-R	4N4S01-☐B0, NO	
	Flame proof packing (Cable size Φ9.5 to 10.4 mm)	4N4S102K-E10-H☐B0-R	4N4S10-☐B0, NO	

Operate by solenoid valve (Normally Open)

PND / TAD	SHUT by solenoid off.	↔	OPEN by power to solenoid.
PSO / TAO (Airless SHUT)	OPEN by power to solenoid.	↔	SHUT by solenoid off. (Spring-return)
PSC / TAC (Airless OPEN)	SHUT by power to solenoid.	↔	OPEN by solenoid off. (Spring-return)

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.

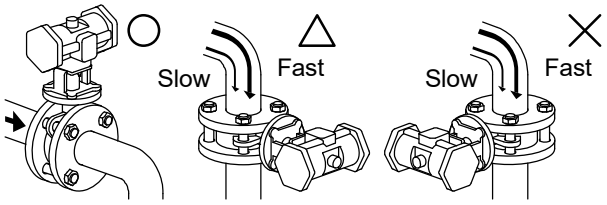
③CHECKING

- Check the product code before installation.
- Make sure that the bolts are not loose.

INSTALLATION

①PRECAUTIONS

- Flush the pipeline carefully before installing the valve. Foreign particles, such as sand or pieces of welding electrode, will damage the disk and seats.
- Seat has ribs for tight gasket seating. Do not use gasket.
- Valve is shipped closed. (PSC is open.) (TAC is closed with a manual unit. Without a manual is open.)
- The butterfly valve should be piped upstream of the elbow. When piping downstream from the elbow, considered a straight line that is at least five times the length of the pipe.



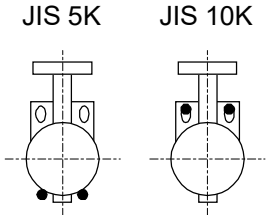
- The valve stem should be mounted perpendicular to the flow for biased fluid.
- Disc interference may also occur when valve is installed in pipeline with smaller than normal inside diameter such as thick wall pipe, or lining pipe. Suitable corrective measurement must be taken (taper boring the pipe or pipe liner, etc.)
- When you use a vinyl chloride flange, there is a caliber to be internal off the corners. Please cut off the corners with reference to the following. (F / FN)

Valve size [mm]		Chamfer [mm]
FN	F	
150	150	1.5
-	200	2.5
-	250	3
-	300	2

- Avoid oil or grease when using EPDM seat.

②PIPING FLANGES (F / FN / FE)

- Class JIS 5K and JIS 10K pipe flanges can be used for FN series. See the drawing below for centering the valve with bolts.



- Wafer type butterfly valve is put between two seats of flanged-end and tightened with long bolts.
- Before bolts are tightened, valve 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.
- When using a resin flange, if the connecting bolt is tightened too much, the flange may deform and leak.

Recommended torque			
Valve size [mm]			Torque [N·m]
F	FN	FE	
050 065 080 100	050 065 080 100	040 050 065 080 100	20
125 150 200	125 150 200	125 150 200	25
250 300	-	250 300	30

③CAUTION ON PLASTIC VALVE (FP)

Flange connection

- Use same material as same as opposite piping flanged. For metal piping, use flanged washer and it is considered that there is no heavy piping stress.
- When the piping, wick gap between a pipe and a valve and a bending cause by an angle difference, it may cause switching incompatible breakage, and leakage from fluid.
- Shaft, face to face dimension distance and flanged angle unit correctly.
- Use the flanged bolt on by bolt side and nut side, tighten all bolts using crossover method to load the joint evenly.

Recommended torques	
Valve size [mm]	Torque [N·m]
FP	
040 050 065 080	20
100 125 150	25
200 250 300	60

Expansion measure of pipe line

- Heat expansion occurs in pipe line depends on by temperature change after piping and temperature condition of internal fluid. Compression or contraction by heat stress acts also on a valve. Especially for metal piping, it happens to plastic valve as weak in intensity. Perform expansion treatment before or after a valve and it is considered that a burden is not placed on valve.

④ENVIRONMENT

- 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.
- For single-acting type, prevent water and dust from coming into air exit.

⑤POSITIONING

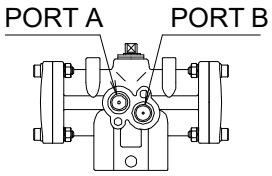
Should be positioned through 90° upward from horizontal. Provide space around the product to allow manual operation, inspection and replacement work.

AIR PIPING

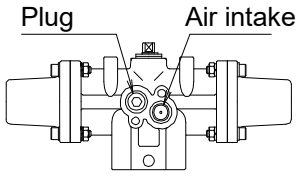
- Pneumatic actuator has an air supply ports to operate piston.

Double-acting type
PND : Rc 1/8
Coupling OD
less than 14.5 Φ

TAD-040 : Rc 1/8
TAD-050 to 160 : Rc 1/4



Single-acting type
PSO / PSC : Rc 1/8
TAO / TAC : Rc 1/4



- Piping of double-acting type is connected by seal tape on PORT A / B. Piping of single-acting type is put seal tape only on the air intake port.
- PND / PSO / PSC: PPS resin air supply port may be damaged if over tighten, please lightly tighten by hand.
- Never put anything on the actuator or make it into a foothold.

OPERATION

①AIR SOURCE

- Use the filtered dry air (less than 40 μ).
- Extra attention is needed where it's cold climate (below 5 °C).
- When air pressure is high, reduce it to standard pressure (0.4 to 0.7 MPa). Air pressure should not exceed 0.7 MPa during operation test.
- Capacity of compressor and air tank are to be calculated by capacity of piping and air consumption. A margin of 30% is required.

②TEST OPERATION

Check the operation of pneumatic actuator before fluid enters the piping.

Double-acting type	Stop the air from the air source. Release the residual pressure in the air cylinder. Open the air equalizer. Move the manual shaft of actuator with a wrench.
Single-acting type	Send the standard pressure air. Confirm the opening / closing operation by slowly moving the actuator.

③TESTING

After piping, check following points.

- Piping is correct.
- Air or fluid leakage from connection. Flow direction of air is correct.
- Air pressure is in the range.
- Nothing interferes with operation when limit switch or solenoid valve is attached.

④ATTENTION

The opening and closing operation of the pneumatic actuator is fast, which may affect the product life. Please adjust the operation time of pneumatic actuator using a speed controller.

Valve size [mm]	Adjustment of operation time.
Less than 040	More than 1 second
050 or more	More than 2 seconds

MANUAL OPERATION

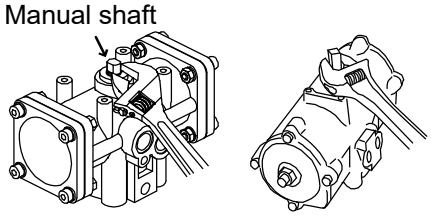
- Double-acting; stop the air supply and do not leave the air inside of cylinder.
- Single-acting; cannot be operated manually.

Optional code with the handle: TAO-MT / TAC-MT.

- Before automatic operation, be sure to remove wrench.

OPERATION (PND / TAD)

After turning air pressure to 0, turn manual shaft slowly with a smooth-jawed wrench to check the direction of OPEN/SHUT position.



PND TAD

MAINTENANCE

- Do the routine maintenance at least once in half a year.
- Do not set or take spring unit parts apart after installing the pneumatic single-acting actuator.

Can be used with no oil supply.

- Confirm the air leakage.
- Confirm the air supply pressure.
- Confirm the dirt or grit inside of cylinder.

Lubrication Procedure (TAD / TAO / TAC)
In case of lubricating, use turbine oil or the equivalent through a lubricator. (ISO VG 32.46).
Once lubricate, do the regularly.

Inspection items

- Confirm operation of opening and closing.
- Confirm whether screws are loose or not.
- Confirm the fluid temperature or pressure.
- Confirm the leak from valve stem.
- Confirm the bolt tightening torque.

TROUBLESHOOTING

Problem	Cause	Solution
Fail to operate.	Air doesn't come out.	Supply air.
	Air pressure is too low.	Adjust to standard pressure level.
Stop in the mid position.	There is a foreign object in the butterfly valve.	Remove a foreign object.
	Valve is distorted.	Replace the valve.
Leakage from valve seat	Damaged on valve seat.	Replace the valve.
		Replace the valve seat. (F)
Leakage from valve stem	O-ring is worn.	Replace the valve.
		Replace the O-ring (F)

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

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