

IWAKI Auto-Dampener

PDA-W

Instruction Manual

⚠ Read this manual before use of product

This is patent pending product.

We thank you for selecting IWAKI Auto-dampener PDA-W series. This instruction manual, which is divided into five sections of "Safety", "Outline of product", "Installation", "Operation" and "Maintenance", deals with the correct handling and operation procedures for the auto-dampener. To make maximum use and to ensure safe and long time operation of the auto-dampener, please read this manual thoroughly and carefully prior to operating the auto-dampener.

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This instruction manual should be kept on hand by end users for quick reference. It is recommended that each user, after reading the instruction manual thoroughly, keep it in a position close to the pump system and where it may be easily accessed by operator at any time whenever necessary.

Contact us if you have any questions.



Important instruction

For the Safe and Correct Handling of the Auto-dampener

- Before use of the auto-dampener, read this "Safety Section" to prevent accidents and to avoid the damage or loss of assets.
- Observe and abide by the instructions described in this "Safety Section".
These instructions are very important for protecting pump users or other persons from hazard or loss of assets.
- Meaning of symbols
Following two symbols describe the extent of hazards and loss which may be brought if the instructions are not observed or if the auto-dampener is wrongly used.

 Warning	Non observance or misapplication of the contents of the "Warning" could lead to death or injury.
 Caution	Non observance or misapplication of the contents of the "Caution" could lead to injury or damage.

Types of Symbols

	Prohibited action or procedure is indicated. Inside or near this circle, a concrete activity to be prohibited is depicted.
	Action or procedure which must be performed without fail is indicated. Inside this circle, a concrete activity to be performed is depicted.

Safety instruction

WARNING

● **Power off**

Be sure to turn off power prior to any inspection/maintenance and installation works. Be careful power is not turned on unintentionally while working on the dampener. In a noisy or dark place, display a sign of "Men Working" near the power supply switch.



Power off

● **Do not remodel the auto-dampener**

Never remodel the auto-dampener. Remodeling may cause serious injury or damage due to electrical shock. We are not responsible for any accident or damage arise from modification.



No remodeling

● **Prohibited installation/storage place**

To avoid fire or injury, do not install or store the dampener in:

- Flammable atmosphere.
- Dusty place.
- Corrosive atmosphere.



Prohibited

● **Ventilation**

Risk of poisoning. Keep your working site ventilation when handling a toxic/odoriferous liquid.



● **Wear protective clothing**

Be sure to wear protective clothing such as safety goggles, protective gloves etc. during maintenance and/or inspection.



Wear protective gear

● **Returns**

When the dampener is sent back to IWAKI, drain the liquid out of the dampener and clean thoroughly with water to prevent any accidents in transportation.



Safety instruction

CAUTION

● Countermeasure against static electricity

When low electric conductivity liquid such as the ultra-pure water and the fluor inactive liquid (e.g. Fluorinert™) are handled, static electricity may generate in the pump, which may cause a static discharge and the pump breakage. Take a countermeasure for removing static electricity.



● When pump is stopped

- When pump is stopped, release pressure on the discharge side first. Otherwise the bellows may be deformed due to the residual pressure on the pump discharge side.
- If a valve is provided on the discharge side, do not close the valve when pump is stopped to avoid impactive pressure resulting in deformation of bellows or connecting plate.



Prohibited

● Pump at halt

- Do not supply air to both the right and left air-supply ports at the same time to prevent the bellows from deformation.
- If the pump or dampener is stopped for a long time with the liquid inside, the gas may be generated to penetrate the bellows and corrode the metallic parts. When the pump or dampener is stopped for 2 days or more, operate them for about 10 minutes a day to replace the air.



Prohibited



● Air exhaust port

Do not choke (make tube dia. smaller) air exhaust port to avoid bellows deformation due to residual air.



Prohibited

● Before operating the pump & dampener

Fully open pump suction and discharge valves. Confirm that liquid is filled in piping.



● Supply air pressure

Do not supply air exceeding 0.5 MPa to prevent bellows from deformation.



● Prohibited liquids

Do not handle the following liquids.

- Liquid easily crystallizes
- Liquid containing slurry
- Solvent naphtha, stripping agents or solvents



Prohibited

● Disposal of used dampener

Disposal of used or damaged dampener must be done in accordance with local laws and regulations. (Consult a licensed industrial waste products disposing company.)



● Do not close a discharge valve which is positioned beyond the dampener in operation.

Impactive pressure may deform the pump and dampener.



Prohibited

Product outline

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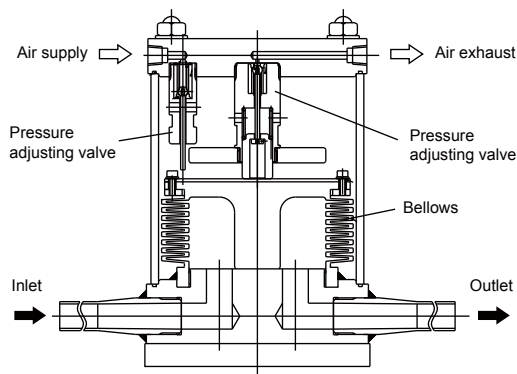
1. Unpacking and inspection



After unpacking the product, check the following points to ascertain that the product is exactly your ordered one.

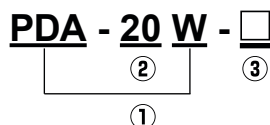
- (1) if the model code on the nameplate is the same as your order.
- (2) if the product is not broken or bolts and nuts are not loosened during transportation.

2. Outline of product



IWAKI auto-dampener the PDA-W series are exclusively designed for the pneumatic driven bellows pump to dampen the liquid pulsation. The liquid discharged from the pump is transferred to outlet through bellows. At this moment, the supply air is automatically adjusted by the pressure regulating valve and this functions to dampen the liquid pulsation.

3. Model code



- ① Series code
- ② Capacity (Max. discharge capacity of corresponding pump)
20 : 20 L/min. 40 : 40 L/min. 80 : 80 L/min.
- ③ Special version
No symbol : Standard version With symbol : Special version

4. Specification

Model	PDA-20W			PDA-40W			PDA-80W
Applied pump	FW-20, FS-30			FW-40, FS-60			FW-80
Temp. range (°C)	10-100	101-150	151-180	10-100	101-150	151-180	10-80
Max. liquid press. (MPa)	0.5	0.3	0.2	0.5	0.3	0.2	0.5
Supply air press. (MPa)	0.2-0.5	0.15-0.3	0.15-0.2	0.2-0.5	0.15-0.3	0.15-0.2	0.2-0.5
Pulsation press width (Mpa)	Within 0.06 (in case liquid viscosity is within 1 - 50 mPa•s)						
Liquid pipe connection	PFA tube ø19 mm ø 16 mm			PFA tube ø25 mm ø 22 mm			
Air piping connection	Rc 1/4 (Female)						
Wet end material	PTFE, PFA						

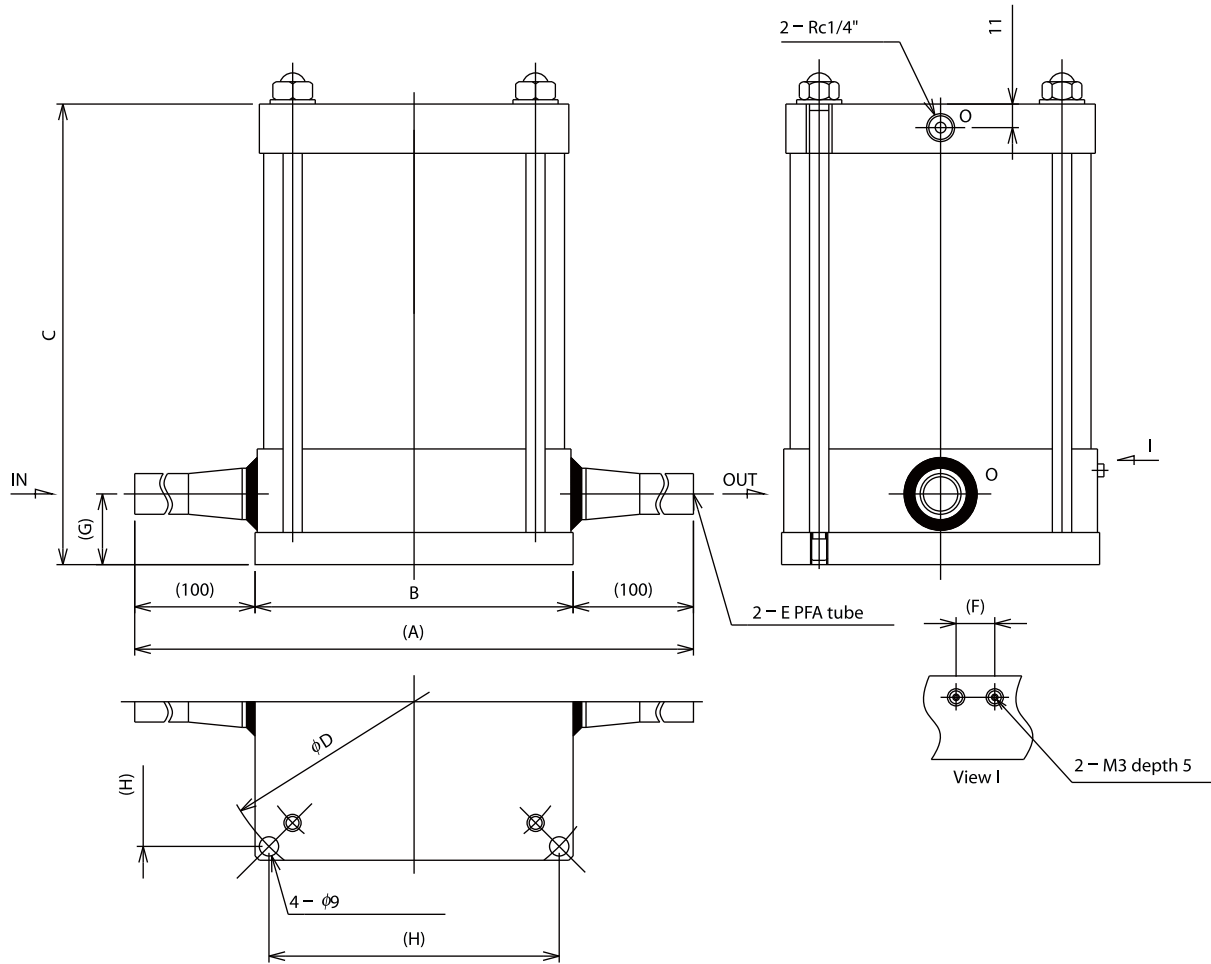
- Notes on operation

- (1) Do not handle the liquid which is apt to be crystallized or contains solids.
Otherwise life of parts is shortened.
- (2) Do not use the product exceeding the max. allowable liquid and air pressure.
Otherwise the pump or dampener may fail.
- (3) If the AC-3 controller is used to drive the pump, use the solenoid valve of double solenoid and 2-position type. If single solenoid type is used, good dampening effect can not be obtained.

Note: Performance and dimensions may be changed without prior notice.

5. Dimension and mass

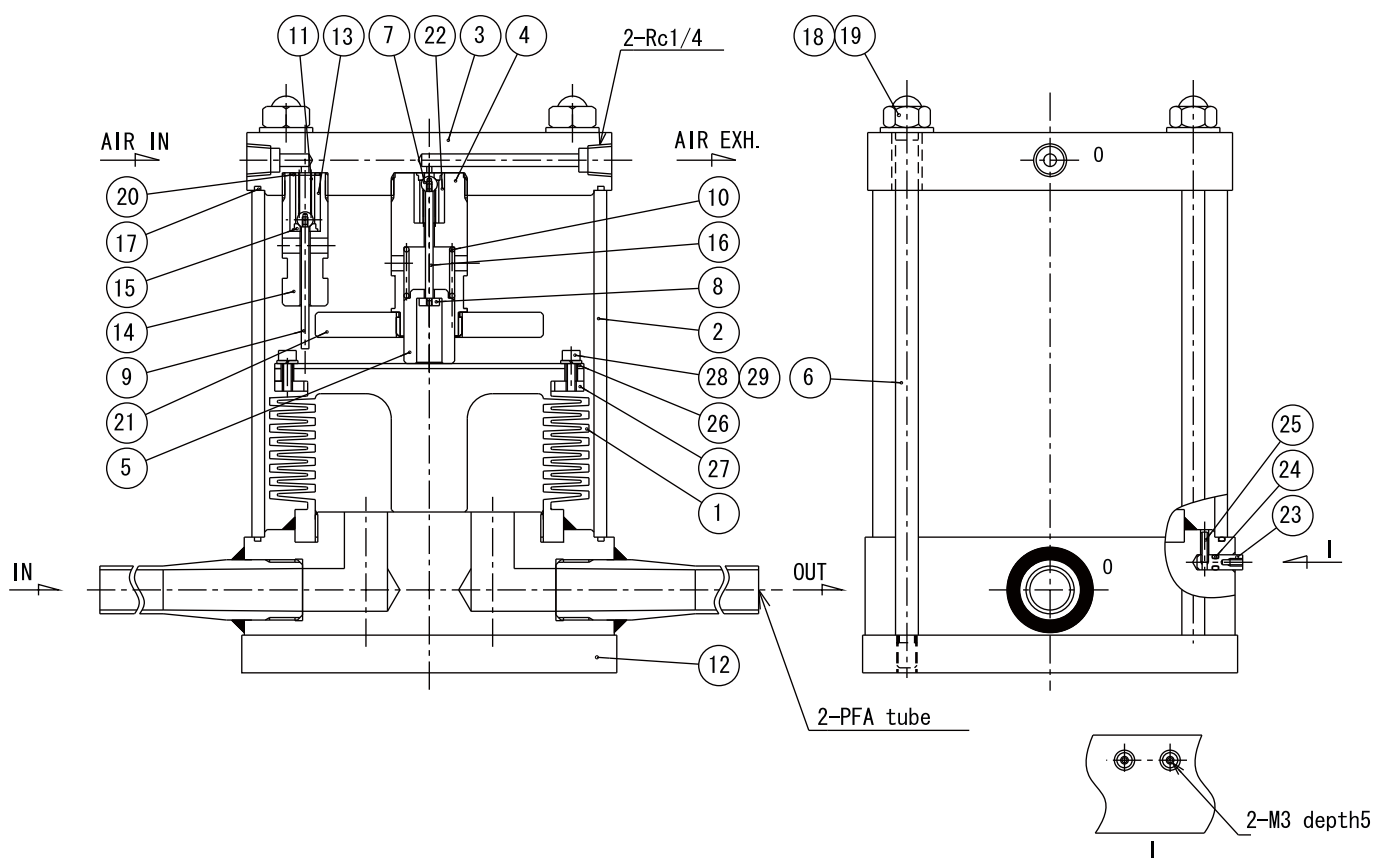
■ PDA-20, 40, 80W



	A	B	C	D	E	F	G	H	Mass (kg)
PDA-20W	348	148	215	191	$\phi 19 \times \phi 16$	18	33	135	7
PDA-40W	388	188	255	229	$\phi 25 \times \phi 22$	23	36	162	12
PDA-80W	408	208	323	266	$\phi 25 \times \phi 22$	25	38	188	17

6. Structure and names of parts

■ PDA-20, 40, 80W

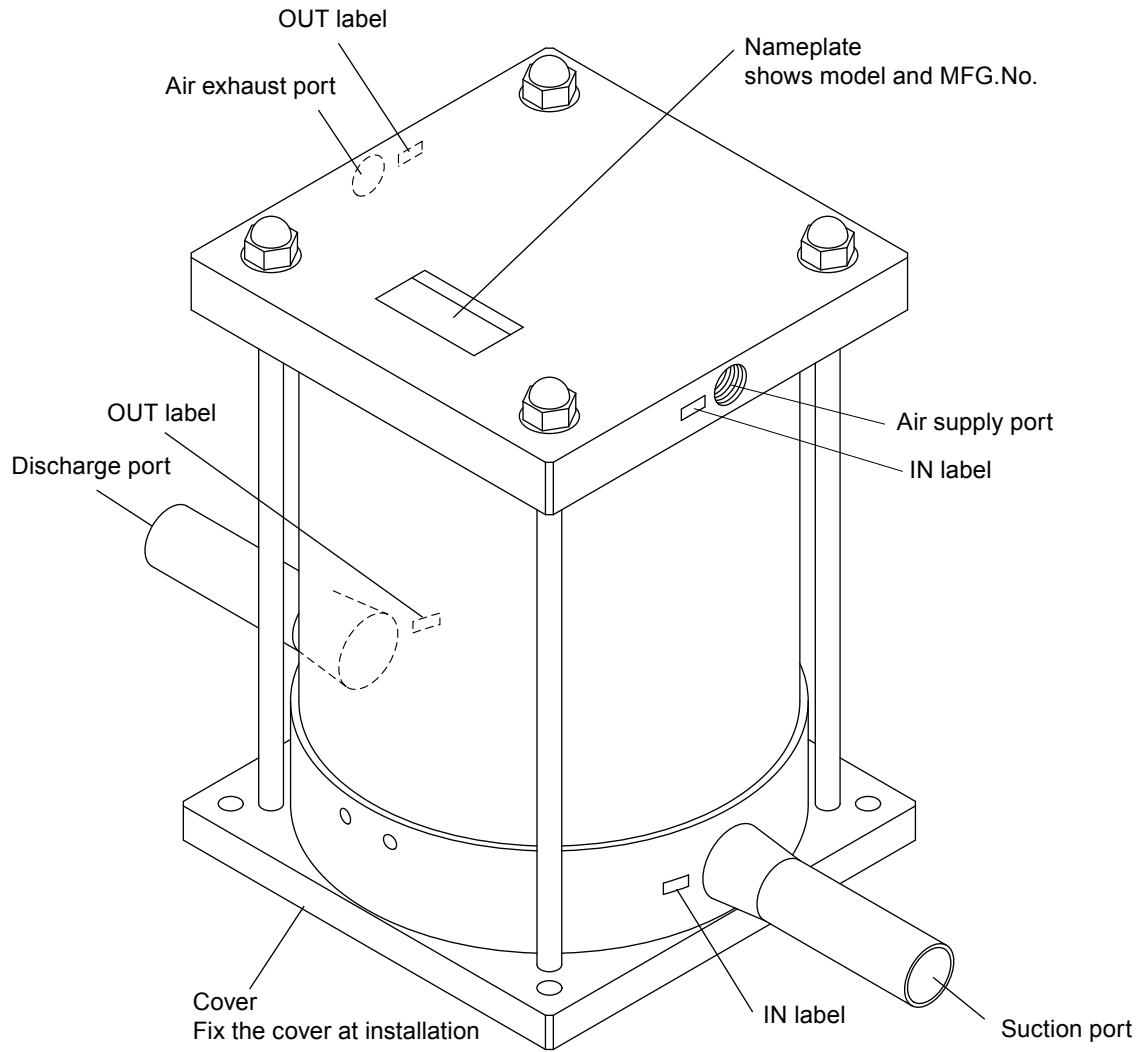


No	Name	Q'ty	Material	Remarks	No	Name	Q'ty	Material	Remarks
1	Bellows unit	1	PTFE, PFA		16	Slider pin	1	SUS304	
2	Cylinder	1	A6063	Fluor coat	17	O-ring	2	FKM	*
3	Plate	1	A5052	Fluor coat	18	Cap nut	4	SS	Fluor coat
4	OUT guide	1	SUS304		19	Plate washer	4	SS	Fluor coat
5	Slider	1	PPS		20	O-ring	1	FKM	S-10
6	Stud bolt	4	SUS304	PTFE coat	21	Stopper	1	SUS304	
7	Valve A	2	SUS304		22	Spacer A	1	PVC	
8	Pin nut	1	SUS304		23	Electrode holder	2	SUS304	
9	Pin	1	SUS304		24	O-ring	2	FKM	P-3
10	Spring A	1	SUS304WPB		25	Hex screw	2	SS	M3 × 12
11	Spring B	2	SUS304WPB		26	Bellows plate	1	SUS304	
12	Cover	1	A5052	Fluor coat	27	Bellows flange	2	SUS304	
13	Spacer	1	PVC		28	Hex bolt	6	SS	
14	IN guide	1	SUS304		29	Spring washer	6	SS	M4
15	Valve seat	2	FKM						

*

	O-ring
PDA-20W	S-135
PDA-40W	172 × 3
PDA-80W	194.5 × 2

7. Main parts and labelling



Installation

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1. Before use

(1) Do not stop the supply air to the dampener while discharge piping is pressurized.

Otherwise the bellows may be deformed. Also, the pulsation reduction effect can not be received.

(2) Do not use the dampener at a higher pressure than the specified pressure of the pump.

The dampener may fail if it continuously operates exceeding the max. allowable liquid pressure and the max. allowable supply air pressure. (Refer to 4. Specification)

(3) Do not handle the liquid which is apt to crystallize or contains slurry.

These liquids shorten the life of bellows.

(4) Pay attention to stripping agents or solvents.

- Some strippers may cause the cracks in a short time in the bellows or in piping (PFA material).
(Guarantee period is different for these liquids. Ask IWAKI.)
- Risk of fire. Do not connect the electrodes with any device including our controllers when using solvent.

WARNING

Do not connect the electrodes with any device including our controllers when using a solvent. Solvents may catch fire due to a electric spark.

(5) Surface temperature of the dampener

WARNING

The temperature of the dampener or pipe surfaces becomes very high while a high temperature liquid is pumped. Do not touch them with bare hands. Always wear protective clothing.

Model	Liquid temp.	Cylinder surface temp.	Room temp.
PDA-20W	180 deg.C	74 deg.C	20 deg.C
PDA-40W	180 deg.C	66 deg.C	20 deg.C
PDA-80W	80 deg.C	40 deg.C	20 deg.C

2. Installation

(1) Connect tubes to Inlet and outlet of the dampener horizontally.

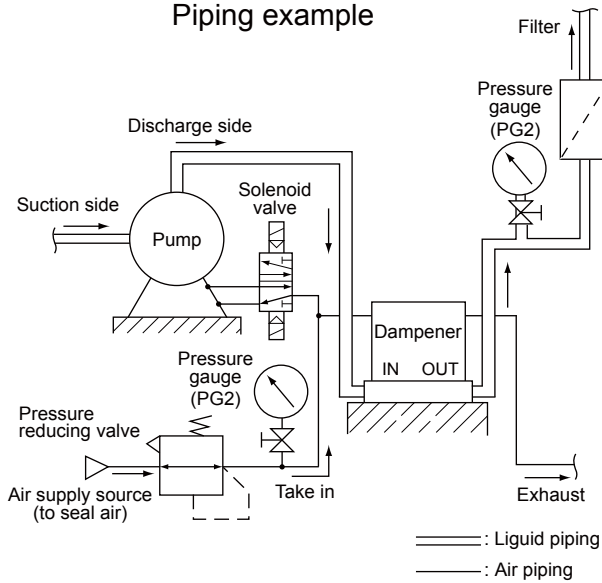
(2) Install the dampener between the pump and the filter, as close to the pump. Keep the tube length between the dampener and the pump less than 1 meter.

(3) Keep a space around the dampener for maintenance work.

(4) Mount the dampener and the pump securely on a flat foundation.

3. Piping

Piping example

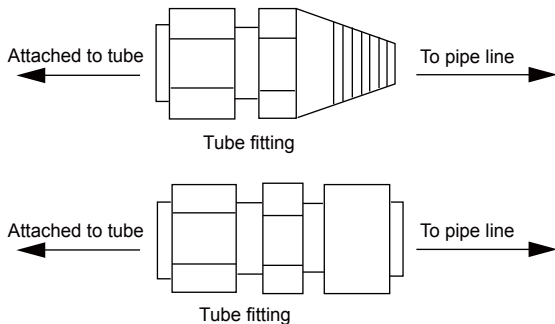


■ Liquid piping

- (1) There is the distinction of suction and discharge side tubes of dampener. Pay attention to the connection. "I" is marked for suction side and "O" for discharge side.
- (2) Keep the pump and the dampener free of any excessive load such as piping weight when tubing each device. Support tubing to protect the dampener from tubing vibration.
- (3) In case that high temperature liquid is handled, piping must be done so that the dampener can not be affected by the expansion and shrinkage of the pipe because of the heat.
- (4) Install the filter in the discharge piping.
- (5) Employ the tube which has the pressure resistance more than that of specified max. pressure of the dampener.
- (6) For mounting of pipe joints, pay attention so that the air can not be sucked in. Especially, the air sucked in suction piping causes unstable or impossible discharge.
- (7) PFA tubes are equipped for suction and discharge ports. Tube diameters are:

- PDA-20W : 19 × 16 mm
- PDA-40W : 25 × 22 mm
- PDA-80W : 25 × 22 mm

Use the tube fittings which correspond to tube diameters(See the left draw.).



Note. Pipe line tubes should have larger bore than the suction/discharge bore.

■ Air piping

⚠ CAUTION

Use the instrument air which is dust free and dehumidified as supply air. If the supply air contains foreign matters, water, or oil, the pressure adjusting valves may malfunction and air may leak from the air exhaust port.

(1) Air piping should be connected to the dampener on the discharge tube beyond the pressure reducing valve.

⚠ CAUTION

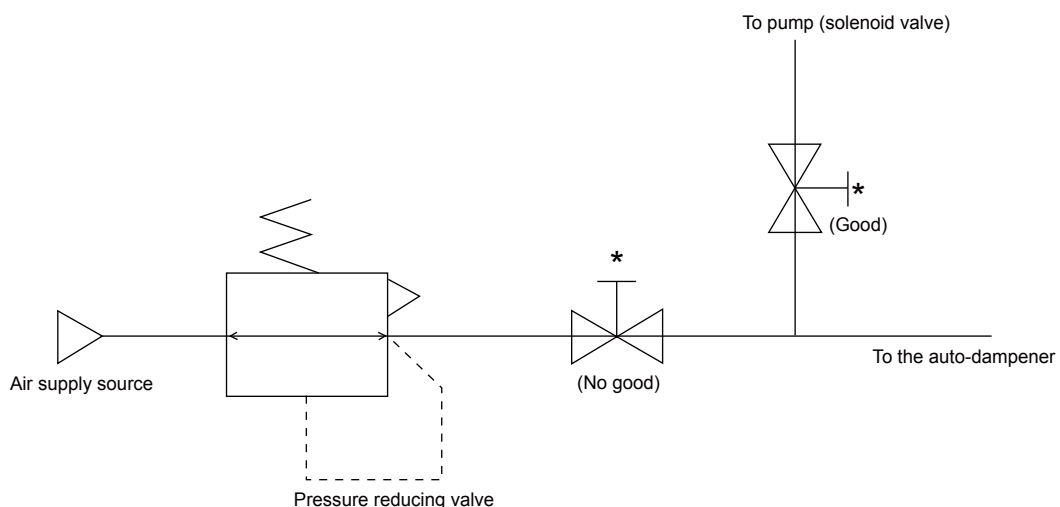
Pipe diameter must be the same as that of the pump (solenoid valve). If the pipe diameter to the dampener is small, necessary air can not be supplied to the dampener inlet because of pressure down, which will bring reduction of dampening effect or deformation of the bellows.

⚠ CAUTION

Install a pressure reducing valve for each combination of the pump/dampener. If only a pressure reducing valve control several combinations of pump/dampener, the pulsation reduction effect will reduce or the bellows are deformed because of the pressure down at dampener inlet.

(2) In case that air adjusting valve is installed

If the valve (marked with * on the illustration below) is installed in the air piping for adjusting a stroke rate of the pump, install it not to interrupt the air supply to the dampener as shown on the illustration below.



(3) When the pressure reducing valve is installed for the pump and the damper separately.

The set pressure for the damper should be equal to the damper.

OPERATION

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1. Preparation for operation

When the pump is operated first time together with the dampener, check the followings.

(1) Check to see if no damage, loosened bolts or leakage are found on dampener (pump).

(2) Air pressure adjustment

This auto-dampener automatically adjusts the air pressure to be sealed depending on handled liquid pressure, which requires no adjustment on the dampener.

2. Operation

Order	Operation	Check items
1	Start pump.	Confirm if liquid is discharged normally.
2	Adjust pump discharge capacity and pressure.	Confirm by pressure gauge if air pressure does not exceed specified pump pressure.
3	Refer to Operating Instruction of pump for details of pump operation.	
4	If no abnormality is found, start full operation.	

CAUTION

Right after the pump starts, the dampener exhausts air intermittently. This is because the pressure adjusting valves function until load fluctuation is gone. Note that this is not abnormal. Installing the muffler into the exhaust port, the exhaust noise can be reduced. (Fitting bore: RC1/4)

CAUTION

Check that pneumatic pressure is applied to auto-dampener while pump operation. If pneumatic pressure is not applied, pulsation dampening effect may be reduced or bellows may be deformed.

In case the bellows of dampener is broken, it may happen the pumped liquid gets into pneumatic piping. Take suitable protective measure in the system.

CAUTION

When the pump operates at 30 spm or below, the air is exhausted from the dampener in sync with operation.

 **CAUTION**

Do not run the pump in time-lag operation. In the time-lag operation, the bellows of auto-dampener may fail in a short time. Also pulsation dampening effect can not be obtained. When the auto-dampener is used, the time-lag should be zero.

Time-lag operation: When proximity switches detects the bellows movement and the switching-over signal is transferred to the solenoid valve, the switching-over signal is outputted with time lag. This is called "time-lag operation". IWAKI controllers (AC-1, FD, SC and FDC) can not operate the pump in time-lag operation. Pay attention to the time-lag operation if the pump is operated by programmable controller or SO.

3. Stopping

- (1) Stop the pump according to the procedure mentioned in operating instructions of the pump and controller. The air is eliminated from the dampener after stoppage.
- (2) Add the supply air to the auto-dampener while pump is stopped.

 **CAUTION**

If air supply is interrupted when discharge piping is pressurized, the bellows may be deformed. Be sure to release the residual pressure.

- (3) Before the pump is stopped for a long time, confirm that pressure is released from the dampener and then stop the air supply.

Maintenance

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1. Troubleshooting

Trouble	Cause	Countermeasure	Inspection & check items
Large pulsation (Beyond specified range)	<ul style="list-style-type: none"> ● Too high discharge pressure. ● Air pressure adjusting valve at intake or exhaust side is clogged. ● Worn valve seat. ● Too low supply air pressure to dampener. 	<ul style="list-style-type: none"> ○ Check filter and replace. ○ Disassemble and clean. (*) ○ Replace valve seat. (*) ○ Keep the supply air pressure to dampener. 	<ul style="list-style-type: none"> a. Filter blinding or drying b. If filter is wetted enough. a. Check air filter. a. Refer to item Air Piping on Installation section.
Air is mixed in the liquid.	<ul style="list-style-type: none"> ● Broken bellows inside dampener 	<ul style="list-style-type: none"> ○ Replace bellows unit. (*) 	<ul style="list-style-type: none"> a. If specified air pressure is added to dampener. b. If the dampener is not used beyond specified pressure
Liquid leaks.	<ul style="list-style-type: none"> ● Broken bellows. (Air is mixed in discharged liquid.) 	<ul style="list-style-type: none"> ○ Replace bellows unit. (*) 	<ul style="list-style-type: none"> a. If specified air pressure is added to dampener. b. If the dampener is not used beyond specified pressure. c. If residual pressure is released.
Air leaks (Cylinder)	<ul style="list-style-type: none"> ● Stud bolts are not tightened enough. ● Deterioration or deformation of O-ring. 	<ul style="list-style-type: none"> ○ Tighten. ○ Replace O-ring(*) 	<ul style="list-style-type: none"> a. Refer to Periodic Inspection on Maintenance and Inspection.
Air leaks (Air exhausting part)	<ul style="list-style-type: none"> ● Air pressure adjusting valve at exhaust side is clogged. 	<ul style="list-style-type: none"> ○ Disassemble and clean. (*) 	<ul style="list-style-type: none"> a. Check air filter.

Note: Items marked (*) are done by IWAKI.

2. Maintenance & inspection

WARNING

- **Wear protectors**

When piping is removed or pump is disassembled/assembled, wear protective gear such as safety goggles and protective gloves etc.

- **Release pressure inside piping**

If pressure is not released from piping, liquid may be splashed. Release residual pressure before maintenance works start.

- **Interruption of supplied air**

Interrupt air supply to dampener before maintenance works start.

- **Power off**

Always turn off power supply prior to maintenance works. Display a sign near power supply switch to notify other person that someone is "WORKING".

Turned on, by mistake, power supply during maintenance works may lead to personal injury. Each operator must pay special attention.

- **Routine inspection**

- a. Confirm if the liquid is discharged normally from dampener (pump).
- b. Confirm the vibration width of pressure gauge to see no change in discharge capacity and pressure.
- c. Confirm if pipe does not vibrate abnormally.

- **Periodical inspection (Make the inspection once a month or more.)**

If the air leakage through cylinder part is confirmed, stop the pump after pump discharge side pressure is released to leave it until it is cooled down. And then, securely tighten the cap nuts of dampener.

Tightening torque

PDA-20W	PDA-40W	PDA-80W
6.4 N m	6.4 N m	12.7 N m

3. Consumable parts

Repair is done by IWAKI.

No.	Parts	Q'ty/unit	Time to be replaced
1	Bellows unit	1	One year (Continuous operation)
15	Valve seat	2	

Note1: The quantity shows the number of the parts which required to a dampener.

Note2: Time to be replaced is just for your reference. It is not guaranteed.

Note3: The durability of consumable parts depends on pressure, temperature and characteristics of liquid.



IWAKI CO.,LTD. 6-6 Kanda-Sudacho 2-chome Chiyoda-ku Tokyo 101-8558 Japan

TEL:(81)3 3254 2935 FAX:3 3252 8892(<http://www.iwakiumps.jp>)

Germany	: IWAKI EUROPE GmbH	TEL : (49)2154 9254 0	FAX : 2154 1028	U.S.A.	: IWAKI America Incorporated	TEL : (1)508 429 1440	FAX : 508 429 1386
Italy	: IWAKI Italia S.R.L.	TEL : (39)02 990 3931	FAX : 02 990 42888	Australia	: IWAKI Pumps Australia Pty. Ltd.	TEL : (61)2 9899 2411	FAX : 2 9899 2421
Denmark	: IWAKI Nordic A/S	TEL : (45)48 24 2345	FAX : 48 24 2346	Singapore	: IWAKI Singapore Pte. Ltd.	TEL : (65)6316 2028	FAX : 6316 3221
Sweden	: IWAKI Sverige AB	TEL : (46)8 511 72900	FAX : 8 511 72922	Indonesia	: IWAKI Singapore (Indonesia Branch)	TEL : (62)21 690 6606	FAX : 21 690 6612
Finland	: IWAKI Suomi Oy	TEL : (358)9 2742714	FAX : 9 2742715	Malaysia	: IWAKIm Sdn. Bhd.	TEL : (60)3 7803 8807	FAX : 3 7803 4800
Norway	: IWAKI Norge AS	TEL : (47)66 81 16 60	FAX : 66 81 16 61	Taiwan	: IWAKI Pumps Taiwan Co., Ltd.	TEL : (886)2 8227 6900	FAX : 2 8227 6818
France	: IWAKI France S.A.	TEL : (33)1 69 63 33 70	FAX : 1 64 49 92 73	Thailand	: IWAKI (Thailand) Co.,Ltd.	TEL : (66)2 322 2471	FAX : 2 322 2477
U.K.	: IWAKI PUMPS (UK) LTD.	TEL : (44)1743 231363	FAX : 1743 366507	Hong Kong	: IWAKI Pumps Co., Ltd.	TEL : (852)2 607 1168	FAX : 2 607 1000
Switzerland	: IWAKI (Schweiz) AG	TEL : (41)26 674 9300	FAX : 26 674 9302	China	: IWAKI Pumps (Guandong) Co., Ltd.	TEL : (86)750 380 9018	FAX : 750 380 9078
Austria	: IWAKI (Austria) GmbH	TEL : (43)2236 33469	FAX : 2236 33469	China	: GFTZ IWAKI Engineering & Trading (Guangzhou)	TEL : (86)20 8435 0603	FAX : 20 8435 9181
Holland	: IWAKI Holland B.V.	TEL : (31)297 241121	FAX : 297 273902	China	: IWAKI Pumps Co., Ltd. (Beijing)	TEL : (86)10 6442 7713	FAX : 10 6442 7712
Spain	: IWAKI Iberica Pumps, S.A.	TEL : (34)943 630030	FAX : 943 628799	China	: IWAKI Pumps (Shanghai) Co., Ltd.	TEL : (86)21 6272 7502	FAX : 21 6272 6929
Belgium	: IWAKI Belgium n.v.	TEL : (32)1367 0200	FAX : 1367 2030	Philippines	: IWAKI Chemical Pumps Philippines, Inc.	TEL : (63)2 888 0245	FAX : 2 843 3096
				Korea	: IWAKI Korea Co.,Ltd.	TEL : (82)2 3474 0523	FAX : 2 3474 0221