IWAKI PUMPS

IWAKI Pulse Dampener

Models PD-15/-30/-60H

Instruction Manual

⚠ Read this manual before use of product

Thank you for having selected IWAKI's Pulse Dampener. This instruction manual, which is divided into five sections, namely "Safety Section", "Outline Section", "Installation Section", "Operation Section" and "Maintenance Section" deals with the correct handling and operation procedures for the dampener. To make maximum use of the dampener and to ensure safe and long operation of the dampener, please read this manual thoroughly and carefully prior to operating the dampener.

Contents

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

Important Instruction

For the Safe and
Correct Handling of the Pump

- "Safety Instruction" section deals with important details about handling of the product. Before use, read this section carefully for the prevention of personal injury or property damage.
- Observe the instructions accompanied with "WARNING" or "CAUTION" in this manual. These instructions are very important for protecting users from dangerous situations.
- The symbols on this instruction manual have the following meanings:

⚠ **WARNING**	**Nonobservance or misapplication of "Warning" sections could lead to a serious accident which may result in death.**
⚠ **CAUTION**	**Nonobservance or misapplication of "Caution" sections could lead to personal injury or property damage.**

Types of Symbols


Indicates that "Warning" or "Caution" must be exercised. Inside this triangle, a concrete and practical image provided as a warning or caution message is depicted.


Indicates a prohibited action or procedure. Inside or near this circle, a concrete and practical image of the activity to be avoided is depicted.


Indicates an important action or procedure which must be performed or carried out without fail. Failure to follow the instructions herein can lead to malfunction or damage to the pump.

⚠Export restrictions

Technical information contained in this instruction manual might be treated as controlled technology in your countries, due to agreements in international regime for export control. Please be reminded that export license/permission could be required when this manual is provided, due to export control regulations of your country.

Safety Section

⚠ WARNING

- **Look around**
  Make sure there is no one around the pump and dampener when the pump is switched on. The pump is not equipped with the power supply switch. Connecting the power cable and supply air to the pump starts pump operation.


Caution

- **Do not remodel dampener**
  Never try to remodel the dampener. Remodeling may be a cause of serious accident or damage. Iwaki takes no responsibility for accidents or damages that may result due to any remodeling without permission by Iwaki.


No Remodeling

- **For specified application only**
  The use of the dampener in any application other than those clearly specified may result in injury of person or damage to the dampener. Use the dampener strictly in accordance with the dampener specifications and application range.


Prohibited

- **Do not drain**
  Never discharge hazardous liquid, including but not limited to chemical liquid, over the ground or floor in the plant directly.
  Abide by local regulations when disposing of hazardous substances.


Prohibited

- **Do not touch**
  Touching the dampener or piping which is extremely hot due to the circulation of a hot liquid may cause severe burns. Arrange adequate hand-protective measures when feeding a liquid at temperatures higher than 50°C.


DO not touch

⚠ CAUTION

- **Wear protectors**
  Never fail to wear protective gear (protective goggles, cap, mask, acid-resistant gloves) when disassembling, assembling, or maintaining the dampener. In addition, clean the dampener carefully with pure water before working on the dampener.


Wear protective gear

- **Qualified operator only**
  The dampener must be operated only by operator(s) who have been trained in the safe operation of the dampener.


Caution

- **Countermeasure for static electricity**
  When low electric conductivity liquids such as ultra-pure water and fluor inactive liquid (e.g. Fluorinert™) are handled, the static electricity may be generated in the dampener, which may cause static discharge and break down. Take countermeasures to avoid and remove the static electricity.


Requirement

Safety Section

⚠ CAUTION

- **Power OFF**
  Make sure no one turns on the power switch while work is being done on the pump. Be sure to turn off the power switch before you start any maintenance/repair work concerning the pump and dampener. If the working site is noisy or under conditions of low visibility, you should display a notice which clearly states "POWER Off (Maintenance)," near the power switch in order to inform other personnel about the situation. Power ON executed by any other person than the operator/service personnel may result in a serious accident. The operator must take special precautions to avoid accidents.


Turning off power

- **Storage limit**
  Do not store the dampener in places where an explosive atmosphere is located, dust is generated, or corrosive gas (such as chlorine gas) is present. Otherwise, a fire may be caused or the health of personnel may be jeopardized.


Prohibited

- **Ventilate site**
  When handling a toxic liquid or odorant, ventilate the working site well. In addition, wear protective gear (protective mask, goggles, gloves, etc.).


Requirement

- **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.)


Caution

- **Send-back to Iwaki**
  When sending the dampener back to Iwaki, drain the liquid out of the dampener and clean thoroughly with water to prevent any accidents during transportation.


Caution

- **Supply air pressure**
  Supply air pressure must be maintained within specified supply air pressure range. Otherwise, the bellows may be deformed.


Caution

- **Prohibited liquids**
  Do not operate the dampener with the following liquids.
  • Liquid easily crystallized
  • Liquid containing slurry
  • Low conductivity hydro-carbon


Prohibited

- **Liquids to be handled with care**
  Stripper, solvent-type liquid, hydrazine or fuming sulfuric acid should be handled carefully.


Caution

- **During pump and dampener operation**
  Make sure to open both the suction and discharge-side valves fully. In addition, confirm that the piping is fully supplied with liquid.


Caution

Safety Section

⚠ CAUTION

- **Stopping pump operation**
  - When stopping pump and dampener operation, release the 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 upon stopping the pump and dampener. The resulting impactive pressure may deform the bellows or connecting plate.


Caution

- **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 becoming deformed.


Caution

OUTLINE OF PRODUCT

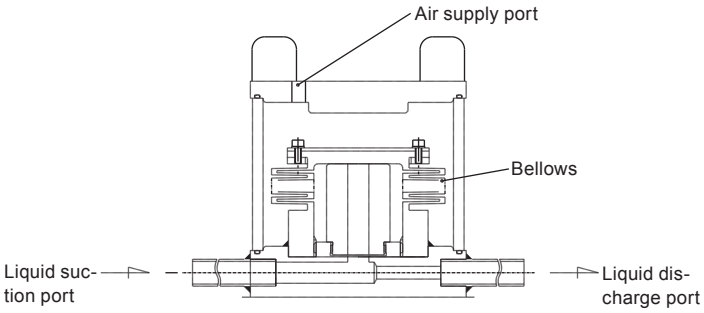
This section deals with operating principle, type and specifications of the dampener.

1. Unpacking and Inspection

After unpacking of the product, check the followings to ascertain that the product is exactly as you ordered.
If you find anything wrong, please contact your dealer.

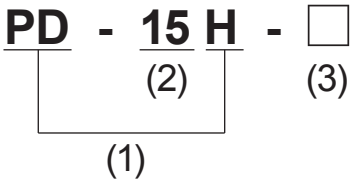
(1) If the model name shown on the nameplate is exactly the one you ordered.
(2) If the product is not damaged or bolts and nuts are not loosened during transportation.

2. Principle of Operation



IWAKI pulse dampener models PD-15, 30, 60H are the devices exclusively designed for IWAKI pneumatic drive bellows pumps for the purpose of dampening the pulses of pumped liquid. The liquid discharged from the pump is transferred through suction port, bellows and to discharge port. The pulsation of liquid is damped by the pressure of sealed air which is supplied through another port.

3. Model Identification



(1) Series name
(2) Applied volume (Max. discharge capacity of applied pump)
15 : 15 L/min.
30 : 30 L/min.
60 : 55 L/min.
(3) Special version symbol
No symbol : Standard

4. Specifications

Dampener model	PD-15H		PD-30H		PD-60H	
Applied pump model	FS-15		FS-30		FS-60	
Liquid temperature (deg. C)	5-100	101-180	5-100	101-180	5-100	101-180
Max. liquid press. (MPa)	0.3	0.2	0.3	0.2	0.3	0.2
Max. supplied air press. (MPa)						
Pulsation press. Width (MPa)	Within 0.06 if liquid viscosity is 1 - 50 mPs•S					
Liquid inlet/outlet ports size	PFA 1/2" tube (12.7 × 9.52 mm dia.)		PFA 3/4" tube (19.05 × 15.83 mm dia.)		PFA 1" tube (25 × 22 mm dia.)	
Air piping connection bore	Rc 1/8 (Female)					
Wet-end material	PTFE, PFA					

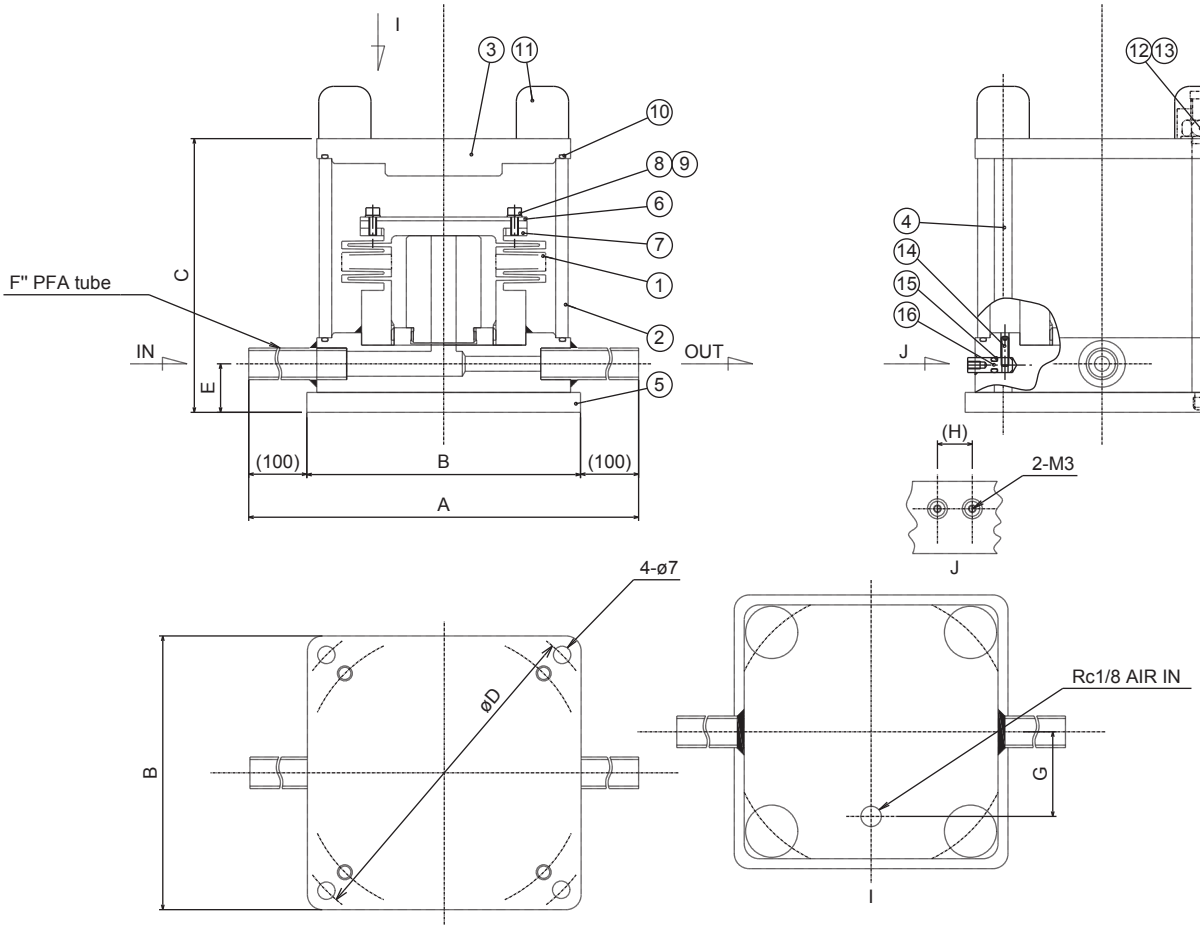
Precautions on handling

1) Do not handle the liquids which are apt to be crystallized or contain slurries. Otherwise, the life of consumable parts are extremely shortened.
2) Do not exceed the specified max. liquid pressure and sealed air pressure. Otherwise, pump or dampener may be damaged.

Performance and dimensions may be changed without prior notice.

5. Construction, Dimension and Mass

Models PD-15H, 30H



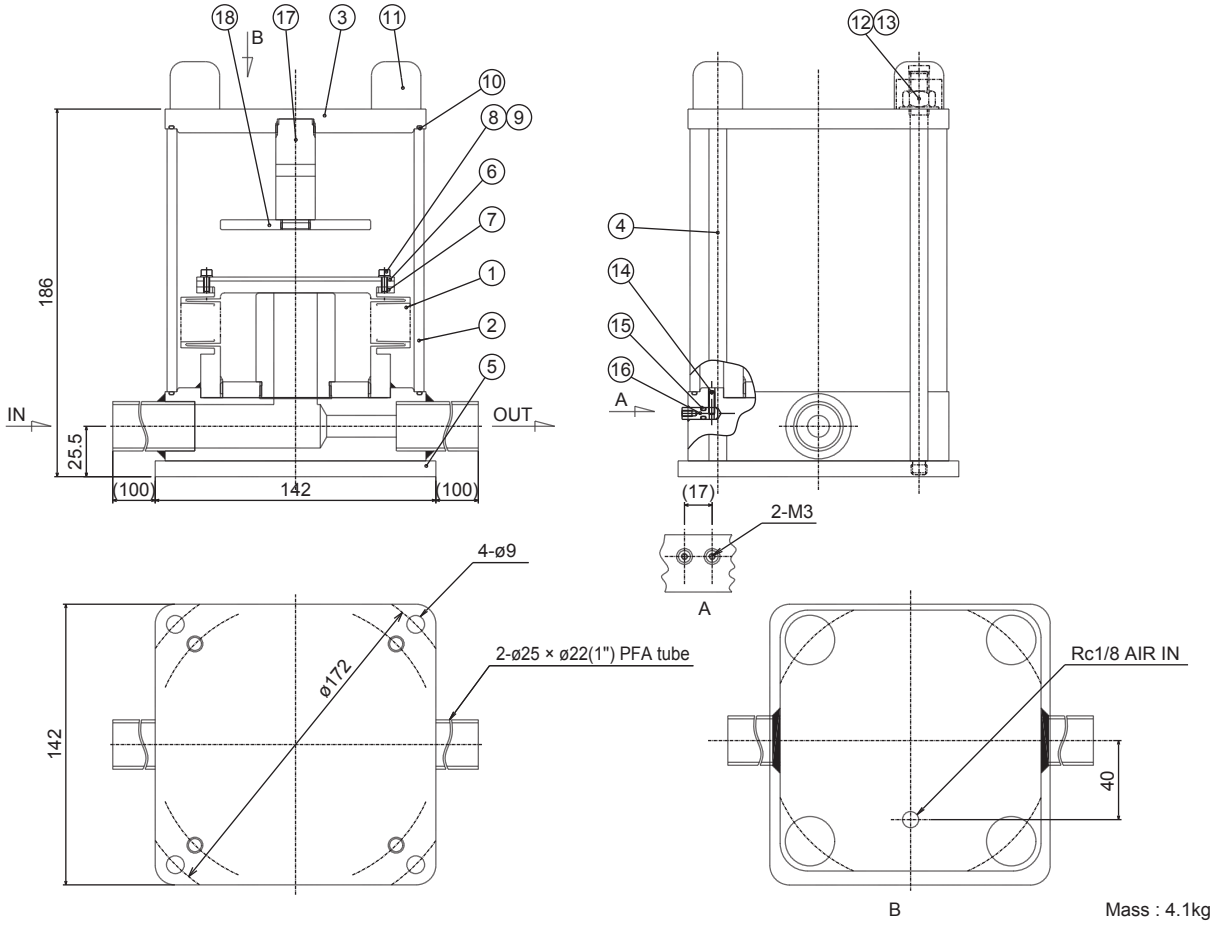
No.	Parts name	Q'ty	Material	Remarks
1	Bellows unit	1	PTFE, PFA	
2	Cylinder	1	A5056	4F coating
3	Plate	1	A5052	4F coating
4	Stud bolt	4	SUS304	PTFE coating
5	Cover	1	A5052	4F coating
6	Bellows plate	1	SUS304	
7	Split flange	2	SUS304	
8	Hex. socket head bolt	6	Stainless steel	M3 × 8
9	Spring washer	6	Stainless steel	M3
10	O ring	2	FKM	Note 1
11	Cap	4	PP	
12	Hex. nut	4	Stainless steel	M8
13	Conical spring washer	4	Stainless steel	Nominal 8
14	Hex. socket head screw	2	Stainless steel	M3 × 12
15	O ring	2	FKM	P-3
16	Electrode holder	2	SUS304	

	A	B	C	D	E	F	G	H
PD-15H	310	110	110	134	19.5	1/2	34	13
PD-30H	316	116	124	143	22.5	3/4	40	14

	O ring
PD-15H	S-95
PD-30H	S-125

	Mass (Kg)
PD-15H	1.8
PD-30H	2.3

Model PD-60H



No.	Parts name	Q'ty	Material	Remarks
1	Bellows unit	1	PTFE, PFA	
2	Cylinder	1	A5056	4F coating
3	Plate	1	A5052	4F coating
4	Stud bolt	4	SUS304	PTFE coating
5	Cover	1	A5052	4F coating
6	Bellows plate	1	SUS304	
7	Split flange	2	SUS304	
8	Hex. socket head bolt	6	Stainless steel	M3 × 8
9	Spring washer	6	Stainless steel	M3
10	O ring	2	FKM	S-125
11	Cap	4	PP	
12	Hex. nut	4	Stainless steel	M10
13	Conical spring washer	4	Stainless steel	Nominal 10
14	Hex. socket head screw	2	Stainless steel	M3 × 12
15	O ring	2	FKM	P-3
16	Electrode holder	2	SUS304	
17	Guide	1	SUS304	
18	Stopper	1	SUS304	

INSTALLATION

This "Installation clause" must be thoroughly understood by the user before actually installing the dampener. Do not start your installation work unless you confirm your understanding of the entire set of descriptions in this section.

1. Before use of Product

(1) Do not interrupt the sealed air coming to the dampener.
The interruption of sealed air coming to the dampener while the pressure is not released at discharge side may cause the deformation of bellows.

(2) Do not apply the pressure exceeding specified pressure of pump.
If the pressure exceeding the specified max. liquid pressure and max. sealed air pressure (Refer to specification table) is applied to the dampener, the dampener may be failed and damaged.

(3) Handling of the liquid which is apt to be crystallized or contains slurries extremely shorten the life of bellows.

(4) Pay attention to handling stripper or solvent.
Some kinds of stripper may generate in a short time the cracks in bellows and pipes (PFA). Please contact IWAKI when you will handle these liquids.

⚠ Caution
When the solvent is handled, do not connect the electrode to the dampener. Otherwise it may spark and result in fire.

(5) Temperature of dampener surface

⚠ Caution
While high temperature liquid is handled, the surface of dampener or pipe becomes very hot. Take protective measurement for bare hand not to touch them.

Model	Liquid temp.	Dampener surface temp.	Room temp.
PD-15H	180 deg. C	48 deg. C	23 deg. C
PD-30H	180 deg. C	54 deg. C	23 deg. C
PD-60H	180 deg. C	52 deg. C	23 deg. C

2. Installation

(1) Install the dampener so that the connected tubes come horizontally.

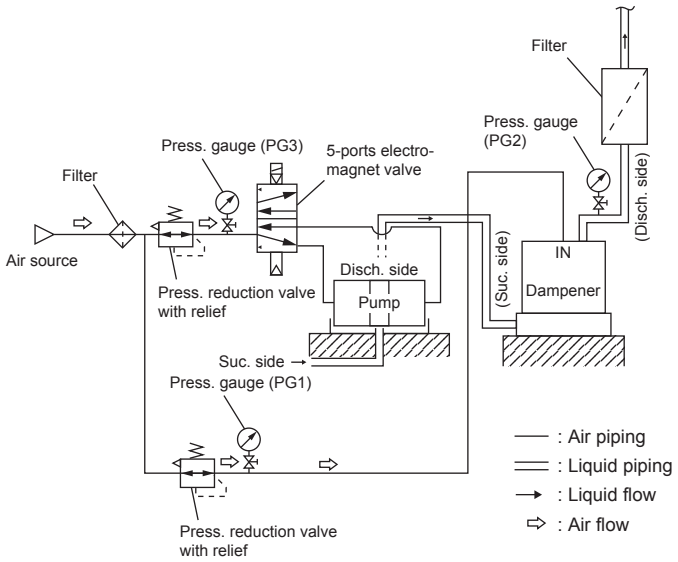
(2) Install the dampener between the pump and filter and as close to the pump as possible. Length of pipe between pump outlet and dampener inlet should be 1 meter or shorter.

(3) Keep enough space around the dampener for the future maintenance.

(4) Securely install the dampener and pump on the flat stand.

3. Piping

Example of liquid and air piping



Liquid piping

(1) Do not confuse the suction port with the discharge port.

(2) Install the pipe support so that the pipe load can not be added to the dampener.

(3) Install the piping so that the dampener can not be influenced by the expansion of heated pipe.

(4) Install the filter at the discharge side of the dampener.

(5) Use the pipe which can resist to the pressure more than the specified dampener pressure.

(6) Take care of the mounting of joints so that the air can not be sucked in. Especially, the air in the suction side piping causes unstable or no discharged liquid.

(7) Connection of discharge, suction pipes
Use the union elbow to connect the pipes to the suction and discharge tubes of dampener.

Air piping

(1) Take the air piping from the secondary side of pressure reduction valve to connect the dampener.

⚠ Caution
Install two pressure reduction valves for pump driving and dampener. Do not use the pressure reduction valve in common for pump driving and dampener.

(2) Use the pressure reduction valve with relief.

⚠ Caution
If relief type pressure reduction valve is not used, it gives bad influence to the pulsation dampening effect.

OPERATION

Dampener operation shall be limited to the range covered by and described in this instruction manual. Use of the dampener in a different method or procedure that is not described in this instruction manual is prohibited. Iwaki takes no responsibility for injury to person or damage to assets which results from a failure to observe this instruction. Contact Iwaki, an Iwaki branch office, or an Iwaki distributor when necessary.

1. Preparation for Operation

When the pump and dampener are used first time, check and see followings.

(1) Confirm that there are no damaged parts, loosened bolts or leakage.

(2) Adjustment of sealed air pressure

The sealed air pressure is adjusted by controlling relief type pressure reduction valve.

2. Operation

Order	Operation	Check items
1	Start pump	If the liquid is discharged normally from discharge side.
2	Adjust pump discharge capacity and sealed air pressure.	Check by pressure gauge (PG3) if air pressure does not exceed the specified pressure of pump. Refer to piping example on page 12. - In case a pressure gauge (PG2) is installed at discharge side. After pump started, adjust the pressure by gradually increasing the sealed air pressure (PG1) so that the vibration of pointer of pressure gauge (PD2) becomes minimum. - In case a pressure gauge (PG2) is not installed at discharge side. You will find the point at which the pump speed gets faster a little bit when the sealed air pressure is gradually increased. Set the sealed air pressure (PG1) at this point.
3	Refer to instruction manual for the pump operation.	
4	After the procedure above, you will find no abnormality, start the normal operation.	

⚠ Caution

When discharge pressure became high due to clogged filter or so, increase the sealed air pressure accordingly. (If sealed air pressure is not changed according to the change of discharge pressure, pulsation will become larger.)

IWAKI pump controller SC (Available on option) can automatically adjust the sealed air pressure according to the change of discharge pressure. (Ask us for SC controller.)

Be sure that the supply air is applied to the dampener during the pump operation. If not, pulsation dampening effect may be reduced or the bellows may be deformed.

If the bellows of dampener is broken, the pumped liquid may get into the air piping. Take suitable protective measure in the system.

3. Stopping

(1) Stop the pump according to the instructions on pump and dampener instruction manual.

(2) Continue to apply the air pressure even when the pump is stopped.

⚠ Caution

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

Time-lag operation : When proximity switch detects the bellows movement and the switching-over signal is activated to solenoid valve, the delayed switching-over signal activation to operate the pump is called "time-lag operation". No time-lag operation happens if IWAKI controller (AC-1, FD, SC and FDC) is used. Pay attention to time-lag operation if pump is operated by programmable controller or so.

(3) When the pump is not operated for a long period, stop supplying air to dampener after you confirm the liquid pressure is not kept in the dampener.

MAINTENANCE

Dampener operation shall be limited to the range covered by and described in this instruction manual. Use of the dampener in a different method or procedure that is not described in this instruction manual is prohibited. Iwaki takes no responsibility for injury to person or damage to assets which results from a failure to observe this instruction. Contact Iwaki, an Iwaki branch office, or an Iwaki distributor when necessary.

Maintenance Section

1. Troubleshooting

Trouble	Causes	Countermeasures	Inspection item
Too large pulsation (beyond specified pulsation rate)	Too high discharge pressure Too low supplied air pressure to dampener	Check and replace filter. Keep suitable supply air pressure.	a. Check if filter is not clogged or dried. b. Check if filter is wetted enough. a. Refer to the item "Air piping" on page 12.
Air is mixed in liquid	Broken bellows in dampener	Replace bellows unit. (Note)	a. Check if specified air pressure is applied to dampener. b. Check if more than specified pressure is not applied to dampener.
Liquid leaks	Broken bellows (Air is mixed in liquid)	Replace bellows unit. (Note)	a. Check if more than specified pressure is not applied to dampener. b. Check if residual pressure is removed.
Air leaks (from cylinder)	Insufficiently tightened bolts Deteriorated or de- formed O ring	Tighten bolts securely. Replace O ring. (Note)	Refer to table of tightening torque on page 17.

Note : Replacement is done by IWAKI.

2. Maintenance and Inspection

⚠ Alarm

- **Wear protectors**
  Make sure to wear protective gear (protective goggles, cap, mask, etc.) when maintenance or inspection works are carried out.
- **Release pressure out of piping**
  Residual pressure in piping may splash liquid and cause an unexpected accident. Release the pressure before starting the works.
- **Stop supplying air**
  When maintenance works are done for dampener, stop supplying air to dampener.
- **Switch off power**
  When maintenance works are done, switch off electric power of pump. Also, make sure no one turns on the power switch while the work is being done. The operator must take special precautions to avoid accidents.

Daily inspection

(1) Check if the liquid is discharged normally from dampener (pump).
(2) Check if discharge pressure and capacity do not change. Check the width of vibration of pressure gauge.
(3) Check if the pipes do not vibrate abnormally.

Periodic inspection (once a month or more frequently)

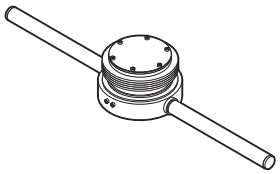
(1) Check if air does not leak from cylinder. If you find the leakage through the cylinder, stop the pump after the pressure is released from discharge side of pump, and leave the pump until it cools down to ambient temperature. Gradually tighten hex. nuts.

Tightening torque of nuts

PD-15H	PD-30H	PD-60H
3 N•m	3 N•m	5.9 N•m

3. Consumable Parts

Repair or replacement is done by IWAKI.

Parts		Q'ty	Time to be replaced
Bellows unit		1	2 years (continuous operation)

Note 1. Quantity is for one dampener.
2. Time to be replaced shown above is reference but not for guarantee. Durability of consumable parts depend on the pressure, temperature, characteristics of handled liquid.

IWAKI PUMPS

( )Country codes

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Austria	IWAKI EUROPE GmbH	TEL:(49)2154 9254 0	FAX:2154 9254 48	Korea	IWAKI Korea Co.,Ltd.	TEL:(82)2 2630 4800	FAX:2 2630 4801
Belgium	IWAKI Belgium n.v.	TEL:(32)1367 0200	FAX:1367 2030	Malaysia	IWAKIm Sdn. Bhd.	TEL:(60)3 7803 8807	FAX:3 7803 4800
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China	IWAKI Pumps (Guangdong) Co., Ltd.	TEL:(86)750 3866228	FAX:750 3866278	Singapore	IWAKI Singapore Pte. Ltd.	TEL:(65)6316 2028	FAX:6316 3221
China	GFTZ IWAKI Engineering & Trading (Guangzhou)	TEL:(86)20 8435 0603	FAX:20 8435 9181	Spain	IWAKI Iberica Pumps, S.A.	TEL:(34)943 630030	FAX:943 628799
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Finland	IWAKI Suomi Oy	TEL:(358)9 2745810	FAX:9 2742715	Taiwan	IWAKI Pumps Taiwan Co., Ltd.	TEL:(886)2 8227 6900	FAX:2 8227 6818
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Hong Kong	IWAKI Pumps Co., Ltd.	TEL:(852)2 607 1168	FAX:2 607 1000	U.S.A.	IWAKI AMERICA Inc.	TEL:(1)508 429 1440	FAX:508 429 1386
Indonesia	IWAKI Singapore (Indonesia Branch)	TEL:(62)21 690 6606	FAX:21 690 6612	Vietnam	IWAKI pumps Vietnam Co.,Ltd.	TEL:(84)613 933456	FAX:613 933399

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