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OPERATION MANUAL

YAMADA AIR-OPERATED DIAPHRAGM PUMPS

NDP-5 series
DP-10/12 series
NDP-10 series
NDP-15 series
NDP-20 series
NDP-25 series
NDP-40 series
NDP-50 series
NDP-80 series
DP-F series

DECLARATION OF CONFORMITY

Name of company : YAMADA CORPORATION

Address : No,1-3,1-Chome,Minami-Magome,ohta-ku,Tokyo,143-8504 Japan

Declares, in sole responsibility, that the following product

Equipment : Diaphragm Pumps

Type : NDP- and DP- series

Referred to in this declaration conforms with the following standard(s) or directive(s)

: - European Standard EN 809 / October 1998

: - Directive 98/37/EC

YAMADA CORPORATION will keep on file for review for following

Technical documentation

- operating instructions as required
- plans
- description of measures designed to ensure conformity
- other technical documentation

Importer / Distributor in EU

Name of company : YAMADA EUROPE B.V.

Address : Aquamarijnstraat 50, 7554 NS Hengelo (O), The Netherlands

This product is certificated in TUV Rheinland about safety.

Certificate Number is R9850515

Place and date issued : Sagamihara Factory / May 16 2001

Name and signature as well as position of undersigned :

Hiromasa Kumagai (Quality assurance Dept. Director)

CE

HIROMASA KUMAGAI

·Introduction

Thank you for purchasing a Yamada Diaphragm Pump. This product is a positive-displacement pump that transfers fluids by movement of diaphragms driven by compressed air through a unique switching mechanism. The casing that comes in contact with the fluid is made of aluminum, stainless steel, forged iron, and polypropylene or fluorine resin, depending on the model you have selected according to the type of fluid to be pumped. The diaphragms are made of a plastic material suitable for the model.

·For safe operation


This document contains information vital for safe and efficient operation of this product. Before using the pump, be sure to read this document carefully, particularly the "warnings and cautions," and be fully familiar with the operating procedures.


Be sure to keep this document handy for future reference.

Warnings and cautions

For safe use of this product, be sure to note the following: In this document, warnings and cautions are indicated by symbols. These symbols are for those who will operate this product and for those who will be nearby, for safe operation and for prevention of personal injury and property damage.

The following warning and caution symbols have the meanings described below. Be sure to remember their meanings.

 **WARNING:** If you ignore the warning described and operate the product in an improper manner, there is danger of serious bodily injury or death.

 **CAUTION:** If you ignore the caution described and operate the product in an improper manner, there is danger of personal injury or property damage.

Furthermore, to indicate the type of danger and damage, the following symbols are also used along with those mentioned above:



This symbol indicates a DON'T, and will be accompanied by an explanation on something you must not do.



This symbol indicates a DO, and will be accompanied by instructions on something you must do in a certain situation.

Operating caution

Before using this product

WARNING



• When using compressed gas (hereinafter called "compressed air") to drive this pump, be sure it is one of the following:

- * Compressed air supplied from an air compressor
- * Nitrogen (N₂) gas

Use of compressed air other than the above may cause air pollution, damage to the pump, or even an explosion.



• The maximum permissible pressure for the compressed air, and the fluid pumped by one of these pumps, depending upon the casing material of the model you are using, is as follows:

- * Metal casing (aluminum, stainless steel, forged iron): 0.7MPa (7kgf/cm²)
- * Plastic casing (polypropylene, fluorine resin): 0.5MPa (5kgf/cm²)
(0.7MPa for the DP-25F/38F)

If the pressure of the compressed air and fluid exceeds the above applicable maximum permissible pressure specified above, there may be leakage of fluid, damage to the casing, or even a severe, possibly even fatal, accident.



• When moving this product, make sure that the internal pressure is released.

If the pump is moved while under pressure, any shock imparted by droppage, etc. may damage the pump or even cause an explosion.



• Hazardous fluids (with strong acid or alkali, flammable or toxic) or gas bubbles generated by such fluids may cause serious injury or even death if accidentally inhaled or consumed or if they come into contact with the eyes or adhere to skin. Therefore, the following precautions are strongly advised.

* Be fully familiar with the properties of the fluid to be pumped and work in strict accordance with the operating instructions provided by the suppliers of such fluids (such as wearing goggles, gloves, mask or work clothes).

* When storing a hazardous fluid, strictly comply with the regulatory procedures (such as using proper containers, storage conditions, etc.).

* Always install the piping and exhaust port of this pump away from human and animal traffic.

When a diaphragm is damaged, fluid will gush out together with air through the exhaust port. Provide protective measures in consideration of possible leakage of fluid (see Notes: Arranging outside exhaust on p.20). When you use the hose and pit etc., be sure you are using a model with appropriate corrosion resistance for the fluid to be pumped.

WARNING



- When installing this product, be sure to connect a ground wire from the specified position of this product (excluded NDP-5FPT, NDP-10, 15FP□, and DP-F series).

When this product is installed and operated without the ground wire properly connected, friction between parts, as well as abrasion caused by the flow of some fluids inside the casing, may generate static electricity. Also, depending on the type of fluid being pumped and the installation environment (such as gases in the air and type of surrounding fixtures), static electricity could become a cause of fire or electric shock.



- Improper grounding, poor ventilation, or unshielded fire or spark can create a danger of fire or explosion. Therefore, the following precautions are strongly advised.

- *All peripheral equipment and piping connected to this product should be properly grounded.

- *To pump flammable liquids, use an ATEX compliant model.

- *Whenever you notice any spark while operating this product, immediately stop its operation, and do NOT start using it again unless you are sure of the cause and corrective actions have been taken.

- *Depending upon the type of fluid being pumped, bubbles of flammable gas may be generated. Make sure that ventilation is satisfactory.

- *This product itself, its piping and exhaust ports should be kept away from unshielded fire, spark and other causes of ignition. If a diaphragm is damaged, fluid will gush out together with air from the exhaust port.

- *Do NOT leave gasoline or solvent etc. that contains waste at the work site.

- *Machinery and other equipment near the place of installation of this product should be properly insulated to prevent conduction with each other.

- *Do NOT operate heating devices that create flames or have heating filaments anywhere near the pump or the piping.

- *If there are flammable gases in the air while the pump is operating, do NOT switch electric appliances on and off.

- *Do NOT operate a gasoline engine at the work site.

- *Restrict smoking at the work site.



- The DP-F series pumps are intended for pumping hazardous fluids such as those that contain strong acids or organic solvents. If you find any irregularity in this product, do NOT try to disassemble or service the product yourself. Contact your dealer or our regional office for service.

If you disassemble or service this product yourself and if further irregularity occurs, it may cause a great risk, depending upon the kind of fluid to be pumped.



- After you shut down the pump and disconnect the piping, some fluid may remain inside the pump. Also, if the pump is left unused for a prolonged period, some fluid may remain inside the pump and connected piping. Therefore, be sure to purge the system of fluid and clean the pump before prolonged disuse.

If the product is left unused for a prolonged period with fluid remaining in the connected piping as well as the pump itself, the fluid may expand, depending on the ambient temperature (because of freezing or heat), which may cause damage to the pump and/or piping and possible leakage of fluid.



- Always use genuine Yamada parts when replacing component parts of this product. Do NOT attempt to modify the components parts or replace them with other than genuine Yamada parts.



- Torque of all tightening parts must be inspected before operation. Designated torques is mentioned in maintenance manual.

⚠ WARNING



• When pumping a hazardous fluid (hot, flammable, strong acid, etc.) with this product, provide protective measures (install a pit, a protection box, sensors, etc.) in consideration of possible leakage of fluid, and post warning signs at necessary places. Copy the warning symbols on p.61, and attach them to the casing and piping, etc.

Leakage of fluid may cause fire, air pollution or a serious accident. When pumping a hot fluid, the casing and piping will become hot, which may burn the skin when touched.

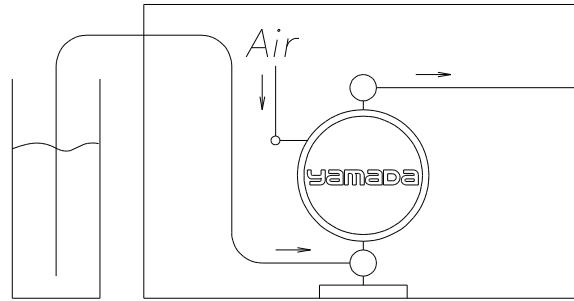


Fig.0.1



• Before using this product, be sure you are familiar with the precautions regarding the fluid to be pumped, and verify the corrosion resistance of the parts that will come into contact with the fluid. NEVER use the product with any fluid against which it does not have sufficient corrosion resistance or with a fluid that poses a risk of explosion. If you are unsure of the corrosion resistance, contact your dealer or our regional office.
If you use this product with any fluid against which the parts that will come in contact with the fluid do not have sufficient corrosion resistance, it may result in damaging the product or leakage of fluid.



• When working in the vicinity of pumping of fluid with this product, be sure to wear protective gear (goggles, mask, etc.).



• When using this product, observe the relevant regulatory rules concerning fire prevention, labor safety standards, etc.



• If you have any questions on the operation of this product (method of connection or installation), contact your dealer or our regional office.

⚠ CAUTION



• When operating this product, it may generate loud operating noise, depending upon the condition of use (fluid pumped, supply air pressure and discharge pressure).
If regulatory rules apply, provide appropriate acoustic measures where necessary. (For the noise value of this product, see 10.1 Main specifications after p.30.)



• To drive this product, use supply air with minimum moisture content.



• If a diaphragm of this product is damaged, supply air may mix with the fluid or the fluid may flow into the main body (air-switching portion). If air supply is inadequate or contaminated, do NOT operate the pump.



• While operating this product, do NOT cover the intake port by hand.



• If more than two years have elapsed since this product was shipped from the factory, notify your dealer or our regional office, and do NOT operate it without assurance from the dealer or our regional office that the pump may be operated safely.

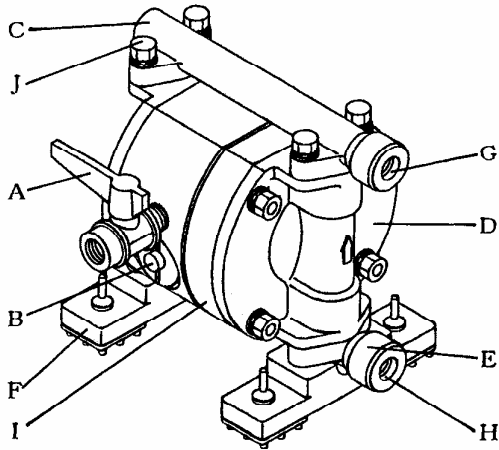
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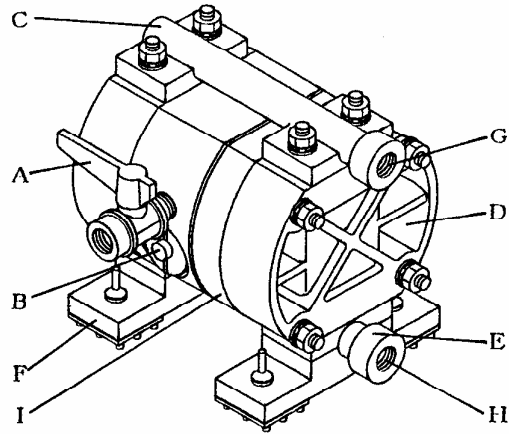
1. Names of parts and materials

1.1 NDP-5 series

- A: Air Valve
- B: Reset Button
- C: Out Manifold
- D: Out Chamber
- E: In Manifold
- F: Pump Base
- G: Discharge Port
- H: Intake Port
- I: Lift Point
- J: Ground Connection Point



NDP-05-FAT
NDP-05-FST



NDP-05-FPT
NDP-05-FVT
NDP-05-FDT

Type	FAT	FST	FPT	FVT	FDT
Switching Portion	PPS				
Fluid contact Portion	AC4C-T6	SCS14	PPG	PVDF	ACETAL
Diaphragm	PTFE				
Flat Valve	SUS316		PTFE		
O Ring	PTFE				
Valve Seat	SUS316		PPG	PVDF	ACETAL
Center Disk	A5056	SUS316	PPG (SUS304)	PVDF (SUS304)	ACETAL (SUS304)

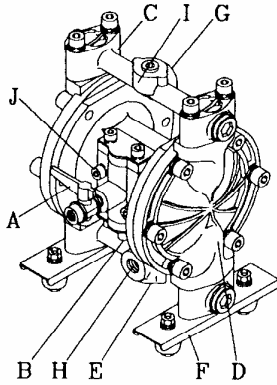
*Only PTFE diaphragm is setup in NDP-5 series.

■List of accessories

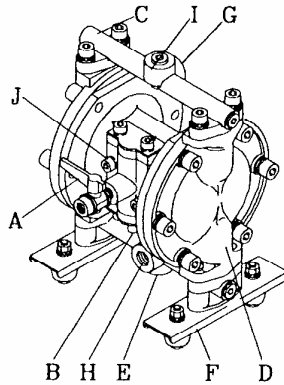
- Operation Manual 1
- Maintenance Manual 1
- Air Valve 1
- Accessory Tool 1 (FPT, FVT, FDT: 2)

1.2 DP-10/12 series

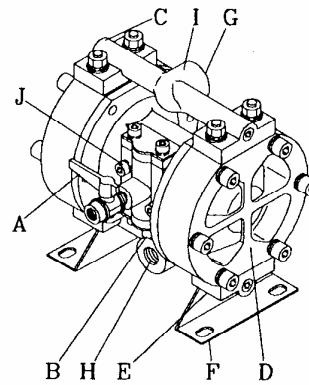
- A: Air Valve
 B: Reset Button
 C: Out Manifold
 D: Out Chamber
 E: In Manifold
 F: Pump Base
 G: Discharge Port
 H: Intake Port
 I: Lift Point
 J: Ground Connection Point



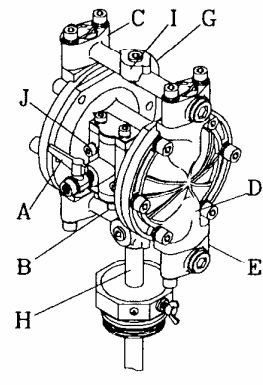
DP-10/12BA□



DP-10/12BS□



DP-10/12BP□



BDP-10/12BA□
 BDP-10/12BS□

• Aluminum type ([]: Drum type **B**)

Type	BAC	BAN	BAT	BAH	BAS	BAE
Switching Portion	ADC12					
Fluid contact Portion	ADC12 [ADC12, SUS304]					
Diaphragm	CR	NBR	PTFE	TPEE	TPO	EPDM
Ball/O Ring	CR/NBR	NBR	PTFE	PTFE	EPDM	EPDM
Valve Seat	A5056					
Center Disk	A5056					

• Stainless-steel type ([]: Drum type **B**)

Type	BSC	BSN	BST	BSH	BSS	BSE
Switching Portion	ADC12					
Fluid contact Portion	SCS14 [SCS14, SUS304]					
Diaphragm	CR	NBR	PTFE	TPEE	TPO	EPDM
Ball/O Ring	CR/NBR	NBR	PTFE	PTFE	EPDM	EPDM
Valve Seat	SUS316					
Center Disk	SUS316					

• Polypropylene type ([]: Drum type **B**)

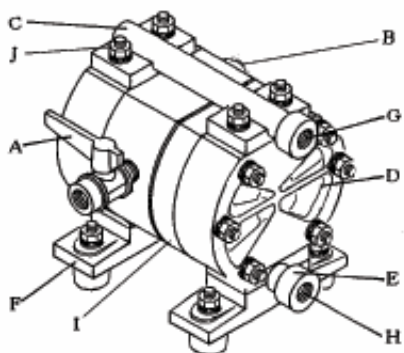
Type	BPC	BPN	BPT	BPH	BPS	BPE
Switching Portion	ADC12					
Fluid contact Portion	PPG					
Diaphragm	CR	NBR	PTFE	TPEE	TPO	EPDM
Ball/O Ring	CR/NBR	NBR	PTFE	PTFE	EPDM	EPDM
Valve Seat	CR	NBR	PPG	PPG	PPG	PPG
Center Disk	PPG (SUS304)					

■ List of accessories

- Operation Manual1
- Maintenance Manual 1
- Air Valve1
- Silencer 1
- Hexagon Wrench 1
- Suction Pipe Set 1 (only BA□,BS□)

1.3 NDP-10 series

- A: Air Valve
- B: Reset Button
- C: Out Manifold
- D: Out Chamber
- E: In Manifold
- F: Pump Base
- G: Discharge Port
- H: Intake Port
- I: Lift Point
- J: Ground Connection Point



NDP-10-BPC, NDP-10-BPN
 NDP-10-BPT, NDP-10-BPS
 NDP-10-BPH, NDP-10-BPE

• Polypropylene type

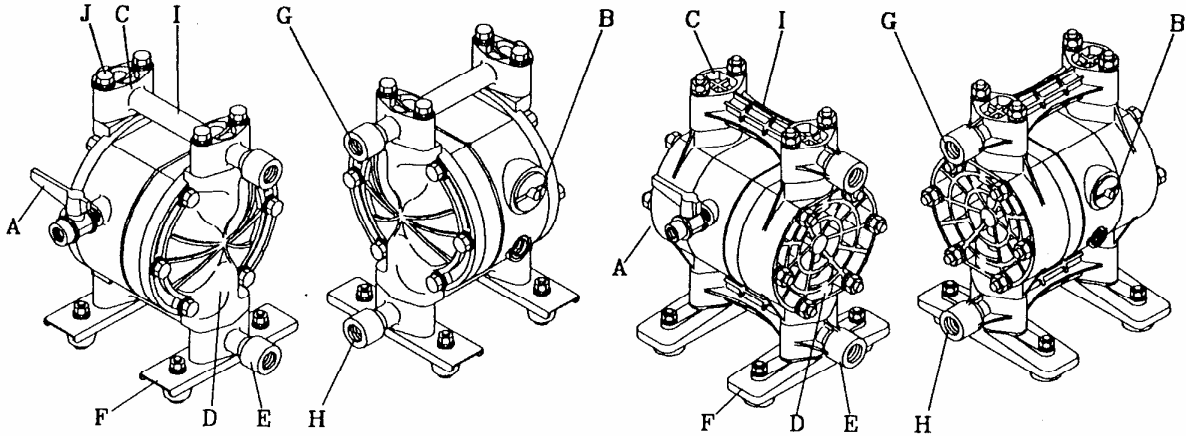
Type	BPC	BPN	BPT	BPH	BPS	BPE
Switching Portion	PPS					
Fluid contact Portion	ADC12					
Diaphragm	CR	NBR	PTFE	TPEE	TPO	EPDM
Ball/O Ring	CR/NBR	NBR	PTFE	PTFE	EPDM	EPDM
Valve Seat	CR	NBR	PPG	PPG	PPG	PPG
Center Disk	PPG (SUS304)					

■ List of accessories

- Operation Manual 1
- Maintenance Manual 1
- Air valve 1
- Accessory tool 1

1.4 NDP-15 series

A: Air Valve
 B: Reset Button
 C: Out Manifold
 D: Out Chamber
 E: In Manifold
 F: Pump Base
 G: Discharge Port
 H: Intake Port
 I: Lift Point
 J: Ground Connection Point



NDP-15-BA□
 NDP-15-BS□

NDP-15-FP□
 NDP-15-FV□
 NDP-15-FDT

• Aluminum type

Type	BAC	BAN	BAT	BAH	BAS	BAE
Switching Portion	PPS					
Fluid contact Portion	ADC12					
Diaphragm	CR	NBR	PTFE	TPEE	TPO	EPDM
Ball/O Ring	CR/NBR	NBR	PTFE	PTFE	EPDM	EPDM
Valve Seat	A5056					
Center Disk	A5056					

• Stainless-steel type

Type	BSC	BSN	BST	BSH	BSS	BSE
Switching Portion	PPS					
Fluid contact Portion	SCS14					
Diaphragm	CR	NBR	PTFE	TPEE	TPO	EPDM
Ball/O Ring	CR/NBR	NBR	PTFE	PTFE	EPDM	EPDM
Valve Seat	SUS316					
Center Disk	SUS316					

• Polypropylene type ([]: Polyvinylidene fluoride type, []: Acetal type)

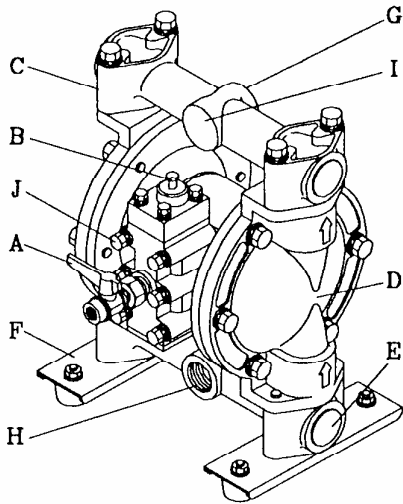
Type	FPC	FPN	FPT/FVT FDT	FPH	FPS/FVS	FPE/FVE
Switching Portion	PPS					
Fluid contact Portion	PPG [PVDF] [ACETAL]					
Diaphragm	CR	NBR	PTFE	TPEE	TPO	EPDM
Flat Valve/O Ring	PTFE/NBR	PTFE/NBR	PTFE	PTFE	PTFE/EPDM	PTFE/EPDM
Valve Seat	PPG [PVDF] [ACETAL]					
Center Disk	PPG (SUS304) [PVDF (SUS304)] [ACETAL(SUS304)]					

■ List of accessories

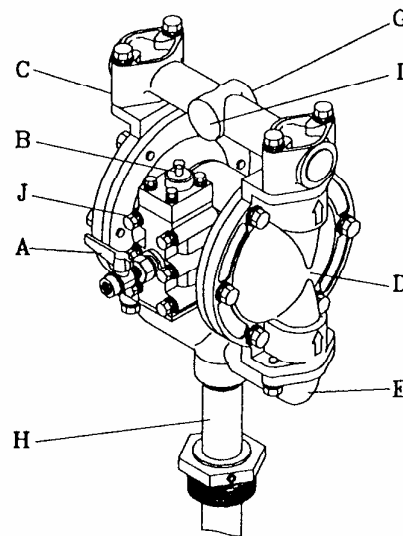
- Operation Manual1
- Maintenance Manual1
- Air Valve1
- Accessory Tool1

1.5 NDP-20, 25 series

A: Air Valve
 B: Reset Button
 C: Out Manifold
 D: Out Chamber
 E: In Manifold
 F: Pump Base
 G: Discharge Port
 H: Intake Port
 I: Lift Point
 J: Ground Connection Point



NDP-20-BA□, NDP-20-BS□
 NDP-25-BA□, NDP-25-BS□
 NDP-25-BF□



BDP-20-BA□

• Aluminum type ([]: Drum type **B**)

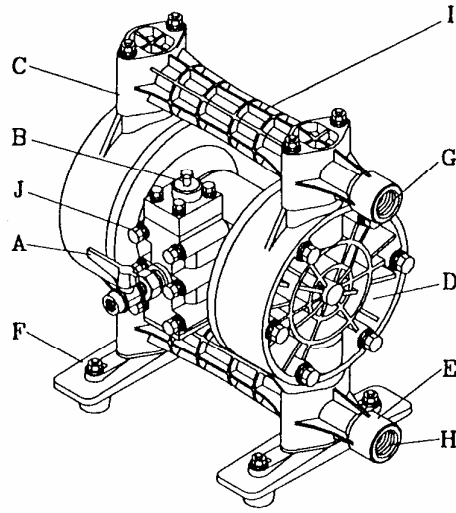
Type	BAC	BAN	BAE	BAV	BAT	BAS	BAH
Switching Portion	ADC12						
Fluid contact Portion	ADC12 [ADC12, AC2A, SGP]						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPO	TPEE
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	EPDM	PTFE
Valve Seat	SMS1025						
Center Disk	SUS316				A5056	SUS316	

• Stainless-steel type ([]: Cast iron type)

Type	BSC [BFC]	BSN [BFN]	BSE [BFE]	BSV [BFV]	BST [BFT]	BSS [BFS]	BSH [BFH]
Switching Portion	ADC12						
Fluid contact Portion	SCS14 [S45C]						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPO	TPEE
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	EPDM	PTFE
Valve Seat	SUS316						
Center Disk	SUS316						

*Cast iron casing is available from NDP-25 series until NDP-80 series.

- A: Air Valve
- B: Reset Button
- C: Out Manifold
- D: Out Chamber
- E: In Manifold
- F: Pump Base
- G: Discharge Port
- H: Intake Port
- I: Lift Point
- J: Ground Connection Point



- NDP-20BP□
- NDP-25BP□
- NDP-25BV□

• Polypropylene type (□): Polyvinylidene fluoride type (○)

Type	BPC	BPN	BPE [BVE]	BPV [BVV]	BPT [BVT]	BPH	BPS [BVS]
Switching Portion	ADC12						
Fluid contact Portion	PPG [PVDF]						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	PPG [PVDF]						
Center Disk	PPG (SUS303) [PVDF(SUS303)]						

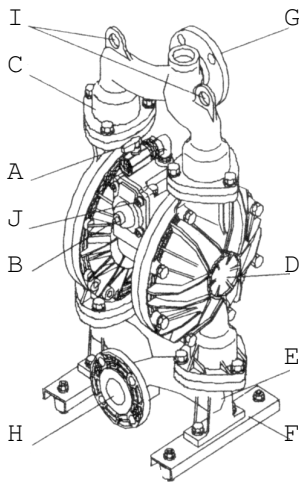
■ List of accessories

- Operation Manual1
- Maintenance Manual1
- Air Valve1
- Silencer1
- Bushing 1 (only NDP-20)
- Accessory Tool 2 (only BP□ and BV□)
- Suction Tube 1 (only B-BA□)
- Bung adopter Assembly 1 (only B-BA□)

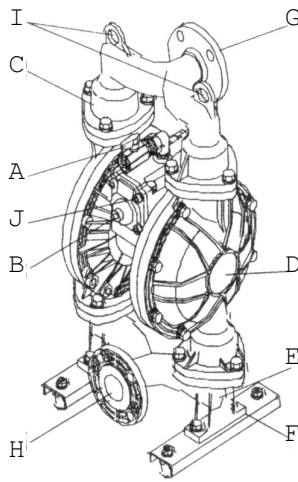
1.6 NDP-40 series

A: Air Valve
 B: Reset Button
 C: Out Manifold
 D: Out Chamber
 E: In Manifold

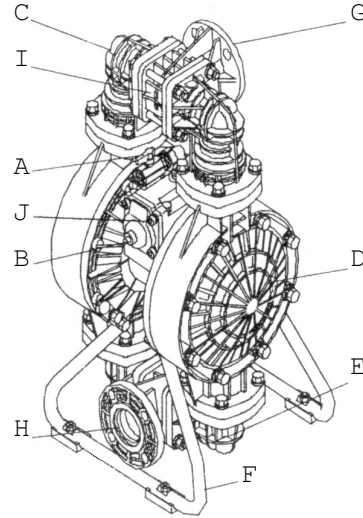
F: Pump Base (Stand)
 G: Discharge Port
 H: Intake Port
 I: Lift Point
 J: Ground Connection Point



NDP-40BA□



NDP-40BS□
 NDP-40BF□



NDP-40BP□
 NDP-40BV□

• Aluminum type

Type	BAC	BAN	BAE	BAV	BAT	BAH	BAS
Switching Portion	ADC12						
Fluid contact Portion	ADC12						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	CR	NBR	EPDM	FPM	A5056	TPEE	TPO
Center Disk	A5056						

• Stainless-steel type ([]: Cast iron type)

Type	BSC [BFC]	BSN [BFN]	BSE [BFE]	BSV [BFV]	BST [BFT]	BSH [BFH]	BSS [BFS]
Switching Portion	ADC12						
Fluid contact Portion	SCS14						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	CR	NBR	EPDM	FPM	SUS316	TPEE	TPO
Center Disk	SUS316						

• Polypropylene type

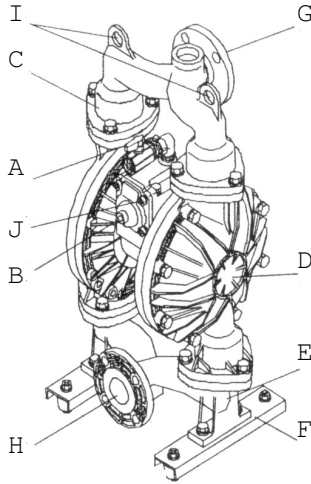
Type	BPC	BPN	BPE BVE	BPV BVV	BPT BVT	BPH BVH	BPS BVS
Switching Portion	ADC12						
Fluid contact Portion	PPG / PVDF						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	PP / PTFE						
Center Disk	PPG (SCS13) [PVDF(SCS13)]						

■ List of accessories

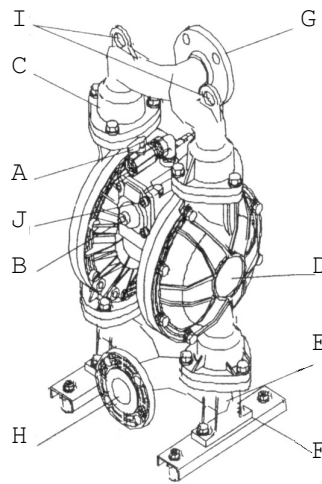
- Operation Manual 1
- Maintenance Manual 1
- Bolt 4 (for securing the pump with the cushions, excluding BP□ type.)

1.7 NDP-50 series

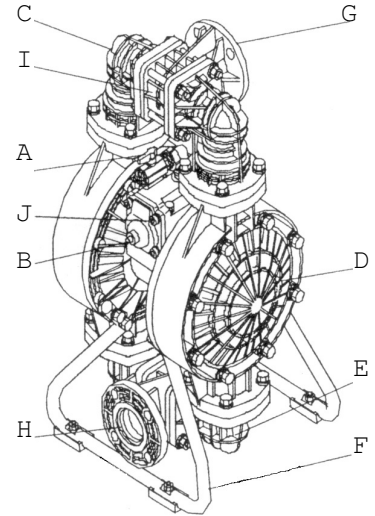
- A: Air Valve
 B: Reset Button
 C: Out Manifold
 D: Out Chamber
 E: In Manifold
 F: Pump Base (Stand)
 G: Discharge Port
 H: Intake Port
 I: Lift Point
 J: Ground Connection Point



NDP-50BA□



NDP-50BS□
 NDP-50BF□



NDP-50BP□
 NDP-50BV□

• Aluminum type

Type	BAC	BAN	BAE	BAV	BAT	BAH	BAS
Switching Portion	ADC12						
Fluid contact Portion	ADC12						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	CR	NBR	EPDM	FPM	A5056	TPEE	TPO
Center Disk	A5056						

• Stainless-steel type ([]: Cast iron type)

Type	BSC [BFC]	BSN [BFN]	BSE [BFE]	BSV [BFV]	BST [BFT]	BSH [BFH]	BSS [BFS]
Switching Portion	ADC12						
Fluid contact Portion	SCS14 [FC250]						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	CR	NBR	EPDM	FPM	SUS316	TPEE	TPO
Center Disk	SUS316						

• Polypropylene type ([]: Polyvinylidene fluoride type)

Type	BPC	BPN	BPE [BVE]	BPV [BVV]	BPT [BVT]	BPH	BPS [BVS]
Switching Portion	ADC12						
Fluid contact Portion	PPG [PVDF]						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	PP [PTFE]						
Center Disk	PPG (SCS13) [PVDF(SCS13)]						

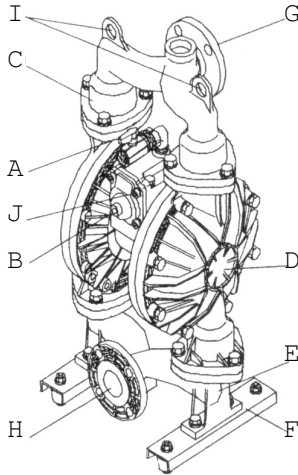
■ List of accessories

- Operation Manual1
- Maintenance Manual1
- Bolt4 (for securing the pump with the cushions, excluding BP□ type.)

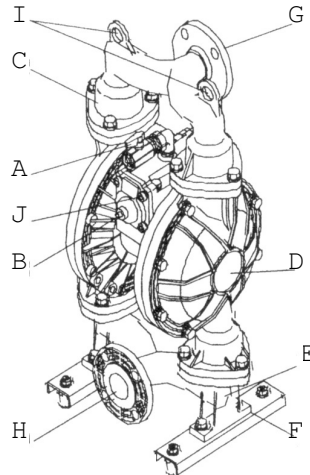
1.8 NDP-80 series

A: Air Valve
 B: Reset Button
 C: Out Manifold
 D: Out Chamber
 E: In Manifold

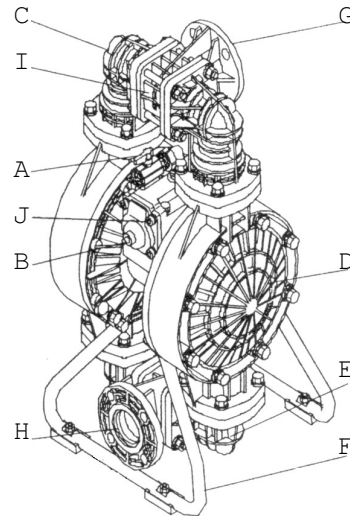
F: Pump Base(Stand)
 G: Discharge Port
 H: Intake Port
 I: Lift Point
 J: Ground Connection Point



NDP-80BA□



NDP-80BS□
 NDP-80BF□



NDP-80BP□

• Aluminum type

Type	BAC	BAN	BAE	BAV	BAT	BAH	BAS
Switching Portion	ADC12						
Fluid contact Portion	ADC12						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	CR	NBR	EPDM	FPM	A5056	TPEE	TPO
Center Disk	A5056						

• Stainless-steel type ([] : Cast iron type)

Type	BSC [BFC]	BSN [BFN]	BSE [BFE]	BSV [BFV]	BST [BFT]	BSH [BFH]	BSS [BFS]
Switching Portion	ADC12						
Fluid contact Portion	SCS14						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	CR	NBR	EPDM	FPM	SUS316	TPEE	TPO
Center Disk	SUS316						

• Polypropylene type

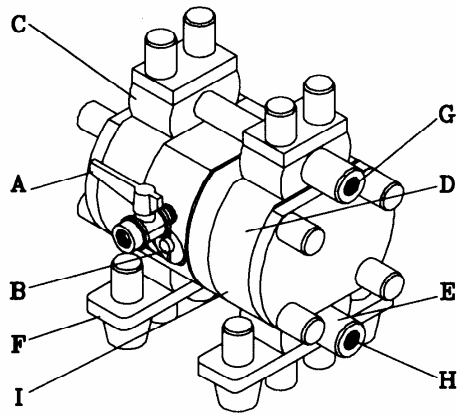
Type	BPC	BPN	BPE	BPV	BPT	BPH	BPS
Switching Portion	ADC12						
Fluid contact Portion	PPG						
Diaphragm	CR	NBR	EPDM	FPM	PTFE	TPEE	TPO
Ball/O Ring	CR/NBR	NBR	EPDM	FPM	PTFE	PTFE	EPDM
Valve Seat	PP						
Center Disk	PPG (SCS13)						

■ List of accessories

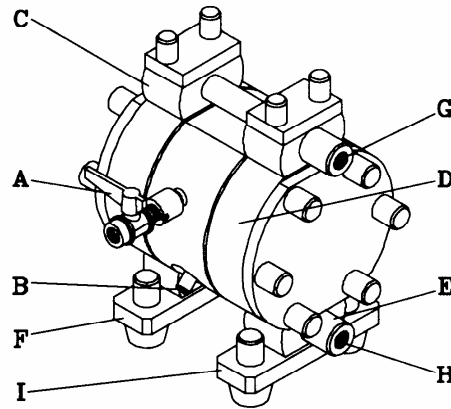
- Operation Manual 1
- Maintenance Manual 1
- Bolt 4 (for securing the pump with the cushions, excluding BP□ type.)

1.9 DP-F series

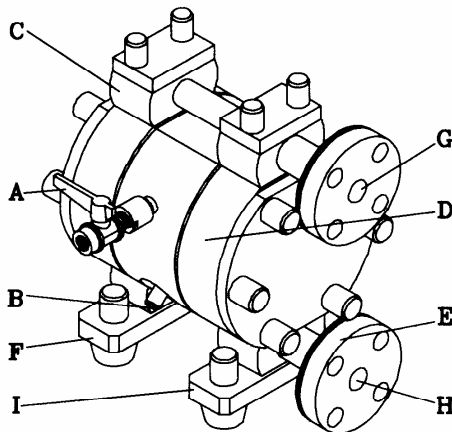
A: Air Valve
 B: Reset Button
 C: Out Manifold
 D: Out Chamber
 E: In Manifold
 F: Pump Base
 G: Discharge Port
 H: Intake Port
 I: Lift Point



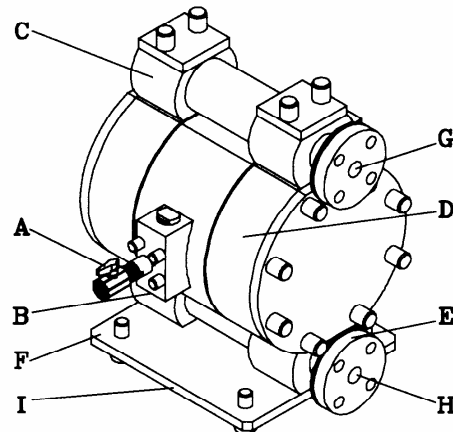
DP-5F



DP-10F (PT: FEMALE)
 DP-20F (PT: FEMALE)



DP-10F (JIS 10K 10A)
 DP-20F (JIS 10K 20A)



DP-25F
 DP-38F

• Fluorine resin type

Type	5F	10F	20F	25F	38F
Switching Portion	PPS	PP		PE, PP	
Fluid contact Portion	PTFE				
Diaphragm	PTFE				
Ball/O Ring	PTFE				
Valve Seat	PTFE				
Center Disk	PFA (SUS316)				

■ List of accessories

- Operation Manual1
- Maintenance Manual1
- Air Valve1
- Silencer1 (exclude DP-5F)
- Bushing 1 (only DP-25F)
- Union (Air Port) 1 (exclude DP-5F)
- Union (Exhaust Port) 1 (only DP-10F, 20F)
- Reinforcement Plate 8 (only Flange Type)
- Accessory Tool 1 (only DP-5F)

2. Assembly

2.1 Installation of accessories

- 1) First, open the product package and make sure that all the accessories are in order (see 1. Names of parts and materials ■List of accessories after p.8).
- 2) Attach the air valve and the silencer (nipple) (see the appearance drawings on 1. Names of parts and materials after p.8).
(With some models, these are already installed.)

CAUTION



•All of the connection parts are capped or taped for shipment. Remove the caps and tapes.



•When installing accessories make sure that no foreign matter falls into the product, as it could cause malfunction of the switching portion.



•Cover each screw with sealing tape to prevent leakage.



•See 10.1 Main specifications after p.30. Remember that the pump is heavy, so extreme care must be taken when lifting it.

3. Installation

3.1 Method of transport

- When lifting the pump using a chain hoist or crane before transporting it, be sure to lift it by the specified lift point (see “1. Names of parts and materials” after p.8).

⚠ WARNING	
!	• Be careful that nobody will pass under the pump when you lift it. It would be very dangerous if the pump should fall.

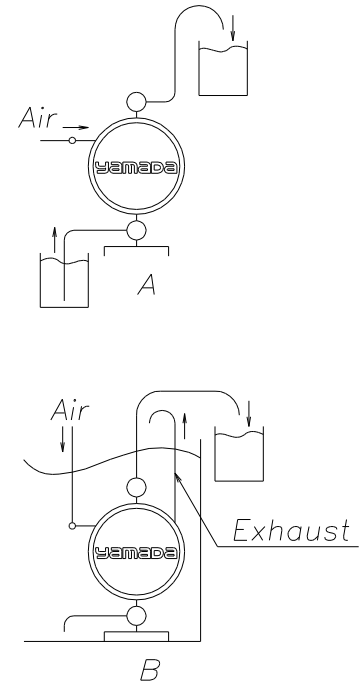
⚠ CAUTION	
!	• See 10.1 Main specifications after p.26. Remember that the pump is heavy, so extreme care must be taken when lifting it.
!	• When moving the pump with a forklift or truck, make sure that the pump will not fall. If it does, it may be damaged and/or cause bodily injury.
⊘	• NEVER try to move the pump by pulling the hose connected to the pump. The hose or the pump may be damaged.

3.2 Installing the pump

- 1) Decide where the pump should be installed and secure a suitable space (see Fig. 3.1 A to D).

Note:

- Try to keep the suction lift as short as possible. Protect diaphragm from abnormal breakage, inlet pressure must be kept below the following values:
 - *PTFE diaphragm: 0.02MPa (height 2m) During operation
: 0.05MPa (height 5m) Not in operation
 - *Other diaphragms: 0.1MPa (height 10m)
(Condition with fresh water under ambient temperature)
- Remember to provide sufficient space around the pump for maintenance.
- Can be changed the direction of the fluid intake port and the discharge port opposite from each other. (For switching, see the maintenance manual.)
- The exhaust from the pump will contain some sludge. When operating the pump where it would have an impact on the environment, the exhaust should be directed to a place where there will be no environmental impact.



- 2) Remove the pump from the package and install it in the designated location.

- 3) When fixing the pump in place, use the cushions on the pump base, and secure pump by tightening the tied-down bolts a little at a time.

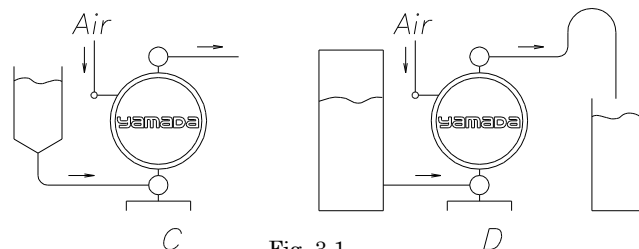


Fig. 3.1

⚠ CAUTION

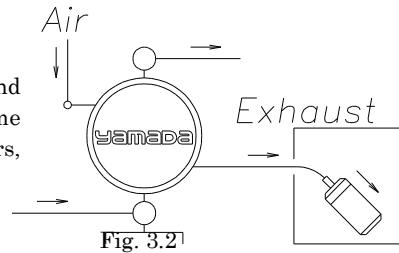
- Even if you do not use the cushions to secure the pump in place, mount it in such a way that vibration generated by pump operation will be absorbed.
- If the pump will be submerged during operation, follow the steps below:
 - *Verify the corrosion resistance of each component of the pump, and do NOT expose the pump to any fluid for which it does not have proper corrosion resistance.
 - *Exhaust should direct outside, not into the fluid in which the pump is submerged. For information on how to arrange the exhaust, see Note: Arranging outside exhaust and Fig. 3.2 below.
 - *Make sure that you can reach all of the valves without submerging your hand.
- When operating the pump, operation noise may be generated, depending upon conditions of use (kind of fluid being pumped, supply air pressure and discharge pressure). If any regulatory rules apply, provide appropriate acoustic measures. (For the noise level of this product, see 10.1 Main specifications on p.26.)
- When pumping a hazardous fluid (hot, flammable, strong acid, etc.), provide protective measures (installation of a pit or sensors, etc.) in consideration of possible leakage of fluid, and post warning signs at necessary places. For details, see the applicable operating caution on p.4,5 and 6.

WARNING ⚠

- If using the pump with a flammable fluid or in a flammable environment read the applicable operating caution on p.4,5 and 6.

Notes: Arranging outside exhaust

- Remove the silencer.
- Connect a hose with a ground wire to the pumps exhaust port, and attach the silencer to the tip of the hose. Use a hose of the same diameter as the exhaust port. (If the hose is longer than 5 meters, consult your dealer or our regional office.)
- Have a pit, a protection box, etc. at the end of the hose.

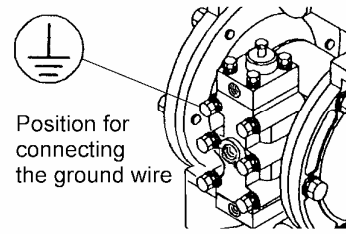


⚠ WARNING

- Be sure to have a pit, a protection box, etc. at the end of the hose in preparation for the flow of fluid in case of damage to a diaphragm. For details, see the applicable operating caution on p.4,5 and 6.
- Pump exhaust should be directed to a safe place, away from people, animals and food.

3.3 Connecting the ground wire

- When installing the pump, be sure to connect the ground wire at the specified position, see relevant fig. 3.3.
- Also connect ground wires to peripheral equipment and piping.
- Use 2.0mm² minimum ground wire.



Position for connecting the ground wire

Fig. 3.3.a type 20/25

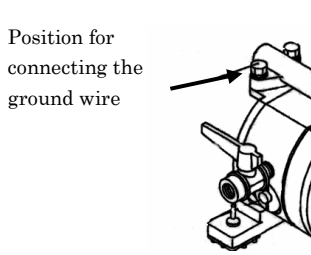


Fig. 3.3.b type 05/10/15

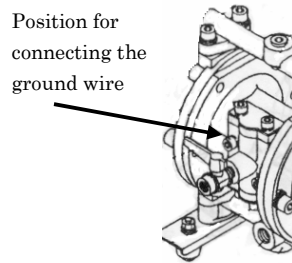
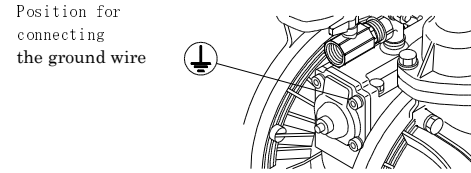



Fig. 3.3.c type dp10



Position for connecting the ground wire

Fig. 3.3.d type 40/50/80

⚠ WARNING



- Be sure to connect ground wires to the connected piping and any other connected equipment. For details, see the applicable operating caution on p. 4,5 and 6.

When the pump is operated without a ground wire or otherwise not properly grounded, friction between parts and abrasion caused by some fluids flowing inside the casing may generate static electricity. Also, depending on the type of fluid being pumped and the installation environment (such as gases in the air or the surrounding fixtures), it may be a cause of fire or electric shock.

3.3.1. Use in potentially explosive atmospheres

- Your pump can be used in potentially explosive atmospheres if the symbol of Fig. 3.3.1. is visible on the identification plate. Below the symbol is indicated what zones and equipment group is applicable. The maximum allowable surface temperature is indicated on the type plate Fig. 3.3.2.
- Always connect a ground wire, which must be attached to the pump. When removing the pump from the system, remove the ground wire at last. When installing the pump to the system, install the ground wire first.
- Use 2.0mm² minimum ground wire.

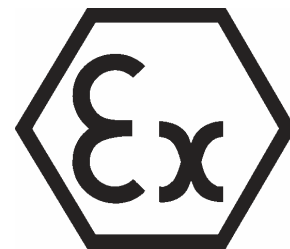





Fig. 3.3.1.





	PUMP TYPE	_____	
	MAX. AIR PRESS.	_____	MPa
	MODEL NR.	_____	
	SERIAL NR.	_____	
	PROD. YEAR	_____	


 II2GD1B/IC95°C
 YE ATEX0580V01X

AQUAMARIJNSTRAAT 50 HENGEL0 (NL)

Fig. 3.3.2.

4. The equipment can be used for group II gases (above ground, group I is applicable for mining) in Zones 1 and 2. For use in combination with group IIC gases, the media must be conductive to prevent built up of static electricity. For group IIA and IIB gases and for Dust, there are no limitations other than the maximum allowable media temperature of 95°C.
5. Make sure that the pump is serviced according to the appropriate service instructions, by a qualified repair station. Use only original Yamada parts for servicing. Use of non-original parts will make the EX approval invalid.
6. No modifications or changes to the pump are allowed, this will make the EX approval invalid.

WARNING



- Be sure to connect ground wires to the connected piping and any other connected equipment. For details, see the applicable operating caution on p.4,5 and 6. Do not operate the pump without a ground wire or otherwise not properly grounded, friction caused by some fluids flowing inside the casing may generate static electricity. Also, depending on the type of fluid being pumped and the installation environment (such as gases in the air or the surrounding fixtures), it may become an ignition source, resulting in a possible explosion.



- Be careful when using tools at or in the environment of the pump. Dropping of metal objects or tools on the pump can cause impact sparks, resulting in an explosion if explosive gas is present.



- Make sure that the pump is serviced according to the appropriate service instruction, by a qualified repair station. Use only original Yamada parts for servicing. Use of non-original parts will make the EX approval invalid. Doing so can result in dangerous situations, resulting in an explosion if explosive gas is present.



- No modifications or changes to the pump are allowed, this will make the EX approval invalid. Doing so can result in dangerous situations, resulting in an explosion if explosive gas is present.

4. Connection

4.1 Connecting fluid piping

- 1) Connect a flow valve and a drain valve to the fluid discharge port of the pump.
- 2) Connect a valve for maintenance to the fluid suction intake port of the pump.
- 3) Connect a hose to the valve on the suction-port side and the valve of the discharge-port side of the pump.
- 4) Connect a hose on the suction-side intake and the discharge-port side to the respective vessels.

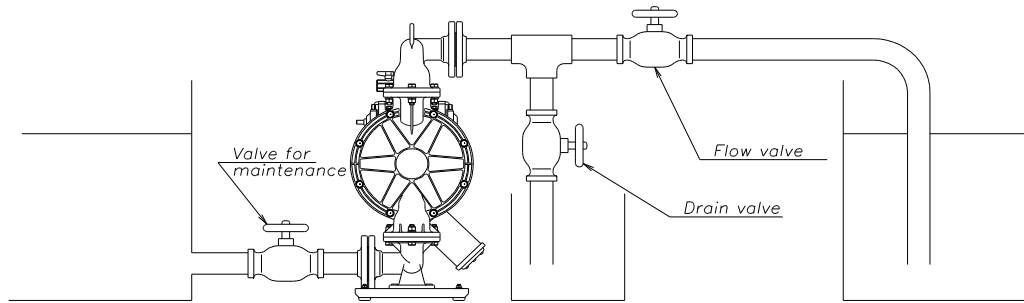


Fig.4.1

⚠ CAUTION

- Use a flexible hose to absorb pump vibration, and ground the hose.
- Make sure that there will be no external force on any connection part of the pump. Be especially careful not to have the pump support part of the weight of the hose and the piping.
- Use a sturdy hose that will not collapse under the strong suction of the pump. Also, make sure the hose is of more than sufficient pressure rating.
- Use a hose of a diameter the same as or larger than the pump's ports. If you use a hose of smaller diameter, the pump's performance will be adversely affected, and it may even malfunction.
- When pumping a fluid that contains slurry, verify that the particle size is below the slurry limitation (after p.30, 10.1 Main specifications). If it exceeds the limitation of slurries indicated in the main specifications, attach a strainer to the pump to stop larger particles. Otherwise, such particles may cause a malfunction.
- If, depending upon the place of pump installation, the volume of the pumped fluid changes drastically, install a relief valve on the discharge side, and bring the pressure down below the maximum permissible value. If, owing to a change in the volume of fluid, the pressure inside the pump exceeds the maximum permissible pressure, it may cause damage.
- Keep a vessel below the relief valve to catch any drain off.
- When testing piping for leakage, do NOT apply pressure to the pump's inlet and outlet sides with compressed air from outside. It may cause abnormal breakage to the diaphragm or the switching portion. When testing the piping, either install a valve between the pump's suction inlet and the discharge outlet and piping, or disconnect the pump from the piping and install plugs so that there will be no pressure from outside.
- In our product inspection, clean water (pure water for the DP-F series) is used. To prevent mixture of dirty water into the fluid to be pumped, clean the inside of the pump before finishing installation work.
- When installing a standby pump or two pumps in parallel, be sure to provide a valve on each of the IN and OUT sides and perform pump switching by using the liquid material valve. If the valve of the stop-side pump is open, the diaphragm will be inverted by the discharge pressure of the operating-side pump, resulting in damage in an early stage.

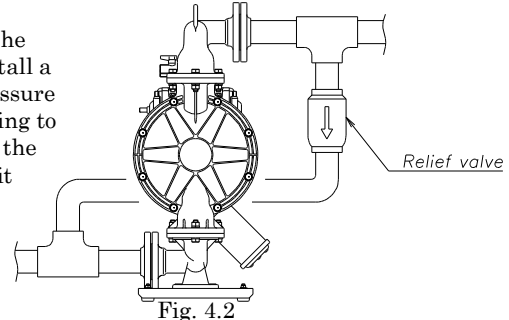


Fig. 4.2

4.2 Connecting air piping

WARNING



- Before starting work, make sure that the air compressor is shut off.

- 1) Connect an air valve, air filter, regulator and if necessary lubricator (hereinafter called the "peripheral equipment") to hose which connected to compressor. Refer (NOTE) for detail information.
- 2) Install these peripheral items supported by brackets, etc., near the pump.
- 3) Connect the hose from the peripheral equipment to the air valve of the pump's supply port.

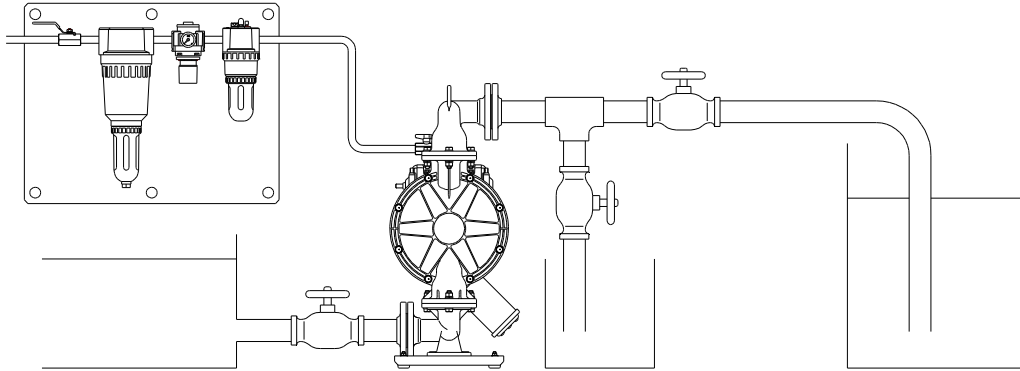


Fig.4.3

CAUTION



- Use a flexible hose to absorb pump vibration, and ground the hose.



- Make sure that there will be no external force on any connection part of the pump.
Be especially careful not to have the pump support part of the weight of the hose and the piping.



- The piping and the peripheral equipment may become clogged with sludge.
Clean the inside of the piping for 10 to 20 seconds before connecting it to the pump.



- Be sure to sufficiently ground the piping and peripheral equipment.




Note:

- So that sufficient air can be supplied to meet the needs of the pump, the diameter of the piping should be the same as the diameter of the supply port of the pump. Also choose peripheral equipment with sufficient airflow to meet the requirement of air consumption of the pump. Also must be considered usage and stability of air pressure. Also must be installed it nearest position of pump unit.
- If you use a solenoid valve as the air valve, be sure it is a three-way valve.
When the valve is closed, the internal compressed air of the pump will be released, and this will switch the spool to its normal position.
- Use of a coupler for the connection part of each hose will make operation and maintenance easier.
- In case of intermitted operation, lubrication is not required during operation. However when pump is operating by dry air and in case of continuous operation and/or transferring high temperature liquid (exceeded 70°C), lubrication must be required.
Must be used turbine oil none addition class 1 turbine oil (equivalent ISO VG 32 grade) for lubricants.
Adjust lubricator to supply minimum amount of oil to pump unit.
Note: DP-F series are not required lubrication even using dry air.

5. Operation



5.1 Method of operation

CAUTION

-  • Before starting the pump, make sure that all piping is properly connected.
-  • Also, before starting the pump, make sure that all the bolts are securely tightened. (Refer to the maintenance manual for the bolts that a regulation torque is explained.)
-  • Make sure that the air valve, regulator and the drain valve on the discharge side are closed. Also, make sure that the valve on the suction side is opened.

- 1) Start the air compressor.
- 2) Open the air valve in front of each piece of peripheral equipment, and adjust the supply air pressure with a regulator to within the permissible range (see 10.1 Main specifications after p.30).
- 3) Open the flow valve on the discharge side.
- 4) Press the RESET button, and then slowly open the air valve of the pump.
- 5) First, verify that fluid is flowing inside the piping and is being pumped to the discharge side, and then fully open the air valve.




CAUTION

-  • Do NOT open the air valve suddenly.
-  • In case of use lubricator, must be used turbine oil none addition class 1 turbine oil (equivalent ISO VG 32 grade) for lubricants. Do not apply lubricants more than required and also do not use any other lubricants, which designated on this instruction manual. This may cause of pump problem and there is danger of serious bodily damage.

5.2 Flow adjustment

- Adjust the flow valve on the discharge side. For the relationship among the flow, supply air pressure and discharge pressure, see 10.3 Performance curve after p.52.

CAUTION

-  • As you start closing the flow valve, the supply air pressure may rise. Make sure that the pressure is kept within the normal operating range (see 10.1 Main specifications after p.30).
-  • Depending upon the viscosity and specific gravity of the fluid, the suction stroke and other conditions, the permissible suction flow speed of fluid into the pump will vary however, if the pump speed (flow speed of fluid) increases greatly, cavitations will occur, and this not only will reduce pump performance, but it may cause a malfunction. Adjust the supply air pressure as well as the flow in order to prevent cavitations.
-  • If fluid is not discharged after you start the pump, or if you hear an abnormal noise or notice any irregularity, shut down the pump immediately (see 8. Troubleshooting after p.28).

5.3 Shutdown

- Close the air valve of the pump and shut off the supply air.

CAUTION



There is no problem in shutting down the pump with the flow valve closed while air is being supplied; however, if this condition continues for many hours while there is nobody watching the pump, it may continue running when there is a leak from the pump or piping, and fluid may continue flowing out of the position of leakage. Upon finishing your work, release the internal pressure from the pump and close the air valve (see 5.4 Releasing the pressure).



When the pump is shut down while pumping slurry, particulate matter contained in the slurry will be deposited and get stuck inside the out chamber. If the pump is started again as-is, the diaphragm may be damaged or the center disk may be overloaded, and this may cause damage such as bending of the center rod. After finishing your work, purge the remaining fluid from the pump (see 6. Method of cleaning on p.27).

5.4 Releasing the pressure

- 1) Make sure that the air valve of the pump is closed.
- 2) Shut down the air compressor or close the valve on the air-supply side of the peripheral equipment.
- 3) Close the flow valve on the discharge side, start slowly opening the drain valve, and discharge the fluid under pressure.
- 4) Open the air valve of the pump and then start running the pump, and discharge the remaining air.
- 5) After making sure that the pump has been shut down and the pressure has been released, fully open the regulator, and close the air valve and drain valve of the pump.

CAUTION



- Keep a vessel below the relief valve to catch any drain off.



- Fluid under pressure will gush out as soon as you open the valve, so be careful.



- If the pump will be unused for a prolonged period, purge and clean the pump (see the Operating caution on p.4,5 and 6).

6. Method of cleaning

WARNING



• Before starting operation, make sure that compressed air is not supplied to the pump.



• Before starting operation, make sure that the pump is not pressurized.

- 1) Remove the hose from the suction side of the pump.
- 2) Close the flow valve on the discharge side, open the drain valve, and then operate a pump by starting air pressure for a while to discharge any fluid remaining inside the pump as much as possible.
- 3) Remove the hose from the discharge side, and attach different hoses to the suction side and the discharge side for cleaning.
- 4) Be ready with a vessel with cleaning solution, select cleaning solution appropriate for the type of fluid pumped, and then connect the suction-side and the discharge-side hoses of the pump.
- 5) Operate a pump by starting air pressure slowly, and let the cleaning solution circulate for sufficient cleaning.
- 6) Finally, flush with clean water.
- 7) Remove the hose from the suction side of the pump, run the pump for a while and purge the pump of remaining fluid as much as possible.

CAUTION



• Be careful when removing piping. Fluid will gush out.



• After cleaning with clean water, turn the pump upside-down to drain out the water.

7. Daily check

- Before starting pump operation, be sure to conduct the following check every day. If any irregularity is found, do NOT start running the pump until the cause of the irregularity has been found and corrective measures have been taken.
 - a) Verify the drain flow through the air filter.
 - b) In case using a lubricator, verify the quantity of lubricating oil.
 - c) Make sure that there is no leakage of fluid from any connection part or the pump.
 - d) Make sure that there are no cracks in the pump casing or piping.
 - e) Check the tightness of every bolt of the pump.
 - f) Make sure that the connection parts of the piping and peripheral equipment is not loose.
 - g) Make sure that the time has not elapsed for replacing any parts of the pump that are to be replaced at regular intervals. For details, see the maintenance manual.

8. Troubleshooting

8.1 Pump does not run

Cause	Action to be taken
The exhaust port (silencer) of pump is clogged with sludge.	Check and clean the exhaust port and silencer.
Air is not supplied.	Start the compressor, and open the air valve and air regulator.
The supply air pressure is low.	Check the compressor and the configuration of air piping.
Air leaks from connection parts.	Check the connection parts and tightness of bolts.
Air piping or peripheral equipment is clogged with sludge.	Check and clean the air piping.
The flow valve on the discharge side is not open.	Open the flow valve on the discharge side.
The spool stopped in neutral position.	Press the RESET button.
The fluid piping is clogged with sludge.	Check and clean the fluid piping.
The pump is clogged with sludge.	Disassemble the casing, check and clean.

8.2 Pump runs, but fluid does not come out

Cause	Action to be taken
The suction lift or discharge head is long.	Confirm the piping configuration and shorten the length.
The discharge-side fluid piping (including the strainer) is clogged with sludge.	Check and clean the fluid piping.
The valve on the suction side is not open.	Open the valve on the suction side.
The pump is clogged with sludge.	Disassemble the casing, check and clean.
The ball and valve seat are worn out or damaged.	Disassemble the manifold, check and replace parts.

8.3 Flow (discharge volume) decreased

Cause	Action to be taken
The supply air pressure is low.	Check the compressor and configuration of air piping.
Air piping or peripheral equipment is clogged with sludge.	Check and clean the air piping.
The discharge-side flow valve opens differently.	Adjust the discharge-side flow valve.
Air is taken in together with fluid.	Replenish fluid and check the configuration of the suction-side piping.
Cavitations occur.	Adjust the supply air pressure and discharge pressure, and shorten the suction lift.
Chattering occurs.	Adjust the supply air pressure and discharge pressure. Reduce inlet flow valve to adjusting liquid pressure and volume.
Icing on air-switching portion.	Eliminate ice from air-switching valve and check and clean the air filter. Use external exhaust hose to control exhaust air speed. (Refer Fig.3.2)
The fluid piping (including the strainer) is clogged with sludge.	Check and clean the fluid piping and strainer.
The exhaust port (silencer) of the pump is clogged with sludge.	Check and clean the exhaust port and silencer.
The pump is clogged with sludge.	Disassemble the casing, check and clean.

8.4 Liquid leakage from exhaust port (silencer)

Cause	Action to be taken
The diaphragm is damaged.	Disassemble and check the pump and replace the diaphragm.
The fastening nuts for the center disk are loose.	Disassemble and check the pump. Tighten the nuts.

8.5 High air consumption during operation

Cause	Action to be taken
The seal ring and sleeve are worn out.	Disassemble the air-switch portion, check and clean. Replace parts as necessary.

8.6 Irregular noise

Cause	Action to be taken
The supply air pressure too high.	Adjust the supply air pressure.
The spool oscillates, and occurs ball chattering.	Adjust the supply air pressure and discharge pressure. Reduce inlet flow valve to adjusting liquid pressure and volume.
The pump is clogged with sludge with particles of larger than the permissible diameter.	Disassemble the casing, check and clean.

8.7 Irregular vibration

Cause	Action to be taken
The supply air pressure is too high.	Adjust the supply air pressure.
The spool oscillates, and occurs ball chattering.	Adjust the supply air pressure and exhaust pressure.
Connection parts and pump mounting are loose.	Check each connection part and tighten the bolts.

- If disassembly is required, refer to the maintenance manual and follow with the instructions.
- If any of the above mentioned causes do not apply to your problem, contact your dealer or our regional office.

9. Returning the product for servicing

9.1 How to use the FAX Sheet

- Copy the FAX Sheet on p.60 "11. Trouble-Reporting FAX Sheet", fills out the necessary details regarding your problem and conditions of operation, and faxes it to your dealer or our regional office.

9.2 Before returning the product

- 1) Purge the pump of fluid and clean (see 6. Method of cleaning on p.27).
- 2) Return the product in the same package as when it was first shipped from the factory.

WARNING



- It will be the end-user responsibility to thoroughly wash a clean the pumps to prevent accidents caused by liquid leaks.

CAUTION



- Be sure to prevent liquid leak from pump for safe transport.

10. Main body specification

10.1 Main specification

■NDP-5 series

Type		NDP-5				
		FAT	FST	FPT	FVT	FDT
Nominal Diameter		1/4" (6mm)				
Fluid Connection	Suction Port	Rc1/4"			E.C. Countries BSP1/4" Other Countries Rc1/4"	
	Discharge Port					
Air Connection	Supply Port	Rc1/4"				
	Exhaust Port	Rc3/8"				
Normal Air Pressure		0.2~0.7MPa (2~7kgf/cm ²)			0.2~0.5MPa (2~5kgf/cm ²)	
Maximum Discharge Pressure		0.7MPa (7kgf/cm ²)			0.5MPa (5kgf/cm ²)	
Discharge Volume/Stroke		20mL				
Maximum Discharge Volume		10L/min				
Maximum Air Consumption		250L/min (ANR)			170L/min (ANR)	
Slurry Limitation		Do not use the flat valve type pump for the liquids with slurry.				
Limitation of Viscosity		Limitation of viscosity is highly dependent on application. Contact your local distributor or Yamada for more information.				
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]				
	Fluid Temp.	0~100°C [32~212°F]			0~60°C [32~140°F]	
Operating Noise		72dB				
Weight		1.6kg	2.7kg	1.4kg	1.7kg	

■DP-10/12 series

Type		DP-10/12		
		BA□	BS□	BP□
Nominal Diameter		3/8" (10mm)		
Fluid Connection	Suction / Port	Rc3/8" DP-10 / BSP 1/2" DP-12		E.C. Countries BSP3/8" E.C. Countries BSP1/2" Other Countries Rc3/8"
	Discharge Port			
Air Connection	Supply Port	Rc1/4"		
	Exhaust Port	Rc 3/8"		
Nominal Air Pressure		0.2~0.7MPa (2~7kgf/cm ²)		0.2~0.5MPa (2~5kgf/cm ²)
Maximum Discharge Pressure		0.7MPa (7kgf/cm ²)		0.5MPa (5kgf/cm ²)
Discharge Volume/Stroke		50mL		
Maximum Discharge Volume		20L/min		17L/min
Maximum Air Consumption		300L/min (ANR)		200L/min (ANR)
Slurry Limitation		1mm or less		
Limitation of Viscosity		Limitation of viscosity is highly dependent on application. Contact your local distributor or Yamada for more information.		
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]		
	Fluid Temp.	Diaphragm materials NBR/CR : 0~70°C[32~158°F] TPEE/EPDM : 0~80°C[32~176°F] FPM/TPO/PTFE : 0~100°C[32~212°F]		0~60°C [32~140°F]
Operating Noise		82dB		
Weight		3.6kg [4.5kg]*1	5.3kg [6.2kg]*1	3.1kg

*1.[]: Drum type

■ NDP-10 series

Type		NDP-10					
		BPC	BPB	BPT	BPS	BPH	BPE
Nominal Diameter		3/8" (10mm)					
Fluid Connection	Suction Port	BSP 3/8"					
	Discharge Port						
Air Connection	Supply Port	Rc1/4"					
	Exhaust Port	Rc3/8"					
Normal Air Pressure		0.2 ~ 0.5 Mpa (5kgf/cm ²)					
Maximum Discharge Pressure		0.5 Mpa (5kgf/cm ²)					
Discharge Volume/Stroke		60mL					
Maximum Discharge Volume		23 L/min					
Maximum Air Consumption		300 L/min (ANR)					
Slurry Limitation		1mm or less					
Limitation of Viscosity		Limitation of viscosity is highly dependent on application. Contact your local distributor or Yamada for more information.					
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]					
	Fluid Temp.	Diaphragm materials NBR/CR : 0~70°C [32~158°F] TPEE/EPDM : 0~80°C [32~176°F] FPM/TPO/PTFE : 0~100°C [32~212°F]					
Operating Noise		78dB					
Weight		3.2 kg					

■ NDP-15 series

Type		NDP-15				
		BA□	BS□	FP□	FVT	FDT
Nominal Diameter		1/2" (15mm)				
Fluid Connection	Suction Port	Rc1/2"		E.C. Countries BSP1/2" Other Countries Rc1/2"		
	Discharge Port					
Air Connection	Supply Port	Rc1/4"				
	Exhaust Port	Rc3/8"				
Normal Air Pressure		0.2~0.7MPa (2~7kgf/cm ²)		0.2~0.5MPa (2~5kgf/cm ²)		
Maximum Discharge Pressure		0.7MPa (7kgf/cm ²)		0.5MPa (5kgf/cm ²)		
Discharge Volume/Stroke		70mL				
Maximum Discharge Volume		50L/min		45L/min		
Maximum Air Consumption		450L/min (ANR)		350L/min (ANR)		
Slurry Limitation		1mm or less				
Limitation of Viscosity		Limitation of viscosity is highly dependent on application. Contact your local distributor or Yamada for more information.				
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]				
	Fluid Temp.	Diaphragm materials NBR/CR : 0~70°C [32~158°F] TPEE/EPDM : 0~80°C [32~176°F] FPM/TPO/PTFE : 0~100°C [32~212°F]		0~60°C [32~140°F]		
Operating Noise		81dB		78dB		
Weight		4.1kg	6.2kg	3.5kg	4.3kg	

■ NDP-20 series

Type		NDP-20					
		BA□	BAT	BS□	BST	BP□	BPT
Nominal Diameter		3/4" (20mm)					
Fluid Connection	Suction Port	Rc3/4"				E.C. Countries BSP3/4" Other Countries Rc3/4" DIN Flange available	
	Discharge Port						
Air Connection	Supply Port	Rc1/4"					
	Exhaust Port	Rc3/4"					
Nominal Air Pressure		0.2~0.7MPa (2~7kgf/cm ²)				0.2~0.5MPa (2~5kgf/cm ²)	
Maximum Discharge Pressure		0.7MPa (7kgf/cm ²)				0.5MPa (5kgf/cm ²)	
Discharge Volume/Stroke		350mL	240mL	350mL	240mL	350mL	240mL
Maximum Discharge Volume		110L/min	100L/min	110L/min	100L/min	100L/min	80L/min
Maximum Air Consumption		1200L/min (ANR)	1400L/min (ANR)	1200L/min (ANR)	1400L/min (ANR)	800L/min (ANR)	800L/min (ANR)
Slurry Limitation		2mm or less					
Limitation of Viscosity		Suction Lift 3Pa·s or below Force In 8Pa·s or below					
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]					
	Fluid Temp.	Diaphragm materials NBR/CR : 0~70°C [32~158°F] TPEE/EPDM : 0~80°C [32~176°F] FPM/TPO/PTFE : 0~100°C [32~212°F]				0~60°C [32~140°F]	
Operating Noise		97dB				94dB	
Weight		9.0kg [11.2kg]*1		14.0kg		8.0kg	

*1.[]: Drum type

■ NDP-25 (metal type) series

Type		NDP-25					
		BA□	BAT	BS□	BST	BF□	BFT
Nominal Diameter		1" (25mm)					
Fluid Connection	Suction Port	Rc1"					
	Discharge Port						
Air Connection	Supply Port	Rc3/8"					
	Exhaust Port	Rc3/4"					
Normal Air Pressure		0.2~0.7MPa (2~7kgf/cm ²)					
Maximum Discharge Pressure		0.7MPa (7kgf/cm ²)					
Discharge Volume/Stroke		600mL	500mL	600mL	500mL	600mL	500mL
Maximum Discharge Volume		160L/min					
Maximum Air Consumption		1800L/min (ANR)	1600L/min (ANR)	1800L/min (ANR)	1600L/min (ANR)	1800L/min (ANR)	1600L/min (ANR)
Slurry Limitation		3mm or less					
Limitation of Viscosity		Suction Lift 3Pa·s or below Force In 8Pa·s or below					
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]					
	Fluid Temp.	Diaphragm materials NBR/CR : 0~70°C [32~158°F] TPEE/EPDM : 0~80°C [32~176°F] FPM/TPO/PTFE : 0~100°C [32~212°F]					
Operating Noise		97dB					
Weight		13kg		20kg		20kg	

■ NDP-25 (plastic type) series

Type		NDP-25			
		BP□	BPT	BV□	BVT
Nominal Diameter		1" (25mm)			
Fluid Connection	Suction Port	E.C. Countries BSP1" Other Countries Rc1" DIN Flange available			
	Discharge Port				
Air Connection	Supply Port	Rc3/8"			
	Exhaust Port	Rc3/4"			
Nominal Air Pressure		0.2~0.5MPa (2~5kgf/cm ²)			
Maximum Discharge Pressure		0.5MPa (5kgf/cm ²)			
Discharge Volume/Stroke		600mL	500mL	600mL	500mL
Maximum Discharge Volume		150L/min			
Maximum Air Consumption		1200L/min (ANR)			
Slurry Limitation		3mm or less			
Limitation of Viscosity		Suction Lift 3Pa·s or below Force In 8Pa·s or below			
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]			
	Fluid Temp.	0~60°C [32~140°F] PP 0~80°C [32~176°F] PVDF			
Operating Noise		94dB			
Weight		11.0kg		13.5kg	

■ NDP-40 series

Type		NDP-40							
		BA□	BAT	BS□	BST	BF□	BFT	BP□/BV□	BPT / BVT
Nominal Diameter		1-1/2" (40mm)							
Fluid Connection	Suction Port	Equivalent to JIS flange 10K40A				Rc1-1/2"		Equivalent to JIS flange 10K40A	
	Discharge Port								
Air Connection	Supply Port	Rc1/2"							
	Exhaust Port	Rc1"							
Normal Air Pressure		0.2~0.7MPa (2~7kgf/cm ²)				0.2~0.5MPa (2~5kgf/cm ²)			
Maximum Discharge Pressure		0.7MPa (7kgf/cm ²)				0.5MPa (5kgf/cm ²)			
Discharge Volume/Stroke		2800mL	1400mL	2800mL	1400mL	2800mL	1400mL	2800mL	1400mL
Maximum Discharge Volume		380L/min	340L/min	400L/min	350L/min	400L/min	350L/min	350L/min	320L/min
Maximum Air Consumption		3500 L/min (ANR)	2500 L/min (ANR)	4000 L/min (ANR)	4000 L/min (ANR)	4000 L/min (ANR)	4000 L/min (ANR)	2500 L/min (ANR)	2500 L/min (ANR)
Slurry Limitation		7mm or less							
Limitation of Viscosity		Suction Lift 3Pa·s or below Force In 8Pa·s or below							
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]							
	Fluid Temp.	Diaphragm materials NBR/CR : 0~70°C [32~158°F] TPEE/EPDM : 0~80°C [32~176°F] FPM/TPO/PTFE : 0~100°C [32~212°F]						0~60°C [32~140°F] PP 0~80°C [32~176°F] PVDF	
Operating Noise		95dB				91dB			
Weight		29kg		40kg		60kg		27kg	

■NDP-50 series

Type		NDP-50									
		BA□	BAT	BS□	BST	BF□	BFT	BP□	BPT	BV□	BVT
Nominal Diameter		2" (50mm)									
Fluid Connection	Suction Port	Equivalent to JIS flange 10K50A				Rc2"		Equivalent to JIS flange 10K50A			
	Discharge Port										
Air Connection	Supply Port	Rc3/4"									
	Exhaust Port	Rc1"									
Nominal Air Pressure		0.2~0.7MPa (2~7kgf/cm ²)					0.2~0.5MPa (2~5kgf/cm ²)				
Maximum Discharge Pressure		0.7MPa (7kgf/cm ²)					0.5MPa (5kgf/cm ²)				
Discharge Volume/Stroke		4300mL	2100mL	4300mL	2100mL	4300mL	2100mL	4300mL	2100mL	4300mL	2100mL
Maximum Discharge Volume		600 L/min	580 L/min	630 L/min	600 L/min	630 L/min	600 L/min	550 L/min	500 L/min	550 L/min	500 L/min
Maximum Air Consumption		5500 L/min (ANR)	5500 L/min (ANR)	6000 L/min (ANR)	6000 L/min (ANR)	6000 L/min (ANR)	6000 L/min (ANR)	3500 L/min (ANR)	4000 L/min (ANR)	3500 L/min (ANR)	4000 L/min (ANR)
Slurry Limitation		8mm or less									
Limitation of Viscosity		Suction Lift 3Pa·s or below Force In 8Pa·s or below									
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]									
	Fluid Temp.	Diaphragm materials NBR/CR : 0~70°C [32~158°F] TPEE/EPDM : 0~80°C [32~176°F] FPM/TPO/PTFE : 0~100°C [32~212°F]					0~60°C [32~140°F] PP 0~80°C [32~176°F] PVDF				
Operating Noise		94dB					96dB				
Weight		37kg		54kg		65kg		35kg		41kg	

■NDP-80 series

Type		NDP-80							
		BA□	BAT	BS□	BST	BF□	BFT	BP□	BPT
Nominal Diameter		3" (80mm)							
Fluid Connection	Suction Port	Equivalent to JIS flange 10K80A				Rc3"		Equivalent to JIS flange 10K80A	
	Discharge Port								
Air Connection	Supply Port	Rc3/4"							
	Exhaust Port	Rc1"							
Normal Air Pressure		0.2~0.7MPa (2~7kgf/cm ²)				0.2~0.5MPa (2~5kgf/cm ²)			
Maximum Discharge Pressure		0.7MPa (7kgf/cm ²)				0.5MPa (5kgf/cm ²)			
Discharge Volume/Stroke		8500mL	3800mL	8500mL	3800mL	8500mL	3800mL	8500mL	3800mL
Maximum Discharge Volume		800L/min	600L/min	840L/min	640L/min	840L/min	640L/min	760L/min	560L/min
Maximum Air Consumption		6000 L/min (ANR)	5000 L/min (ANR)	6000 L/min (ANR)	6000 L/min (ANR)	6000 L/min (ANR)	6000 L/min (ANR)	4500 L/min (ANR)	4500 L/min (ANR)
Slurry Limitation		10mm or less							
Limitation of Viscosity		Suction Lift 3Pa·s or below Force In 8Pa·s or below							
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]							
	Fluid Temp.	Diaphragm materials NBR/CR : 0~70°C [32~158°F] TPEE/EPDM : 0~80°C [32~176°F] FPM/TPO/PTFE : 0~100°C [32~212°F]				0~60°C [32~140°F]			
Operating Noise		92dB				93dB			
Weight		65kg		102kg		112kg		64kg	

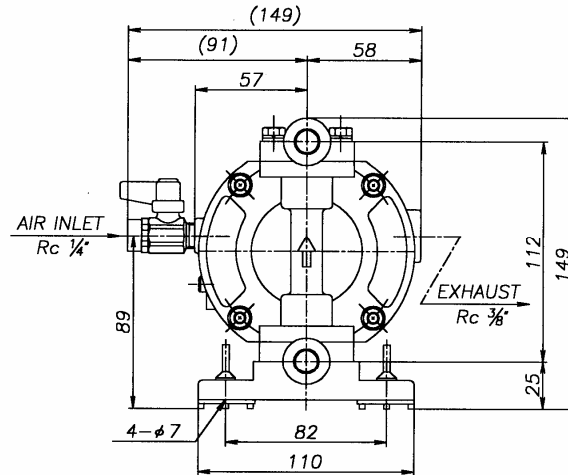
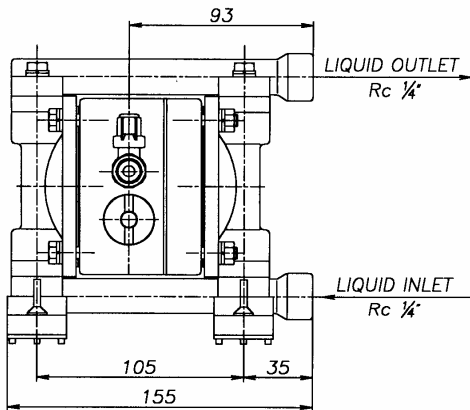
■ DP-F series

Type		DP-5F	DP-10F	DP-20F	DP-25F	DP-38F
Nominal Diameter		1/4" (6mm)	3/8" (10mm)	3/4" (20mm)	1" (25mm)	1" (25mm)
Fluid Connection	Suction Port	Rc1/4"	Rc3/8" or	Rc3/4" or	Equivalent to JIS flange 10K25A	Equivalent to JIS flange 10K25A
	Discharge Port		Equivalent to JIS flange 10K10A	Equivalent to JIS flange 10K20A		
Air Connection	Supply Port	Rc1/4"			Rc3/8"	Rc1/2"
	Exhaust Port	Rc3/8"			Rc3/4"	
Normal Air Pressure		0.2~0.5MPa (2~5kgf/cm ²)			0.2~0.7MPa (2~7kgf/cm ²)	
Maximum Discharge Pressure		0.5MPa (5kgf/cm ²)			0.7MPa (7kgf/cm ²)	
Discharge Volume/Stroke		13mL	65mL	150mL	400mL	700mL
Maximum Discharge Volume		10L/min	25L/min	50L/min	90L/min	95L/min
Maximum Air Consumption		170 L/min (ANR)	250 L/min (ANR)	350 L/min (ANR)	1200 L/min (ANR)	1500 L/min (ANR)
Slurry Limitation		Do not use the flat valve type pump for the liquids with slurry.	1mm or less	2mm or less	3mm or less	
Limitation of Viscosity		0.5Pa·s or below	1Pa·s or below	2Pa·s or below	2.5Pa·s or below	
Operating Ambient Temperature Range	Temp.	0~70°C [32~158°F]				
	Fluid Temp.	0~80°C [32~176°F]				
Operating Noise		71dB	82dB	85dB	88dB	90Db
Weight		3.4kg	7.2kg	15.5kg	40kg	52kg

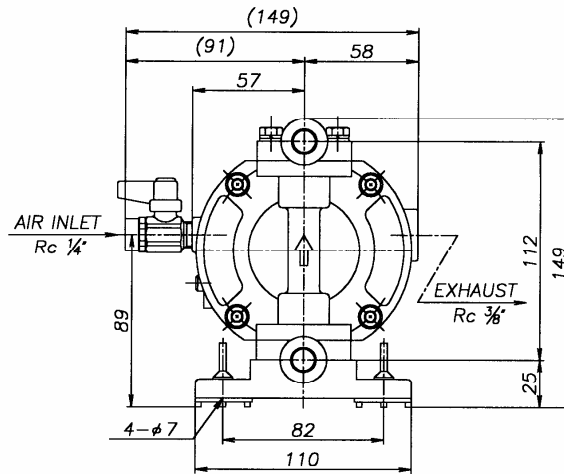
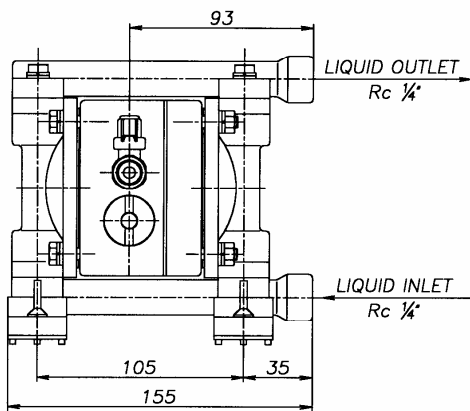
10.2 Appearance and dimensions

10.2.1 NDP-5 series

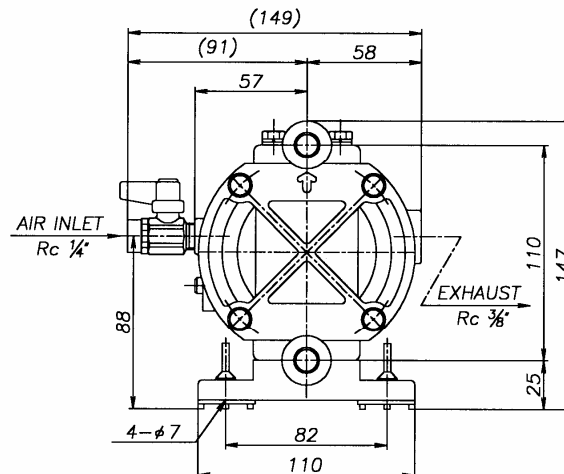
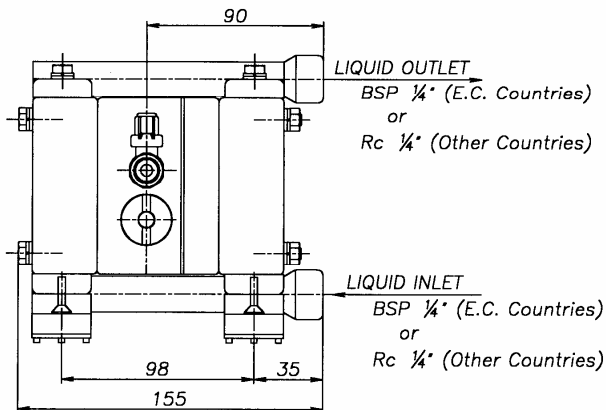
■ NDP-5FAT



■ NDP-5FST

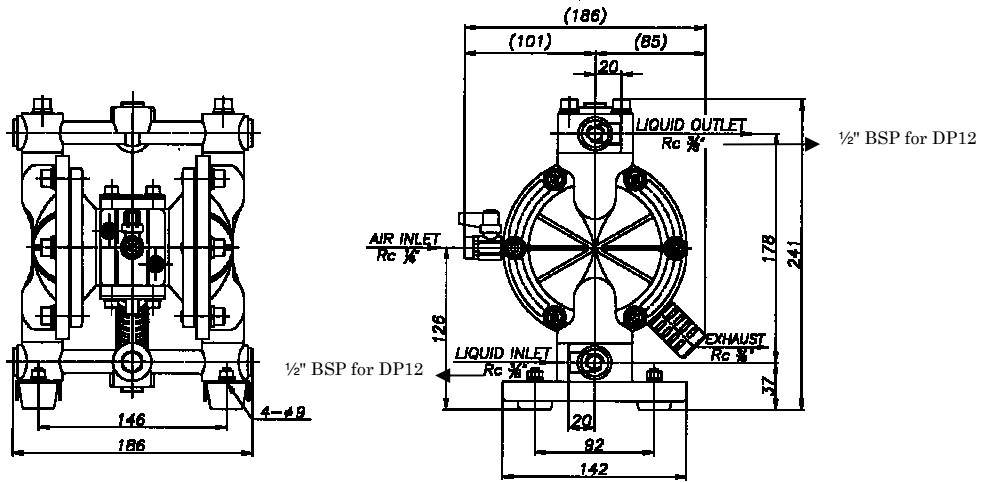


■ NDP-5FPT/FVT/FDT

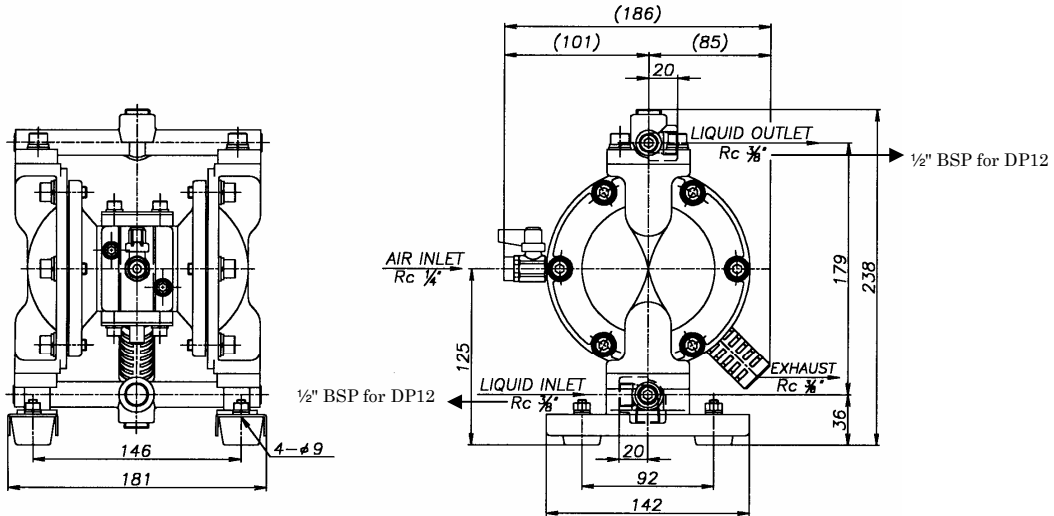


10.2.2 DP-10/12 series

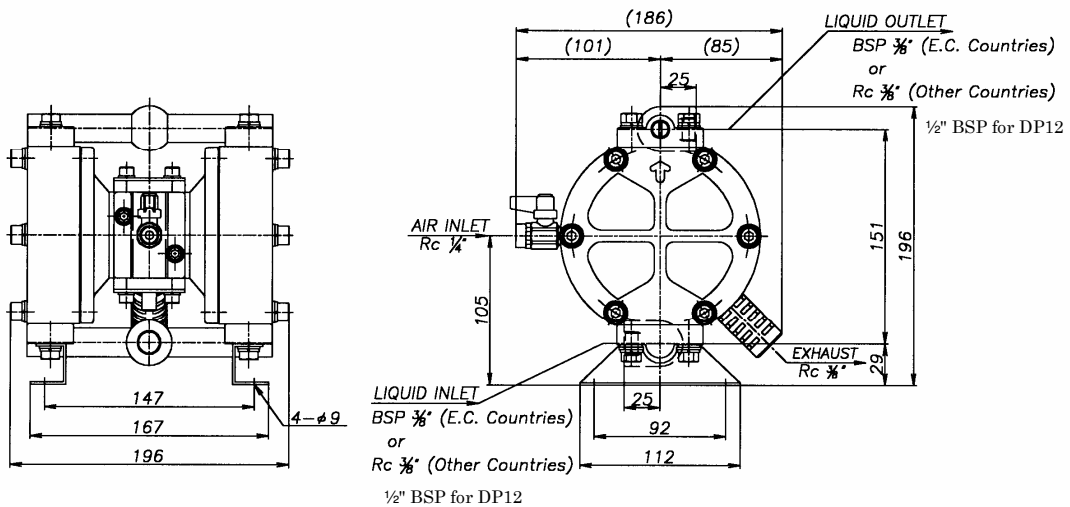
■ DP-10/12BA □



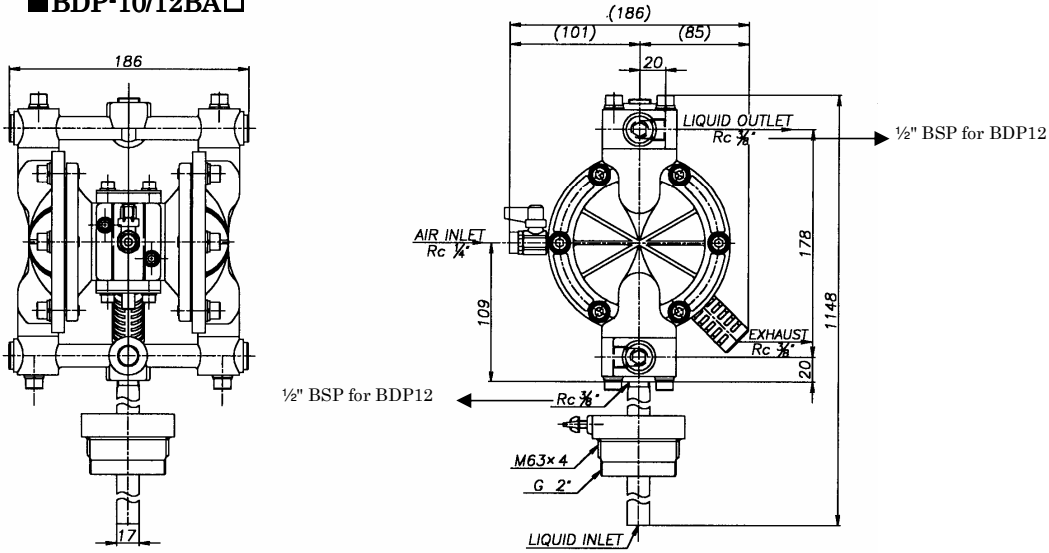
■ DP-10/12BS □



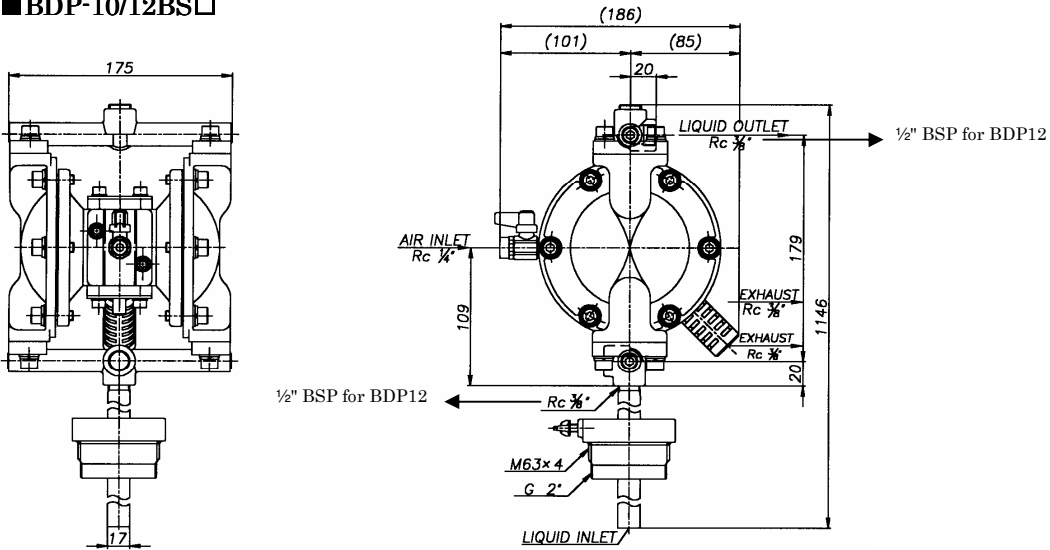
■ DP-10/12BP □



■ BDP-10/12BA □

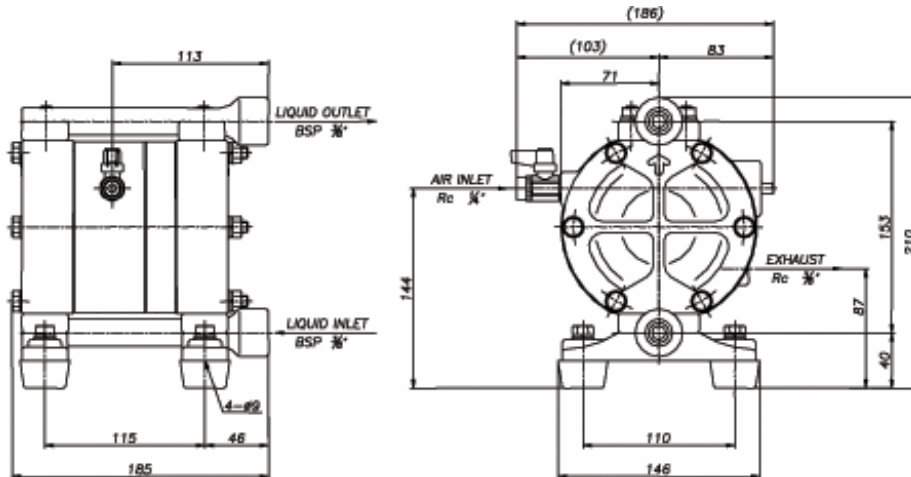


■ BDP-10/12BS □



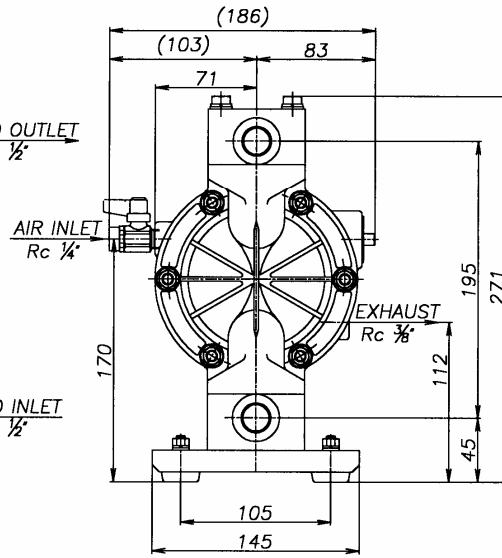
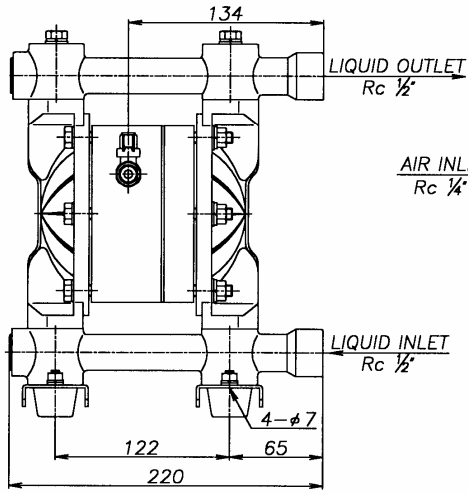
10.2.3 NDP-10 series

■ NDP-10BP □

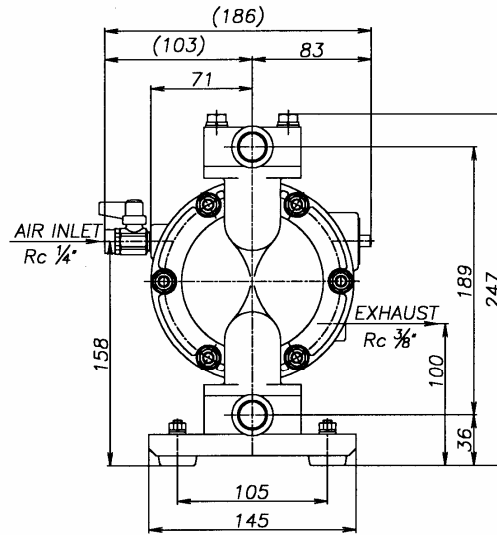
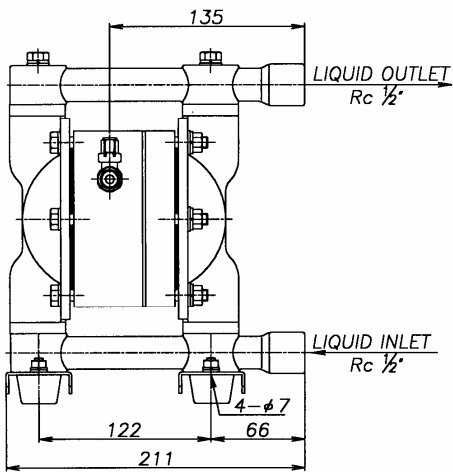


10.2.4 NDP-15 series

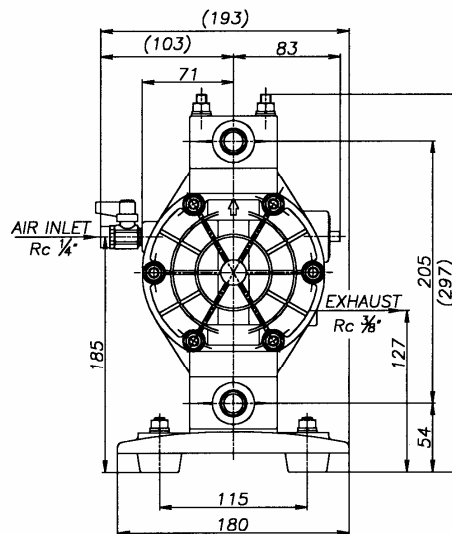
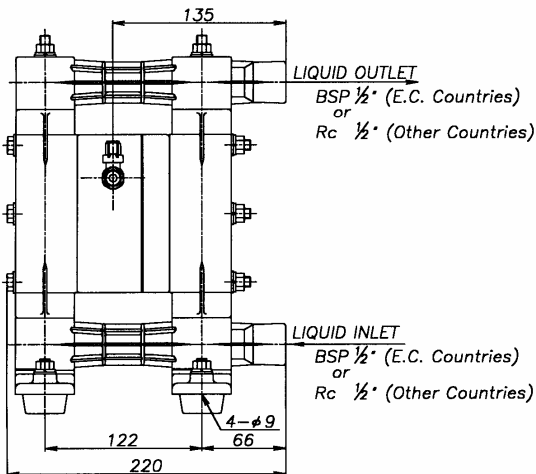
■ NDP-15BA □



■ NDP-15BS □

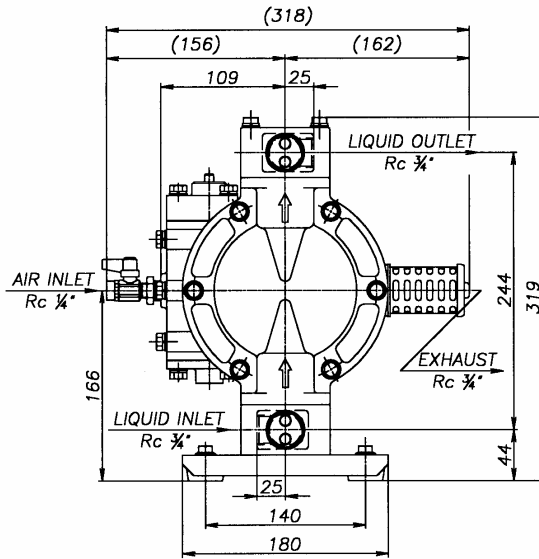
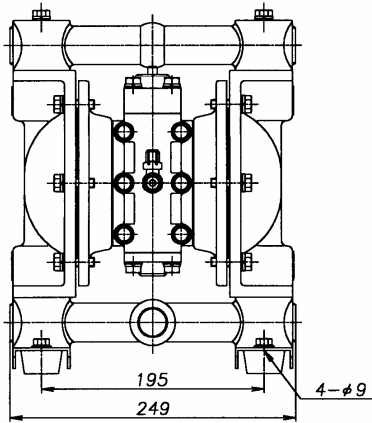


■ NDP-15FP □/FVT/FDT

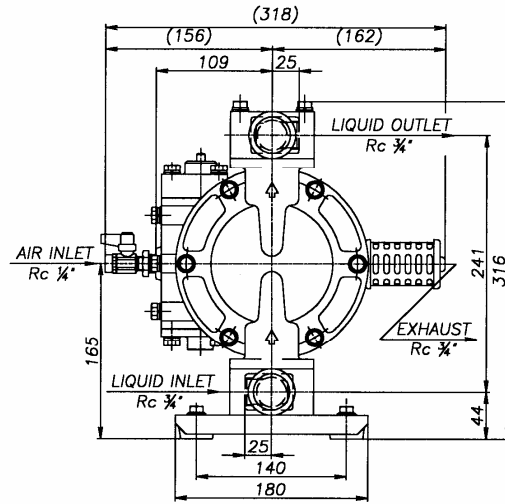
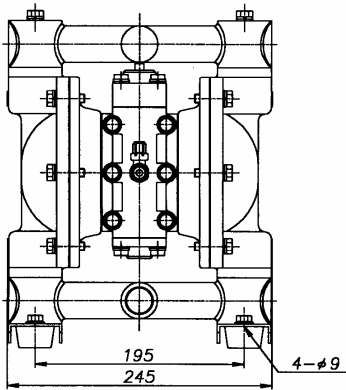


10.2.5 NDP-20 series

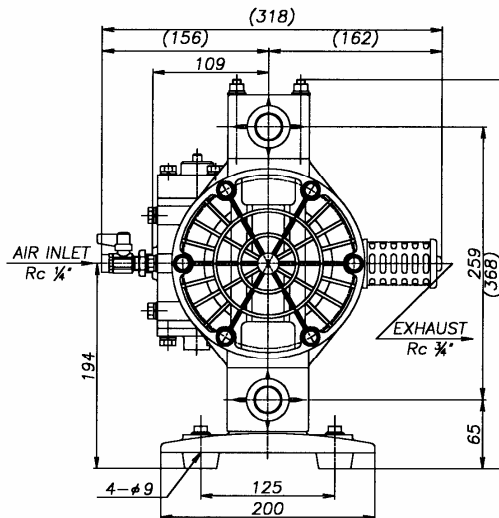
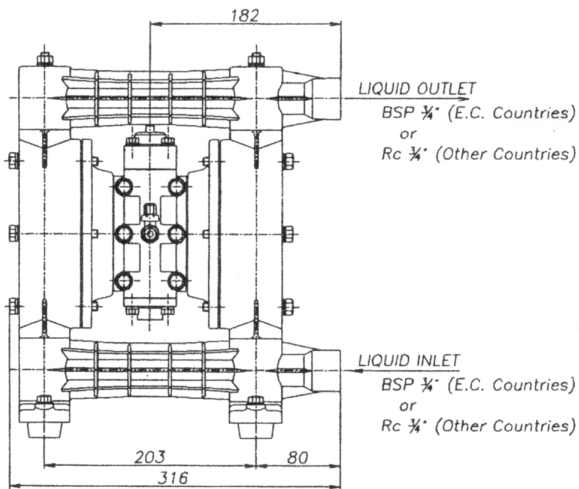
■ NDP-20BA □



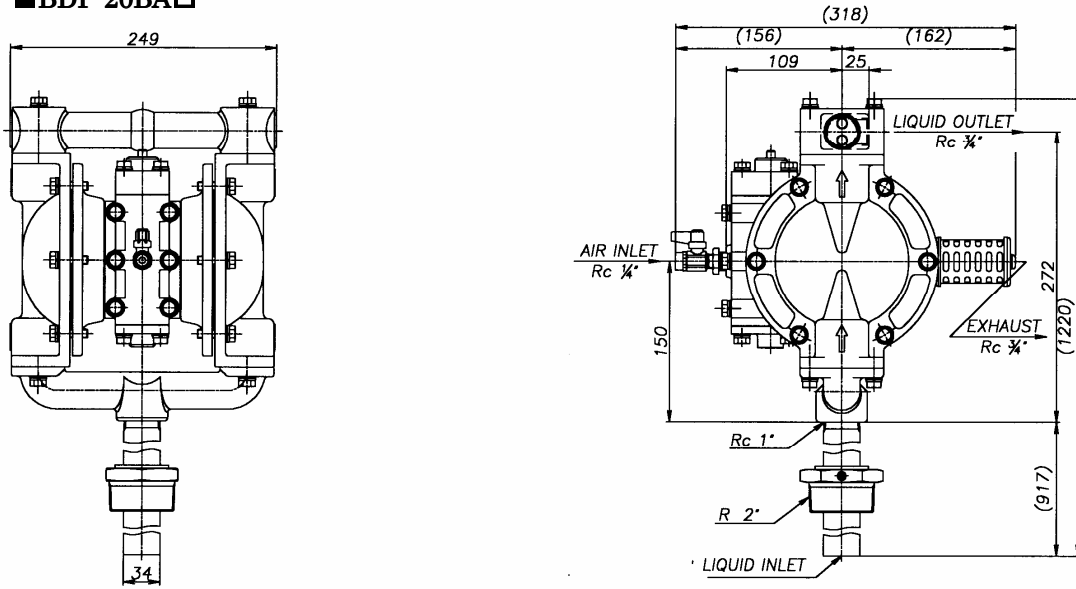
■ NDP-20BS □



■ NDP-20BP □

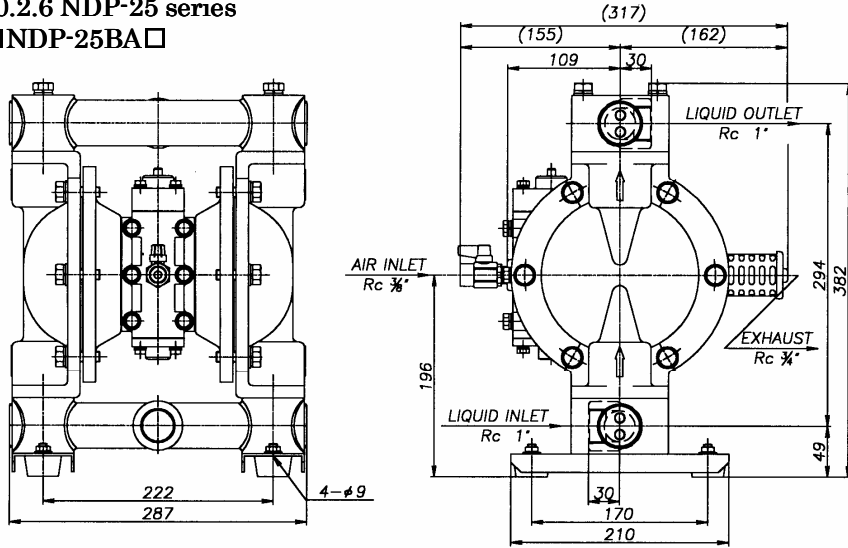


■BDP-20BA□

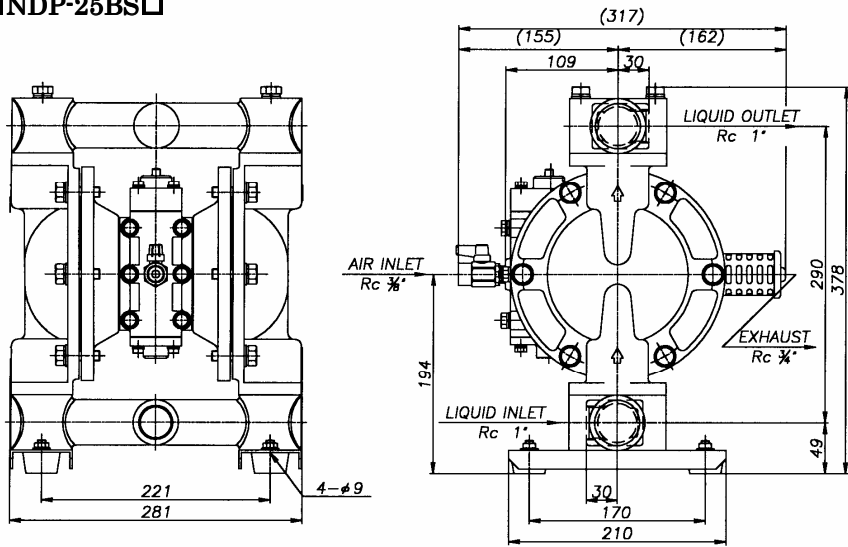


10.2.6 NDP-25 series

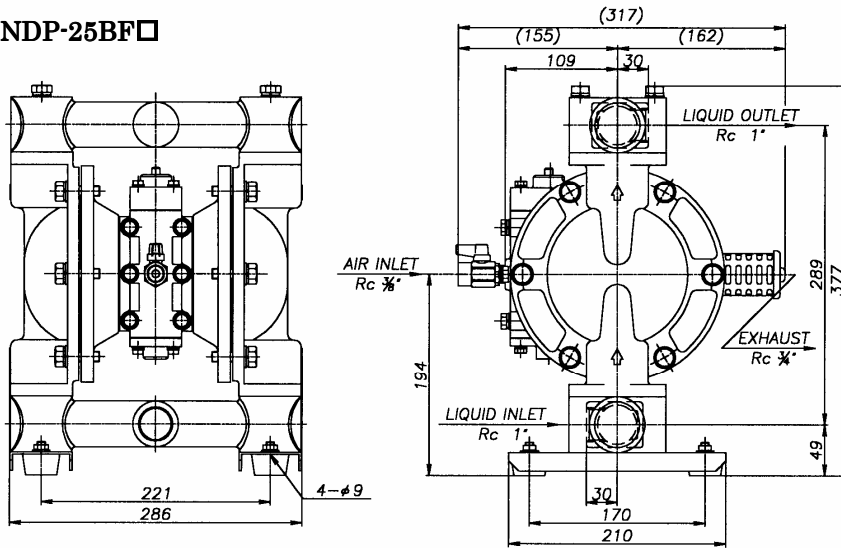
■NDP-25BA□



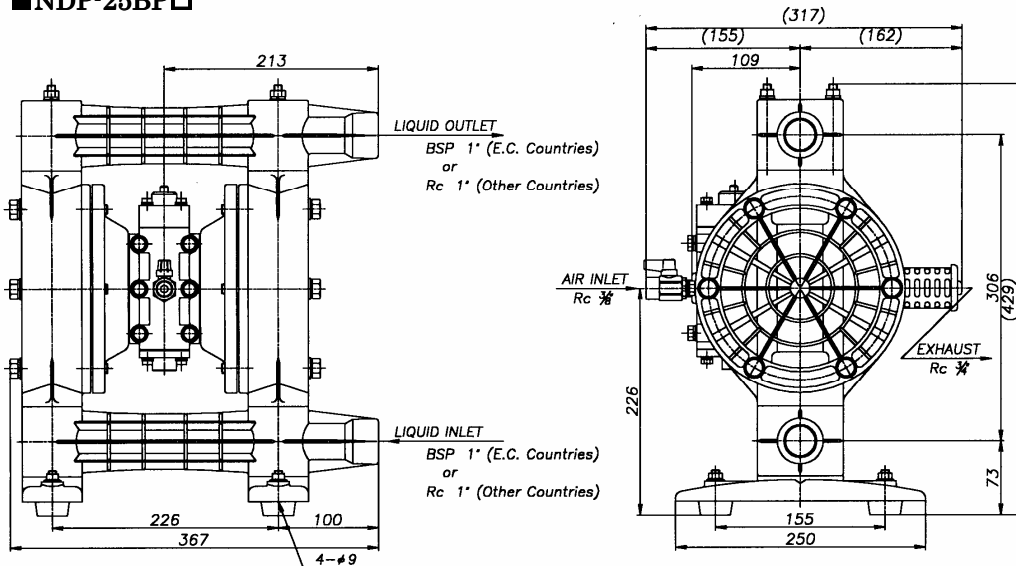
■NDP-25BS□



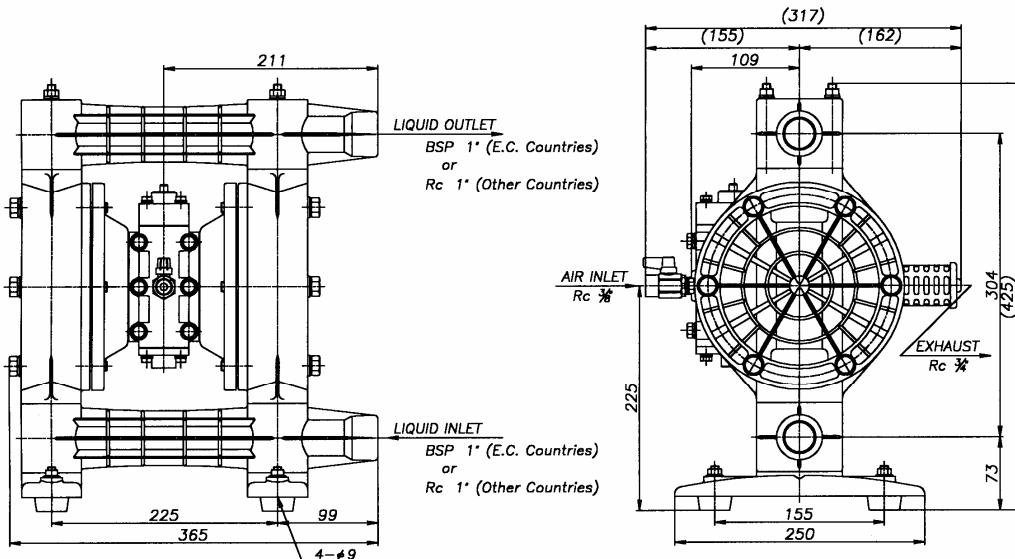
■ NDP-25BF □



■ NDP-25BP □



■ NDP-25BV □

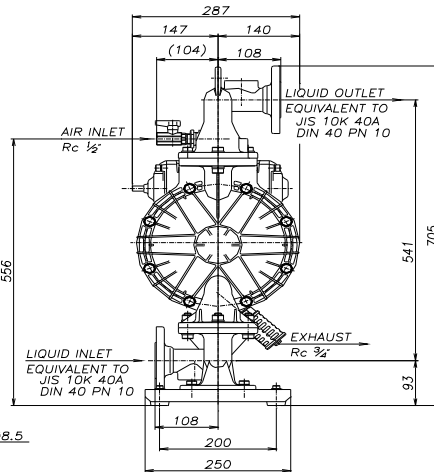
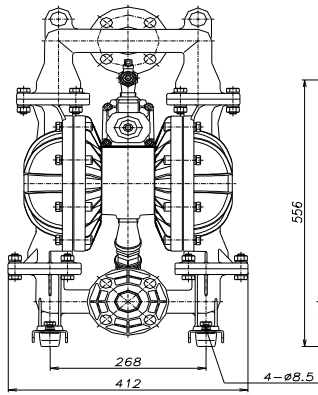


10.2.7 NDP-40 series

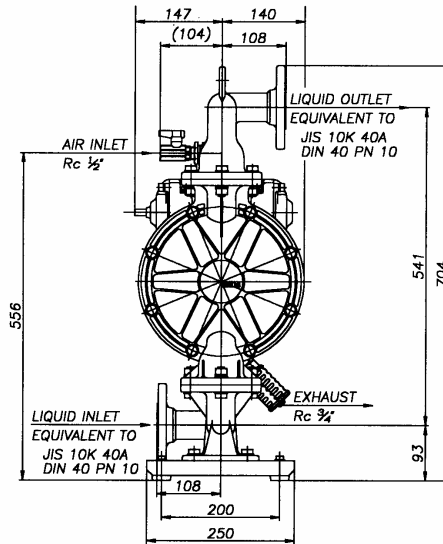
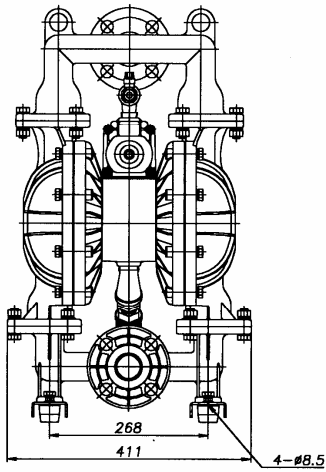
■ NDP-40BA □

NDP-40BA

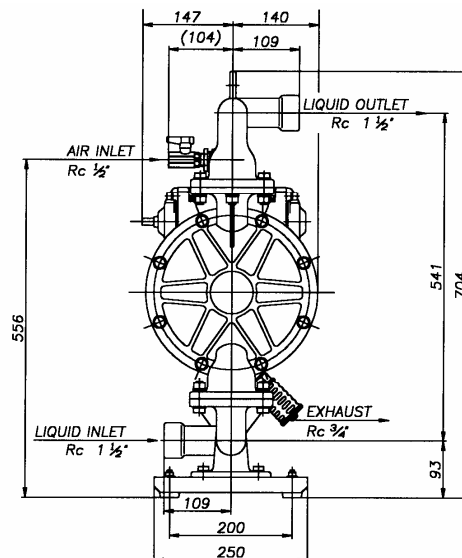
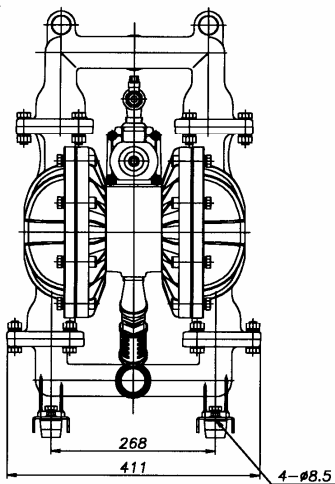
01.6.19



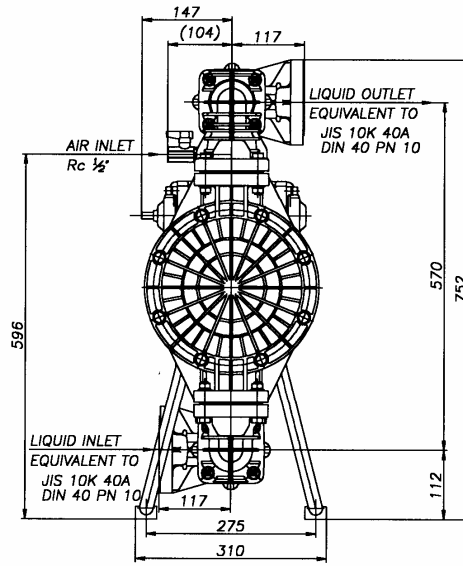
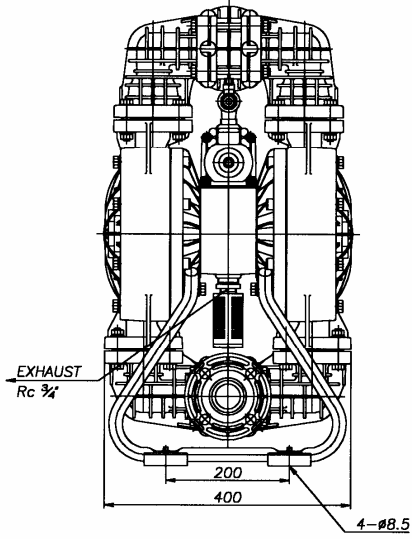
■ NDP-40BS □



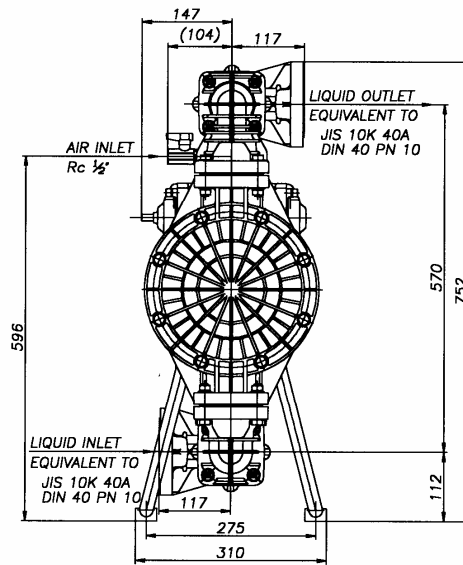
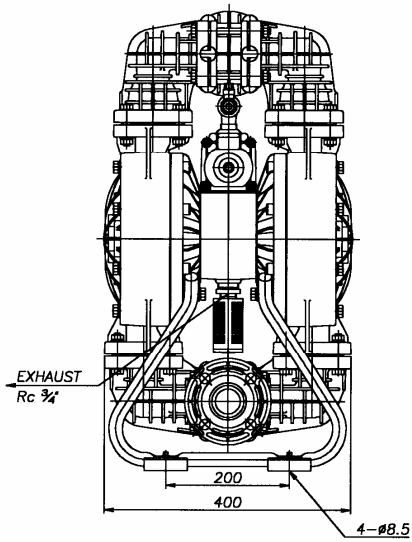
■ NDP-40BF □



■ NDP-40BP □



■ NDP-40BV □

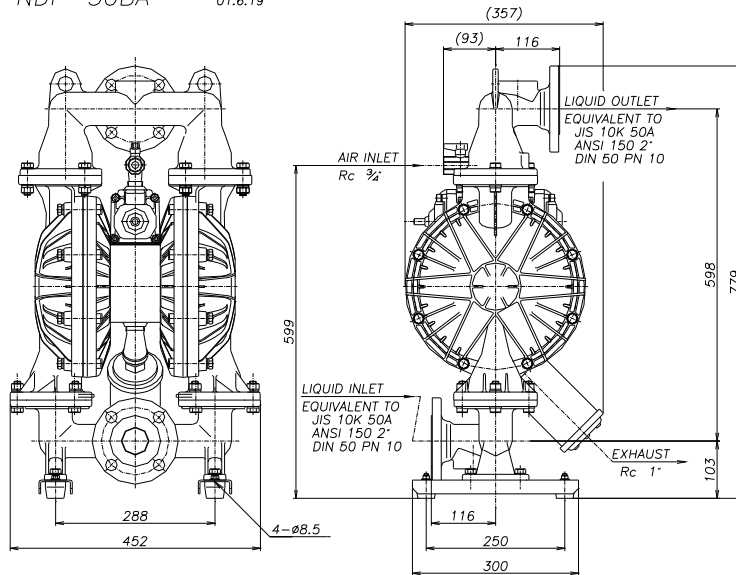


10.2.8 NDP-50 series

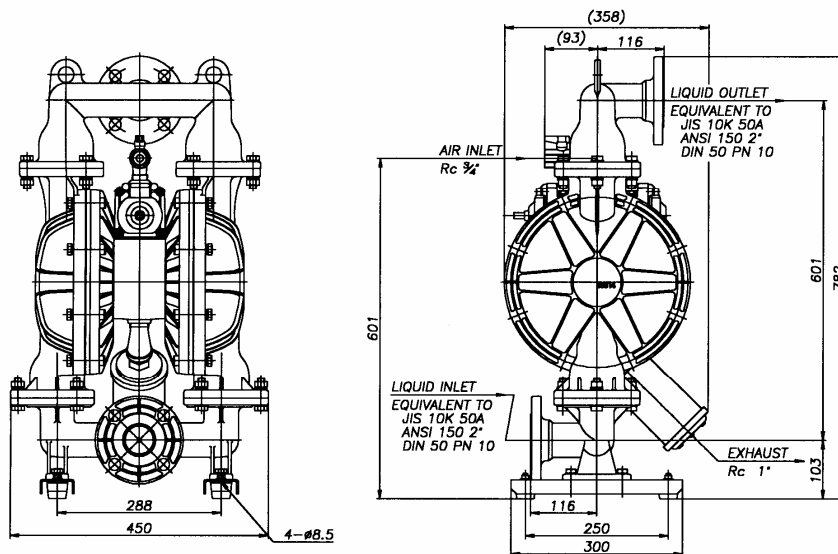
■ NDP-50BA □

NDP-50BA

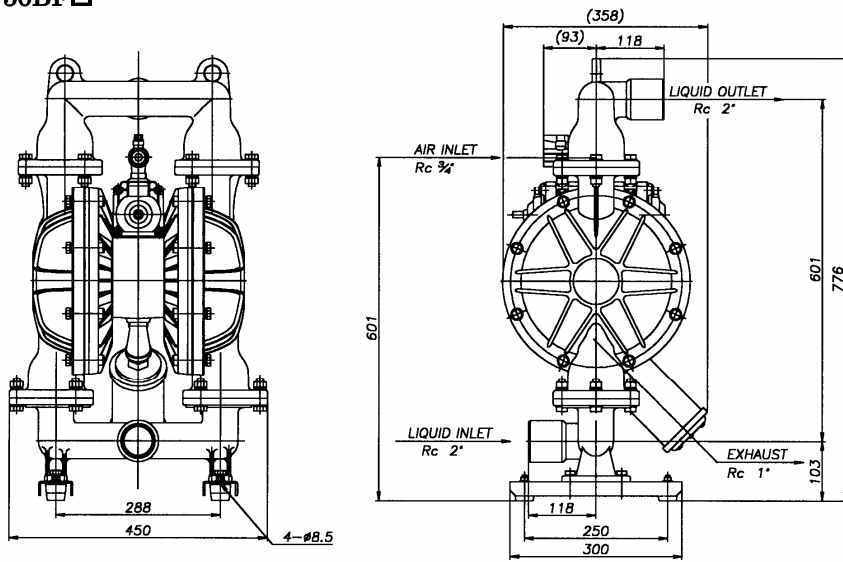
01.6.19



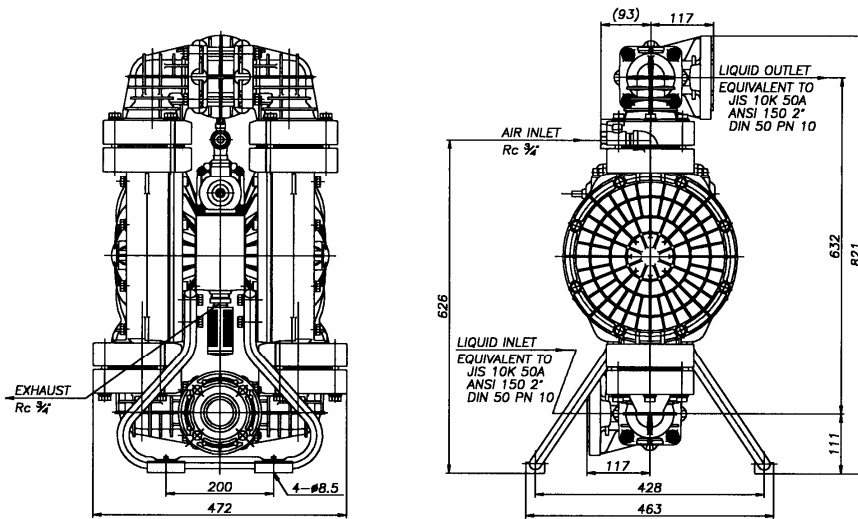
■ NDP-50BS □



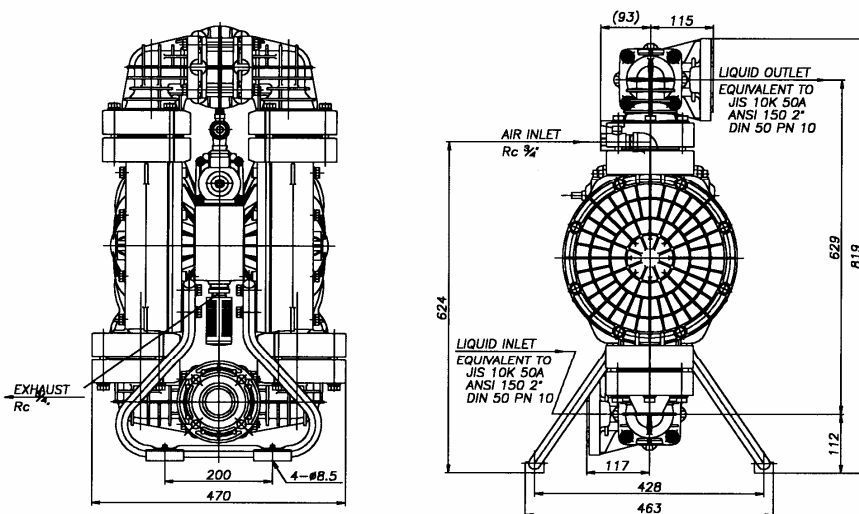
■NDP-50BF□



■NDP-50BP□



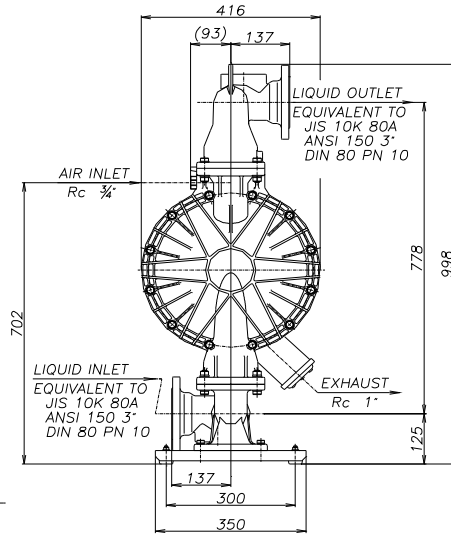
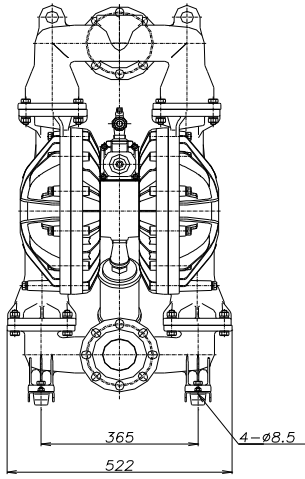
■NDP-50BV□



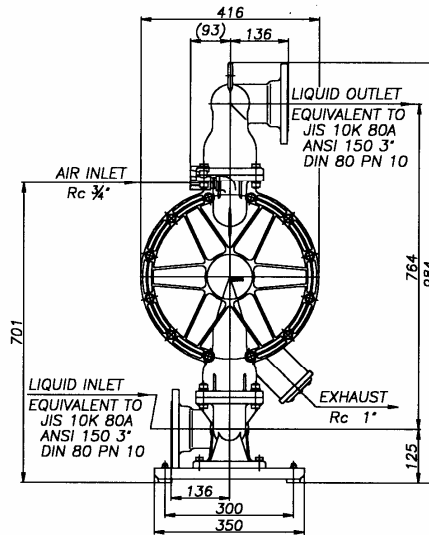
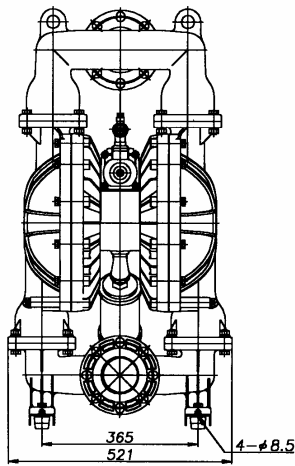
10.2.9 NDP-80 series

■ NDP-80BA □

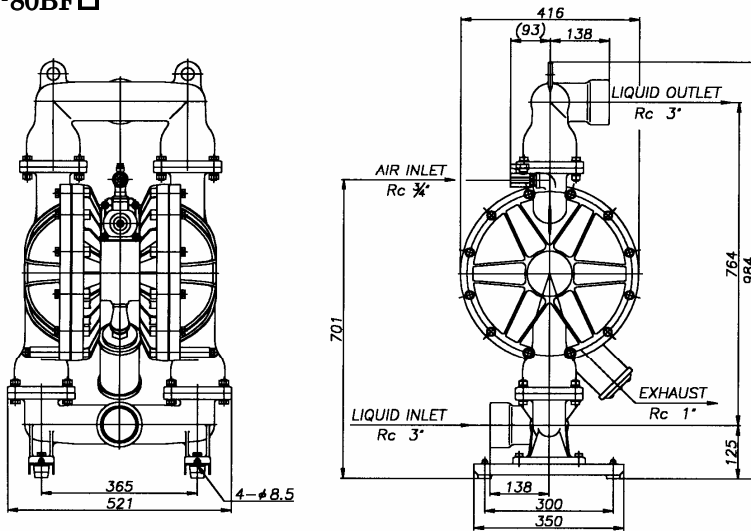
NDP-80BA 00.6.19



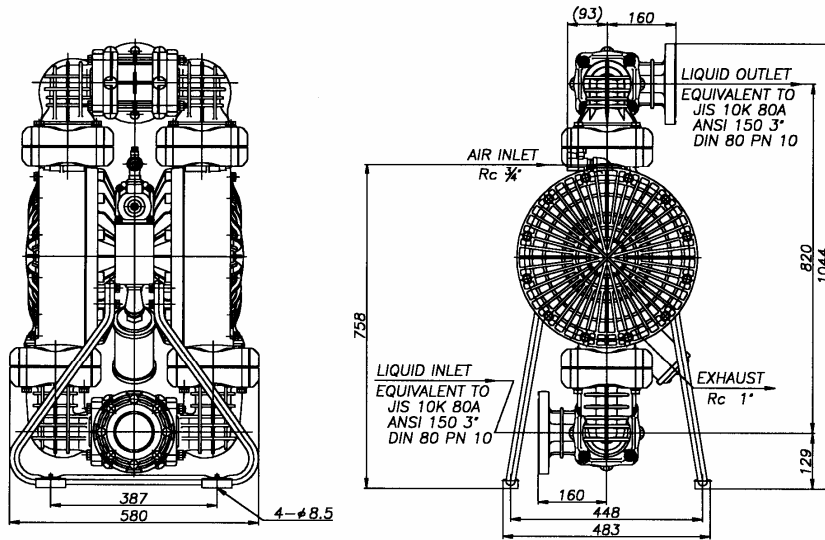
■ NDP-80BS □



■NDP-80BF□

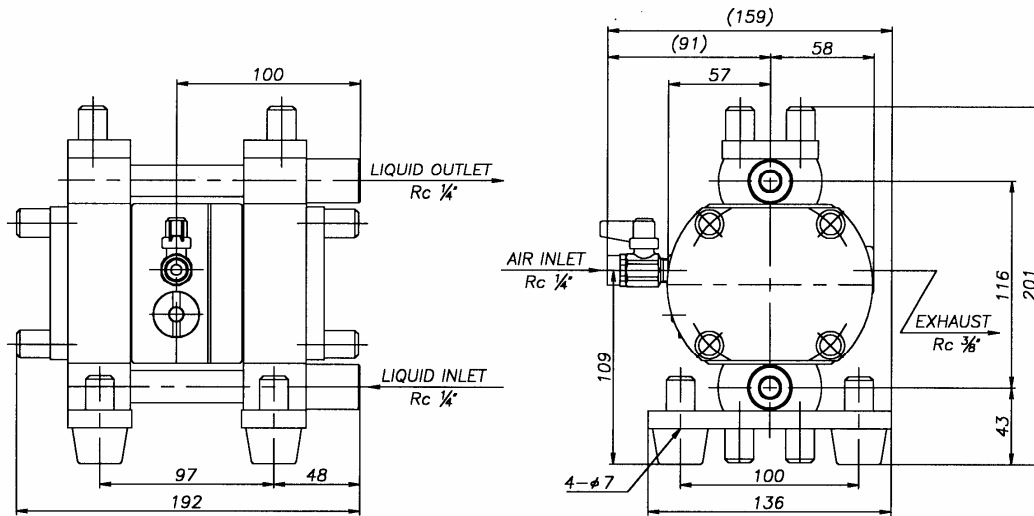


■NDP-80BP□

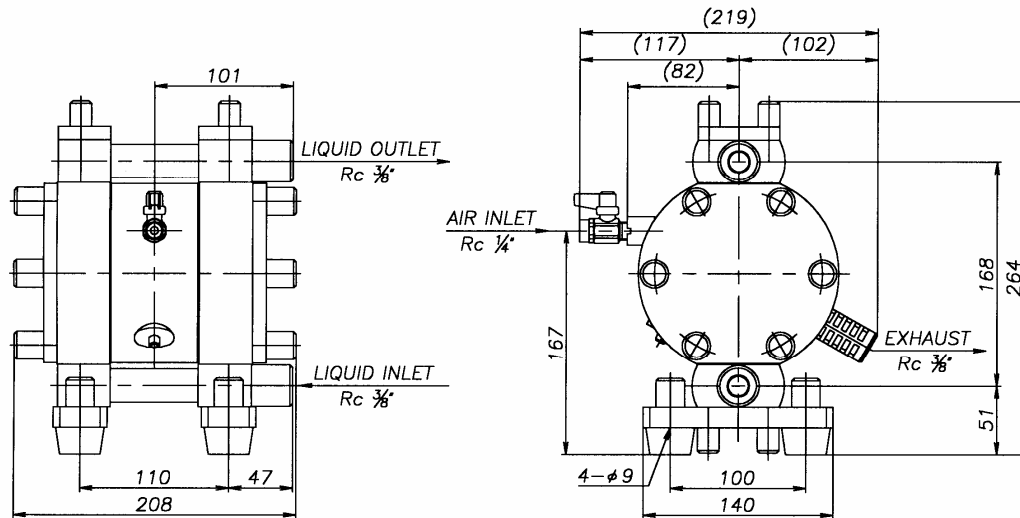


10.2.10 DP-F series

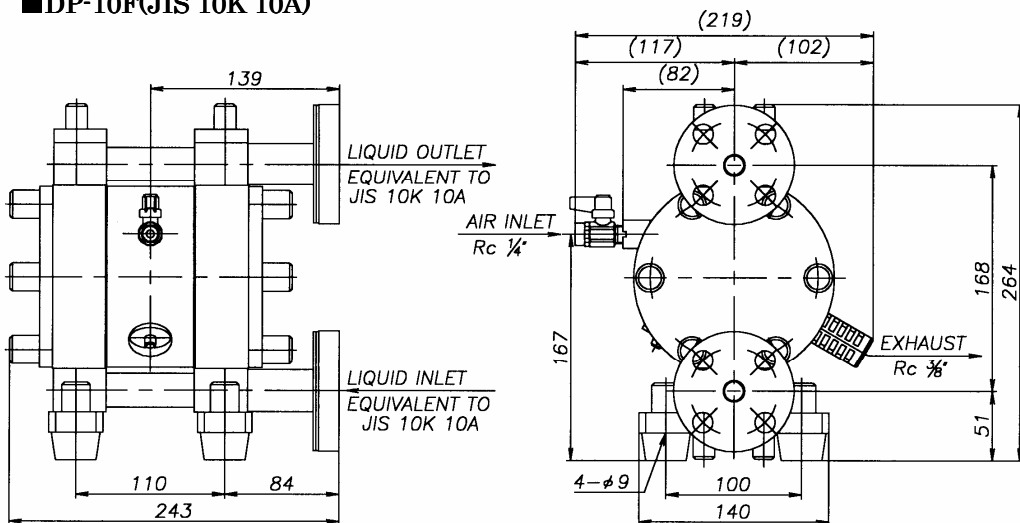
■DP-5F



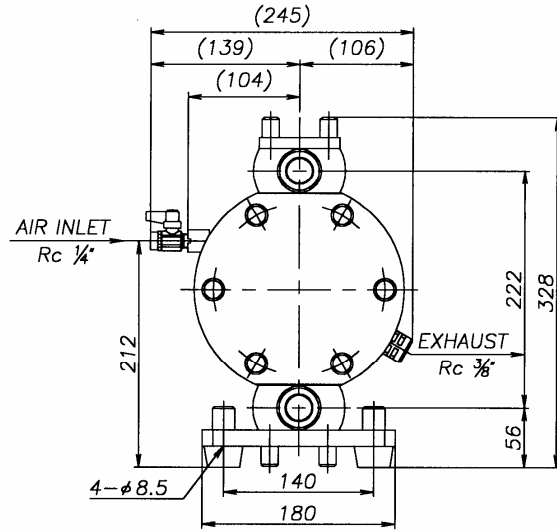
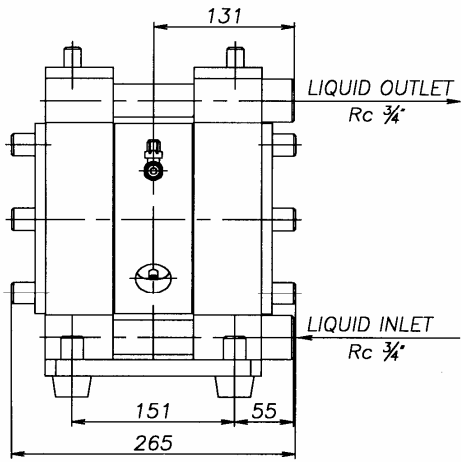
■DP-10F(PT:FEMALE)



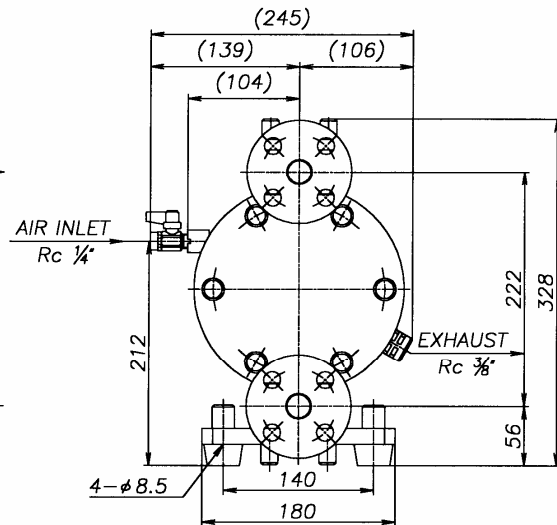
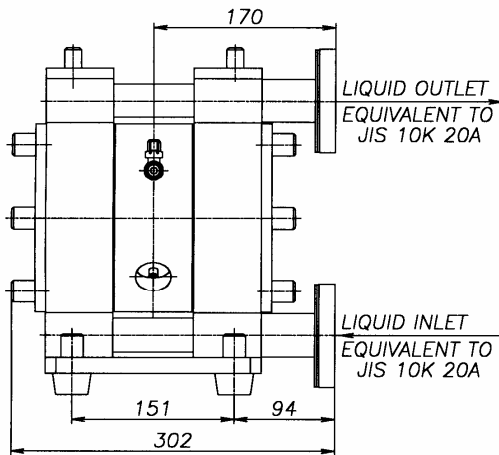
■DP-10F(JIS 10K 10A)



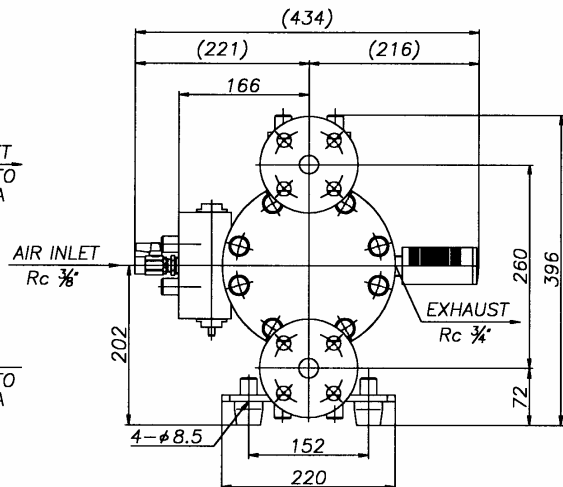
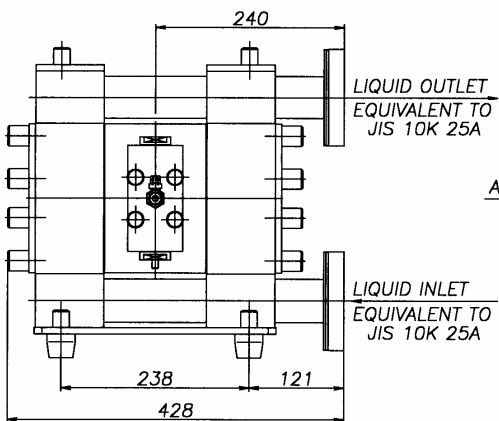
■DP-20F(PT:FEMALE)



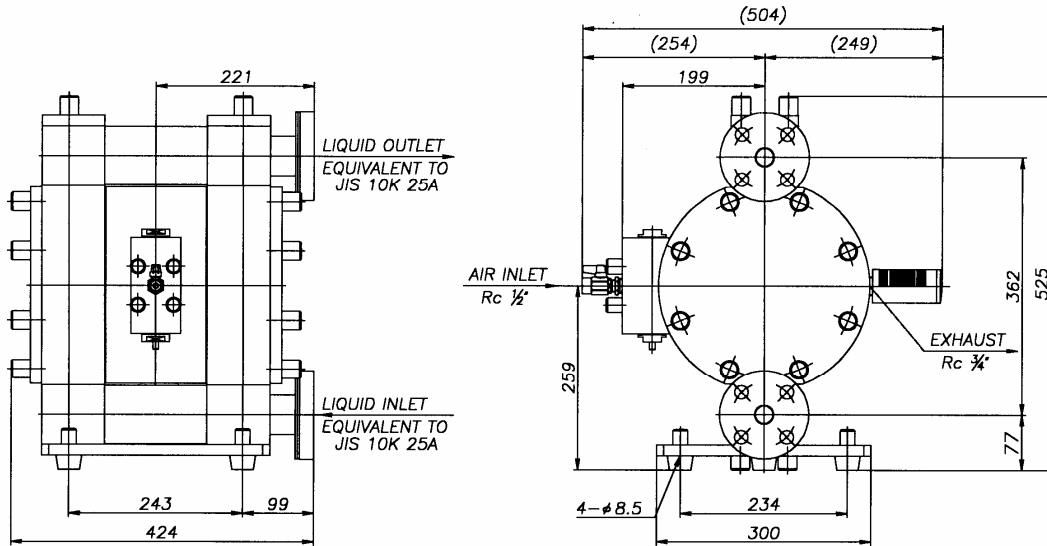
■DP-20F(JIS 10K 20A)



■DP-25F



■DP-38F



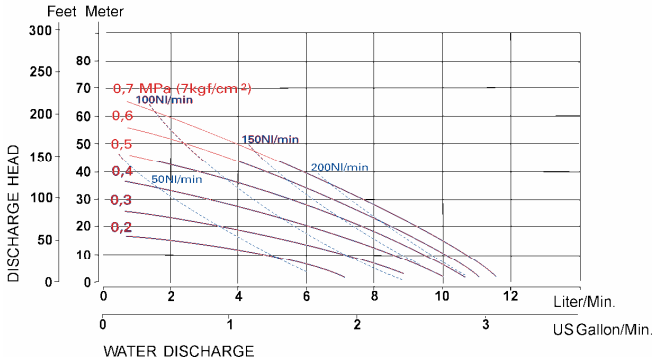
⚠ CAUTION

·Due to improvement or modification of products, dimensions are should be changed without prior notice.
Please contact your dealer or our regional office for detailed information.

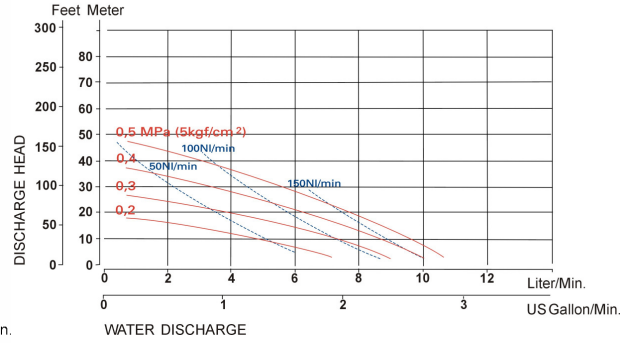
10.3 Performance curve

10.3.1 NDP-5 series

■ NDP-5FAT/05FST

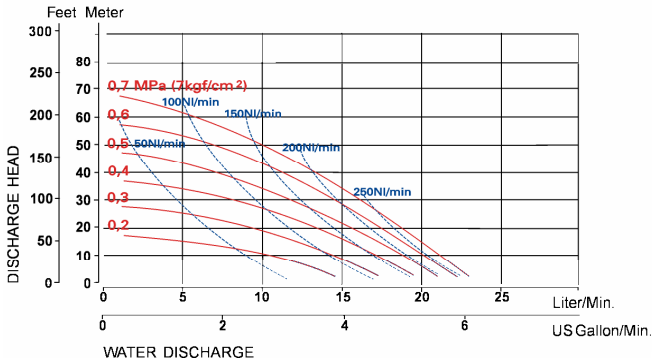


■ NDP-05FDT/FPT/05FVT

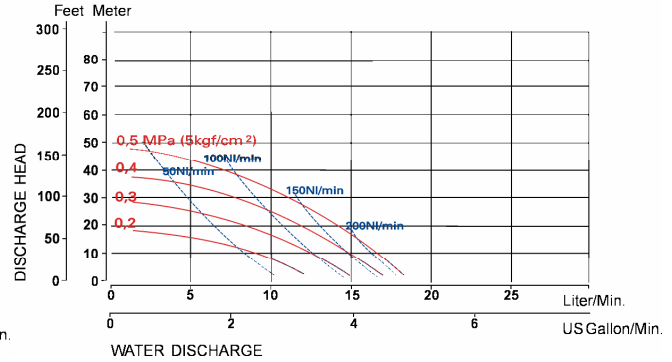


10.3.2 (B)DP-10/12 series

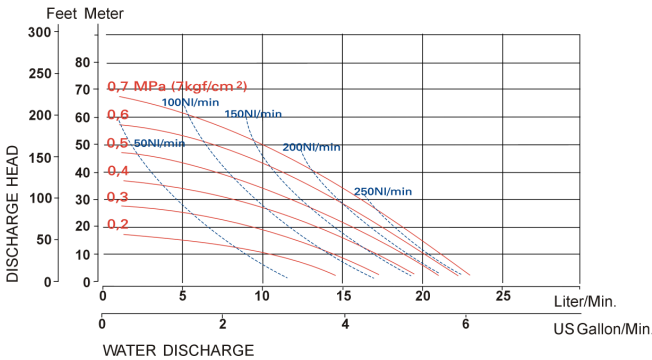
■ DP-10BA□/BS□



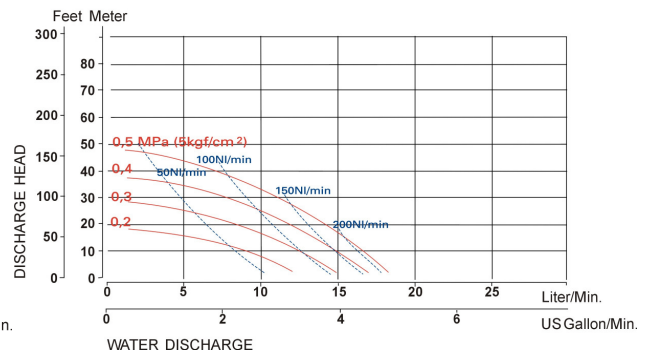
■ DP-10BP□



■ DP-12BA. BS.

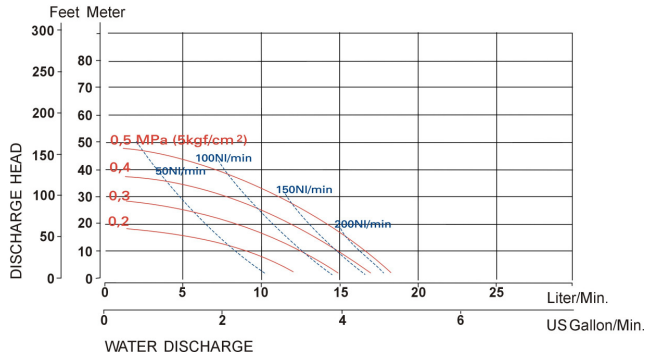


■ DP-12BP□



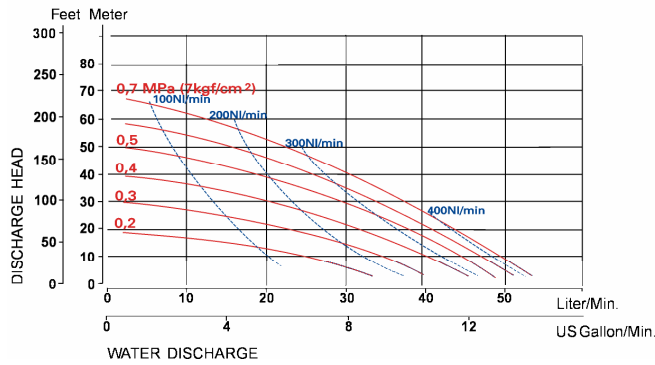
10.3.3 NDP-10 series

■ NDP-10BPC/E/H/N/S/T

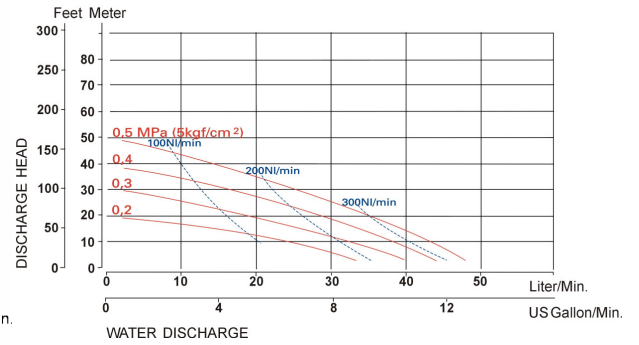


10.3.4 NDP-15 series

■ NDP-15BA□/BS□

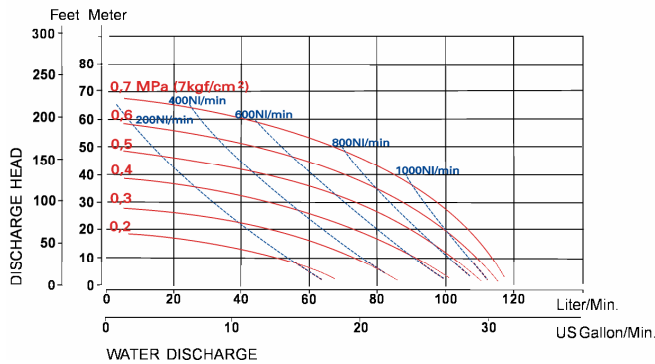


■ NDP-15FP□·15FV□ 15FD□

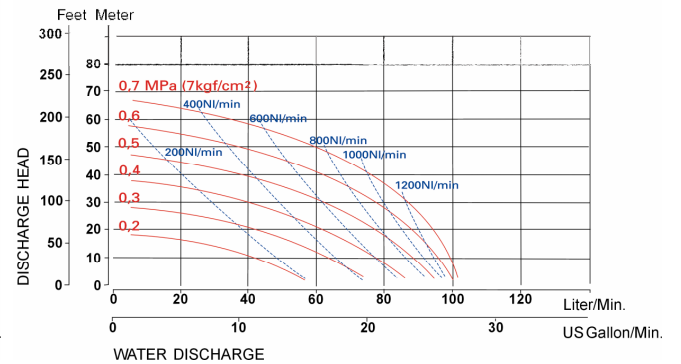


10.3.5 NDP-20 series

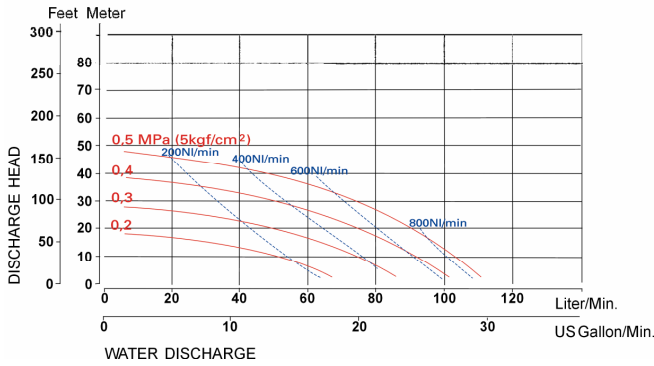
■ NDP-20BA□/BS□



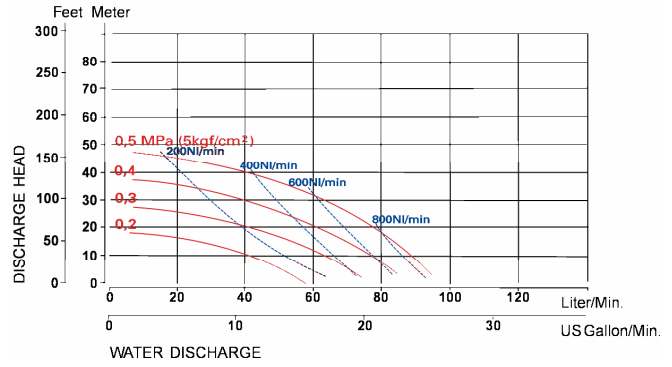
■ NDP-20BAT/BST



■ NDP-20BP □

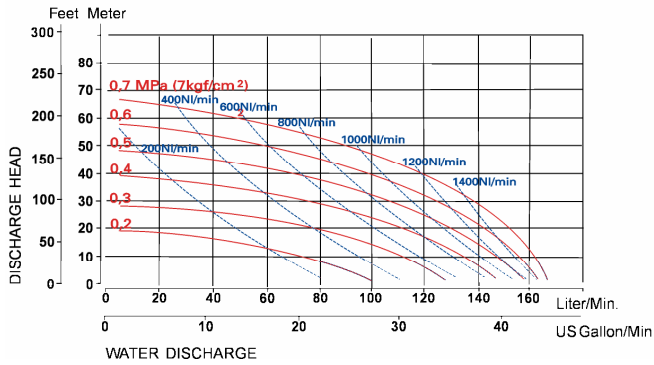


■ NDP-20BPT

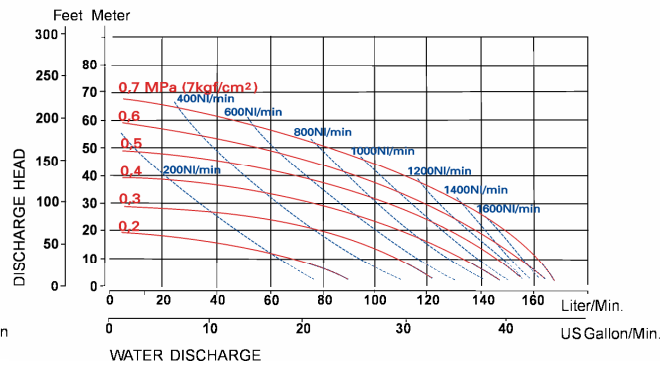


10.3.6 NDP-25 series

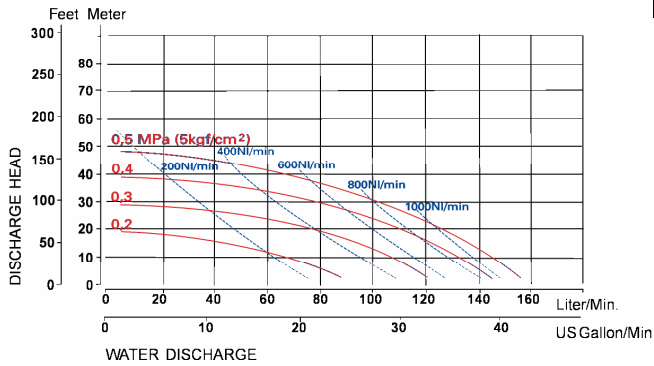
■ NDP-25BA/BF □ / BS □



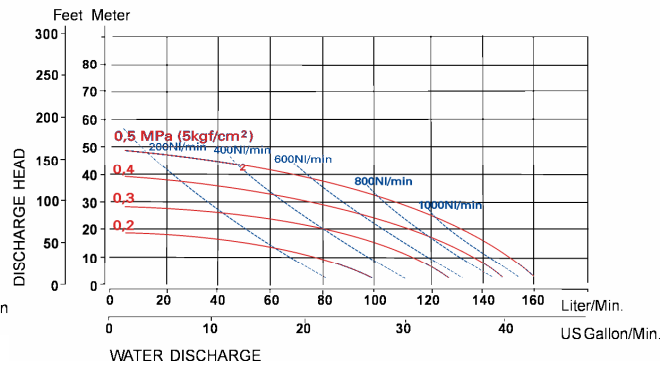
■ NDP-25BAT/BFT/ BST



■ NDP-25BP □ / BV □

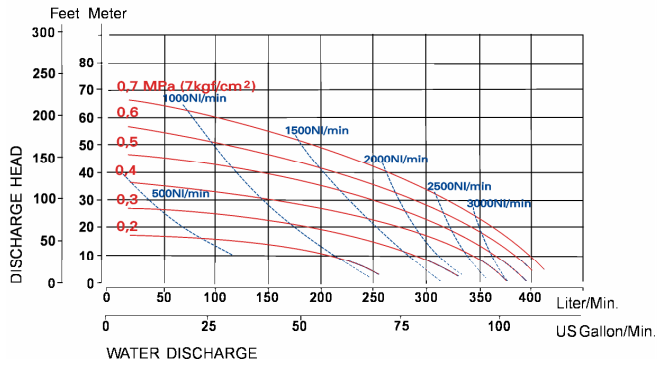


■ NDP-25BPT/BVT

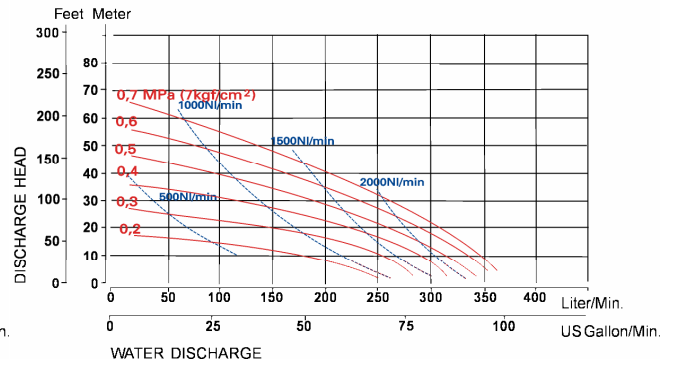


10.3.7 NDP-40 series

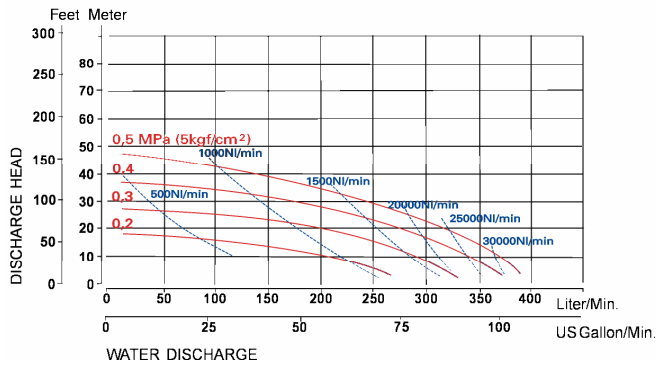
■ NDP-40BA □/BF □/BS □



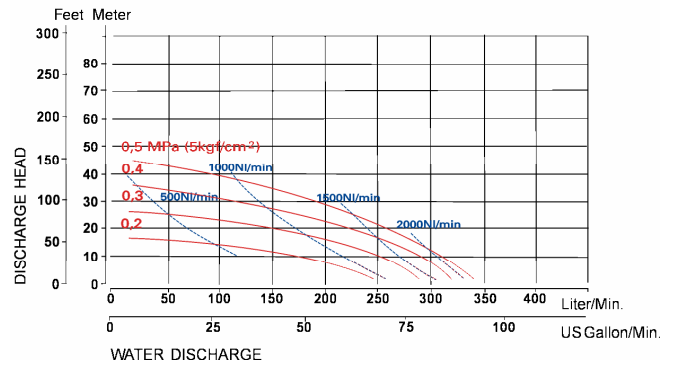
■ NDP-40BAT/BFT/BST



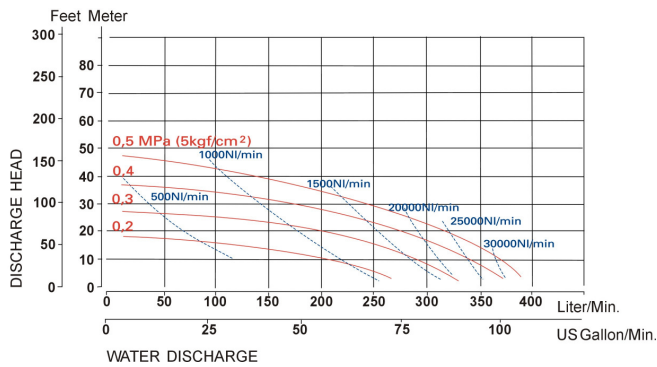
■ NDP-40BP □



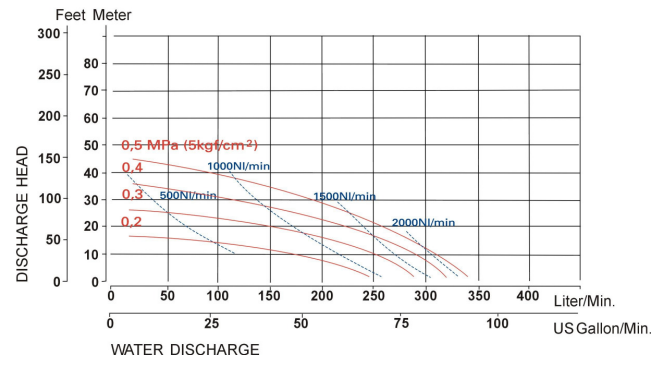
■ NDP-40BPT



■ NDP-40BV

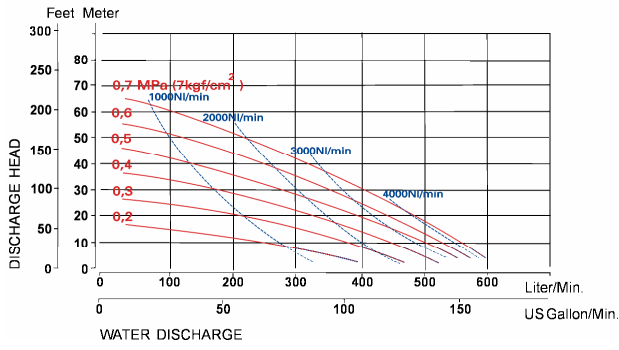


■ NDP-40BVT

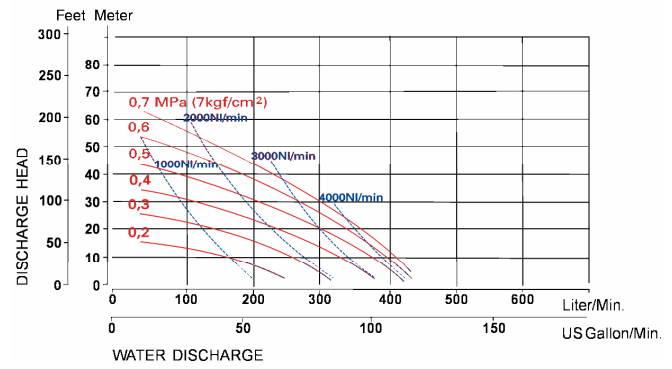


10.3.8 NDP-50 series

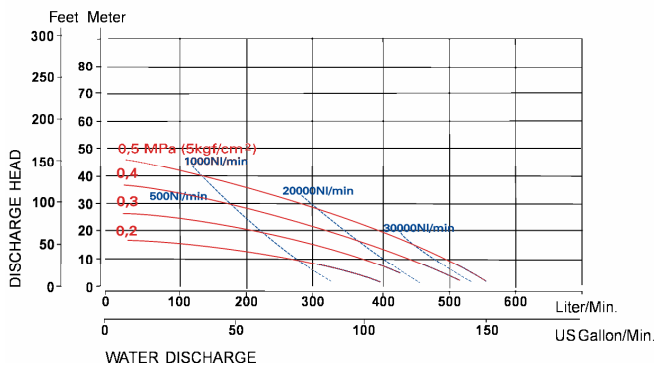
■ NDP-50BA□/BF□/BS□



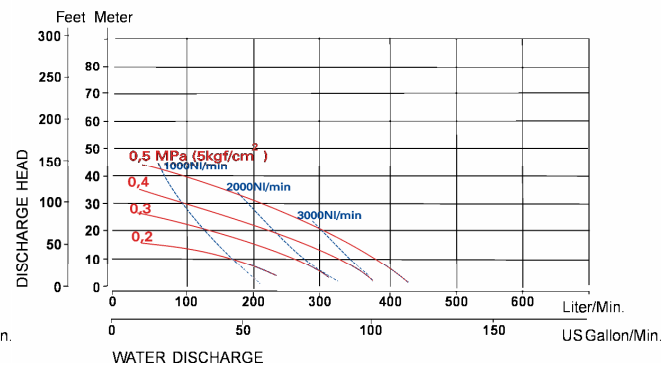
■ NDP-50BAT/BFT/BST



■ NDP-50BP□/BV□

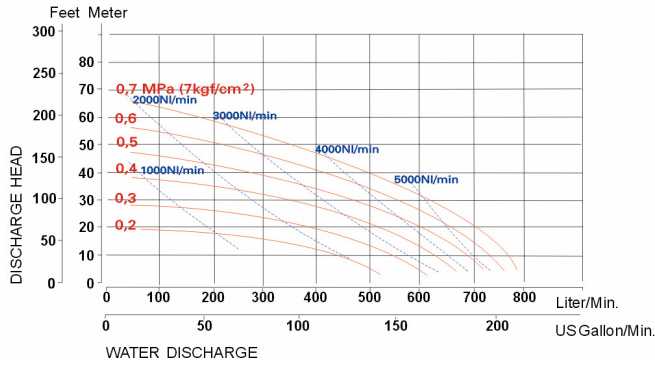


■ NDP-50BPT/BVT

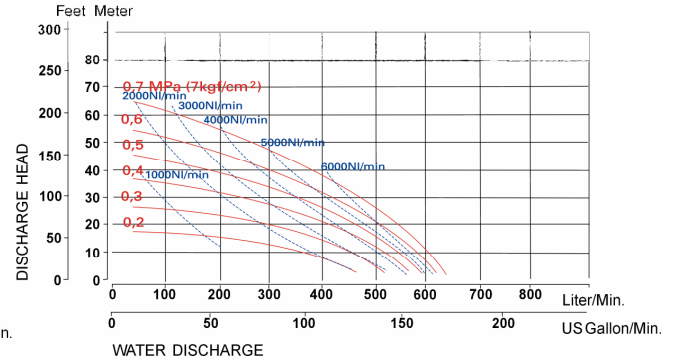


10.3.9 NDP-80 series

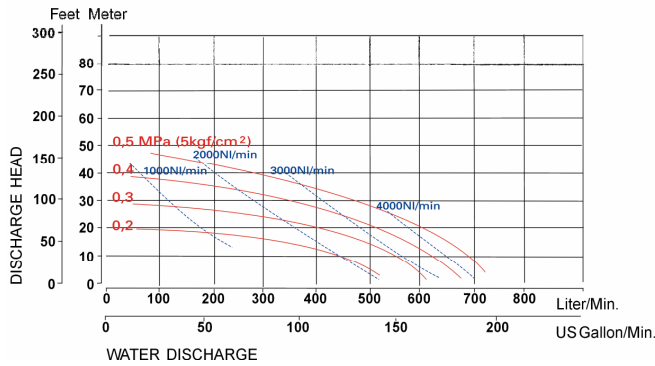
■ NDP-80BA □/ BF □/ BS □



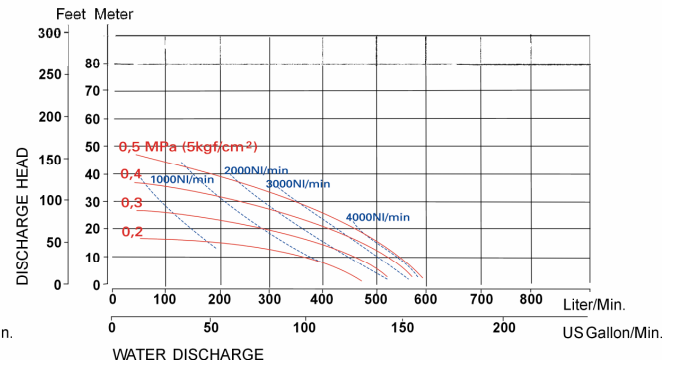
■ NDP-80BAT/ BFT/ BST



■ NDP-80BP □

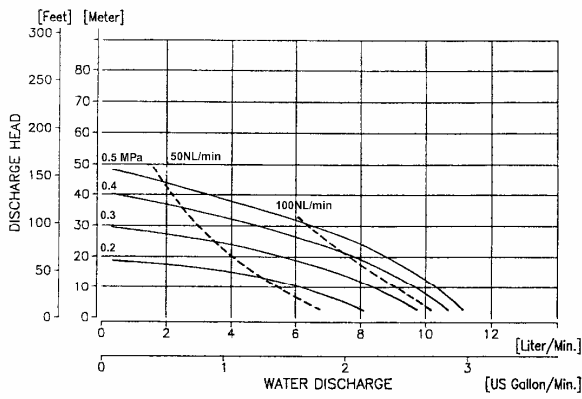


■ NDP-80BPT

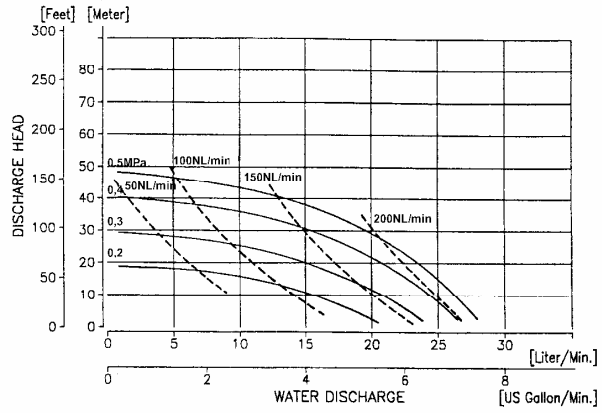


10.3.10 DP-F series

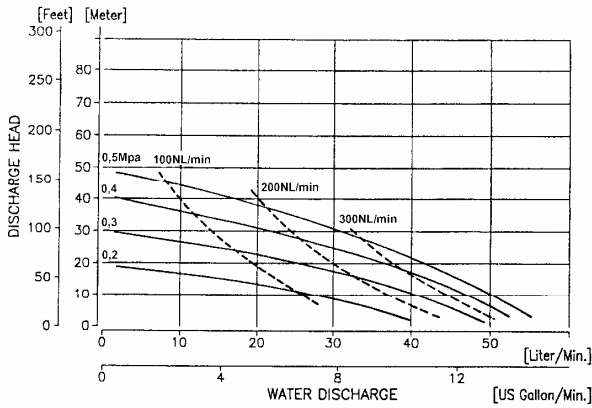
■ DP-5F



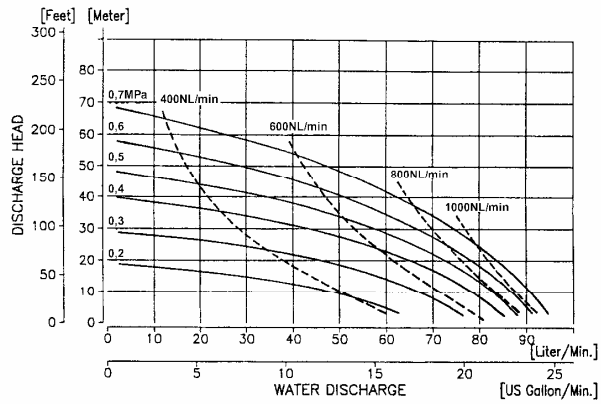
■ DP-10F



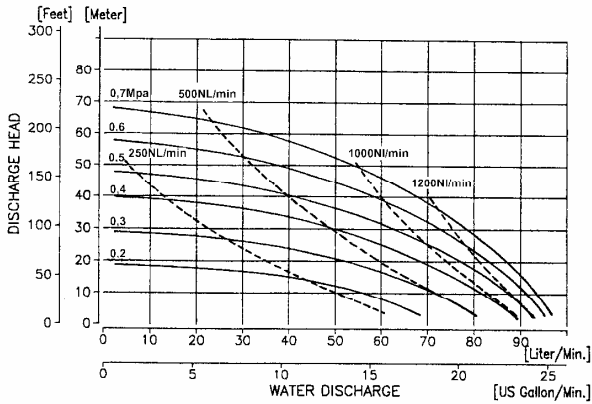
■ DP-20F



■ DP-25F



■ DP-38F



Note: Method of measurement of operating noise

With a specified noise meter, the operating noise is measured at measurement points A, B and C, and the maximum value is to be used.

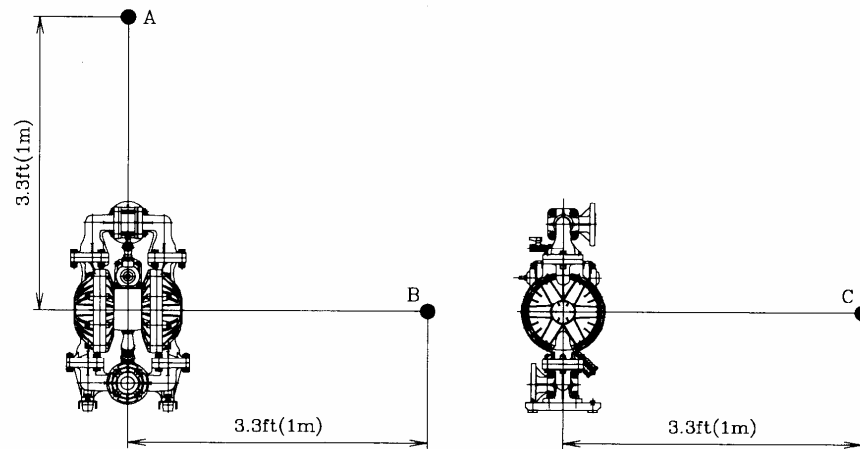


Fig.10.1

Note: Method of measurement of performance curve

Measuring instruments and procedure

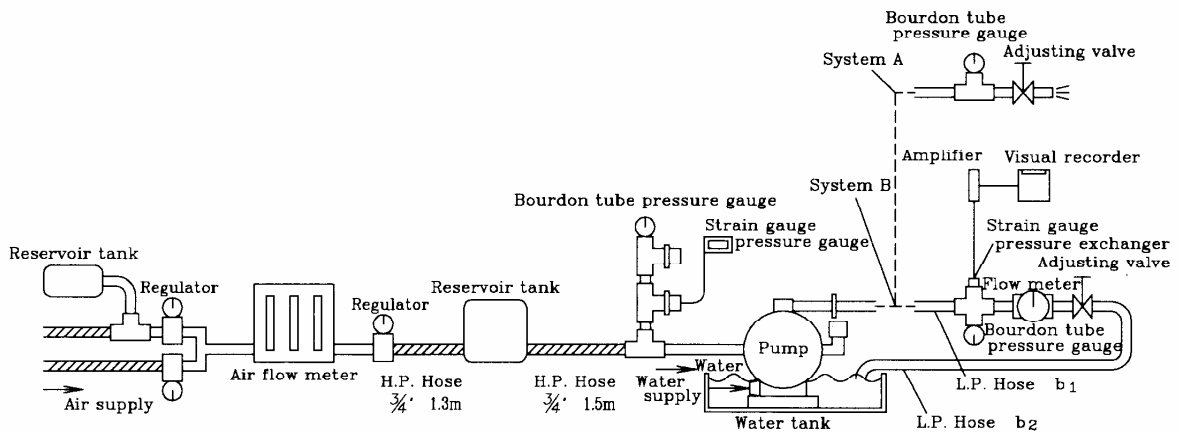


Fig.10.2

• Conditions


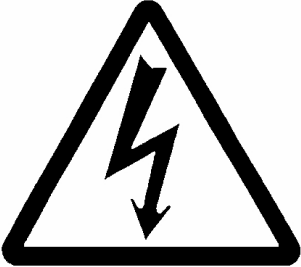



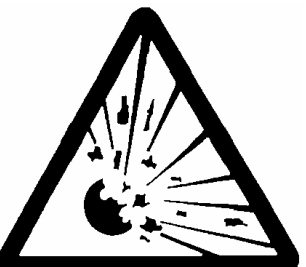


- a) Supplied air pressure: Maintaining preset pressure
- b) Liquid pumped: Fresh water
- c) Temperature: Ambient
- d) Condition of suction: Flat suction 0 meter head
- e) Measuring system: System A ... Converting weight of discharged fluid to volume.
System B ... By liquid meter

11. Trouble-Reporting FAX Sheet

Your information will be most helpful in our efforts to improve our servicing as well as checking into causes of troubles and irregularities. Therefore, take your time, fill out the following FAX sheet and fax it to your dealer or our regional office. Thank you.

Trouble-Reporting FAX Sheet	
Name of your firm _____	Name of person in charge _____
Address _____	Department _____
	Telephone () _____ - _____ Fax () _____ - _____
MODEL/No. (Product name/Product No.)	Date of product
Period of use From _____ to _____ _____/_____/_____	SERIAL No. (Lot No.)
Operating conditions <input type="checkbox"/> Indoor <input type="checkbox"/> Outdoor Frequency of operation <input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent _____ Hours / day / week / month	Date of purchase _____ Name of dealer _____
Operating air pressure _____ MPa Discharge pressure _____ MPa Discharge volume _____ L/min. Stroke Suction side _____ m Discharge side _____ m Oil lubrication <input type="checkbox"/> YES <input type="checkbox"/> NO	Type of fluid pumped _____ Specific gravity _____ Viscosity _____ Pa·s Fluid temperature _____ °C / °F Slurry <input type="checkbox"/> YES Density _____ wt% Particulate diameter _____ mm <input type="checkbox"/> NO
Condition of pump (nature of problem)	
Draw a summary drawing of application (size, length of piping, and component parts)	

12. Warning symbols

<p>BEWARE: HIGH TEMPERATURE</p> 	<p>ELECTRIC SHOCK</p> 	<p>POISON</p> 
<p>FLAMMABLE</p> 	<p>CORROSION</p> 	<p>EXPLOSION</p> 
<p>General warnings, cautions and danger notifications</p> 	<p>FIRE STRICTLY PROHIBITED</p> 	

13. Limited warranty

This product is shipped to customers only after meeting strict inspection standards. If an abnormality occurs during normal operation in accordance with the operating instructions and other operating cautions within the warranty period (12 months after date of purchase) that can be attributed to a manufacturing defect, the defective parts of this product will be serviced or the product will be replaced free of charge. However, this warranty will not cover compensation for incidental damage or any malfunction listed below.

1. Warranty period

This warranty will be valid for a period of 12 months after the date of purchase.

2. Warranty

If, during the warranty period, any of the material of the genuine parts of this product or the workmanship of this product is found defective, and is so verified by our company, the servicing cost will be fully borne by our company.

3. Exclusion

Even during the warranty period, this warranty does not cover the following:

- (1) Malfunction arising from use of parts other than manufacturer-specified genuine parts
- (2) Malfunction arising from misuse or operating errors, or lack of storage or maintenance care
- (3) Malfunction arising from use with a fluid that may cause corrosion, inflation or dissolution of the component parts of the product
- (4) Irregularity arising from repair made by other than by our firm, our regional office, dealer or authorized service personnel
- (5) Malfunction arising from modification of the product by other than authorized service personnel
- (6) Wear and tear of parts that must be regularly replaced in the course of normal operation, such as diaphragms, valve seats, balls, air switch sleeve valves and O-rings
- (7) Malfunction and/or damage due to transportation, moving or droppage of the product after purchase
- (8) Malfunction and/or damage due to fire, earthquake, flood or other force majeure
- (9) Malfunction arising from use of compressed air that contains impurities or excessive moisture, or use of gases or fluids other than the specified compressed air
- (10) Malfunction arising from use with a fluid that causes excessive abrasion or use of lubricating oil other than that specified for this product

Furthermore, this warranty does not cover the rubber parts, or other parts that are subject to wear in normal operation, used in this product and its accessories.

4. Parts

Parts for this product will be kept available for 5 years after discontinuation of production. Once 5 years have elapsed after close of production, availability of parts for this product cannot be guaranteed.

YAMADA CORPORATION

INTERNATIONAL DEPARTMENT

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