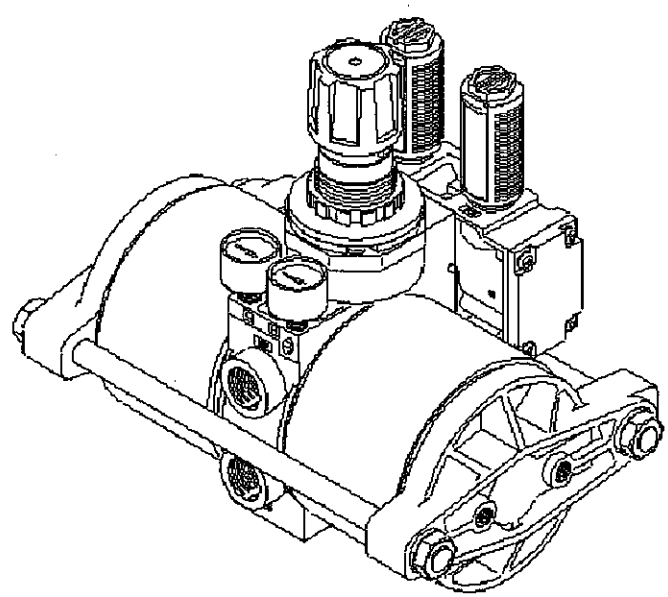
CKD

SM－7622－A

INSTRUCTION MANUAL

AIR BOOSTER

ABP-12



- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

4 t h
CKD Corporation

For Safety Use

To use this product safety, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (ISO 4414 *1, JIS B 8370 *2).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, **read this operation manual carefully for proper operation.**

*1) ISO 4414 : Pneumatic fluid power ··· Recommendations for the application of equipment to transmission and control systems.

*2) JIS B 8370 : General rule for pneumatic systems

INDEX

ABP-12
Air Booster
Manual No. SM-7622-A

Sep. 09. 1995
Revision: May. 08. 2006

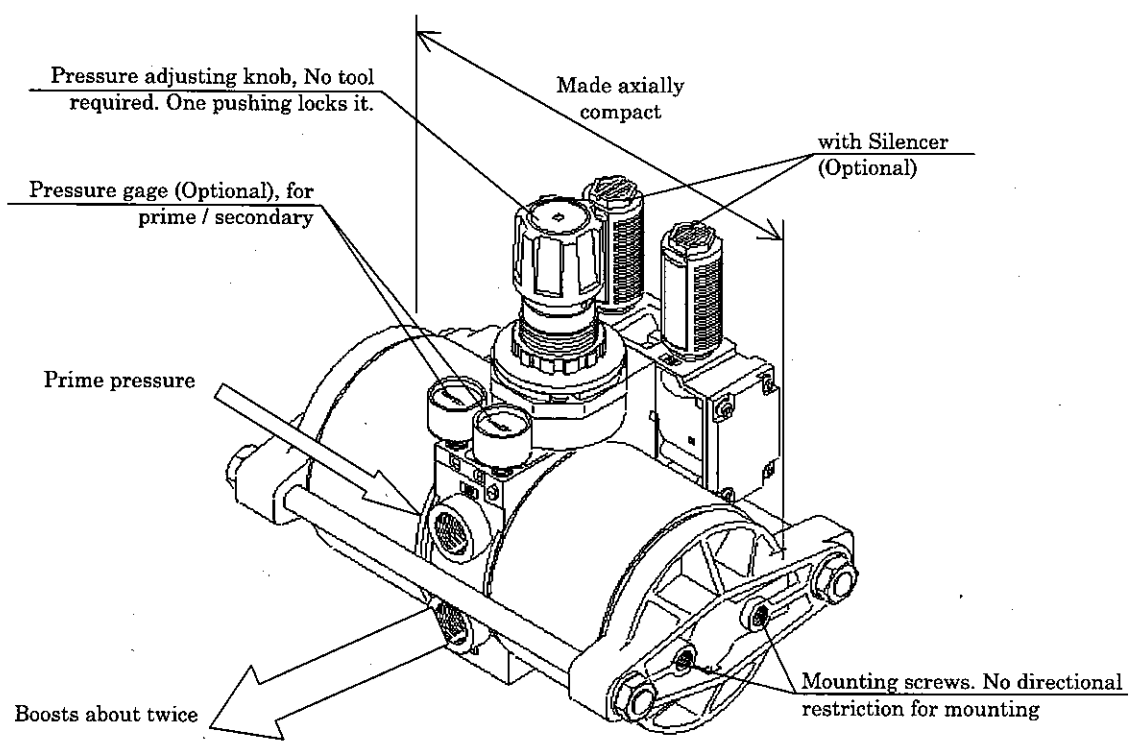
1. PRODUCT

1.1 Out line and feature

Air booster (ABP) is the intensifier of air pressure up to about twice of prime pressure by making use of air pressure only instead of consuming any electricity.

It realizes energy saving as well as cost saving in total operation as it is able to boost the pressure up only where requires in the plant. It also has an air tank which is directly connected with booster.

1) Intensifies up to about twice as of prime pressure.
   It boosts up by compression piston up to about twice as of prime side pressure being adjusted by adjusting knob.
2) Any mounting posture.
   There is no restriction as for mounting posture either perpendicularly. Discharge direction can be either one of three.
3) No tool requirement to adjust pressure.
   Pressure adjustment is achieved by fingers and one push locks it. Easily manually adjustable to raise pressure.
4) Compact contraction of axial length is successfully accomplished

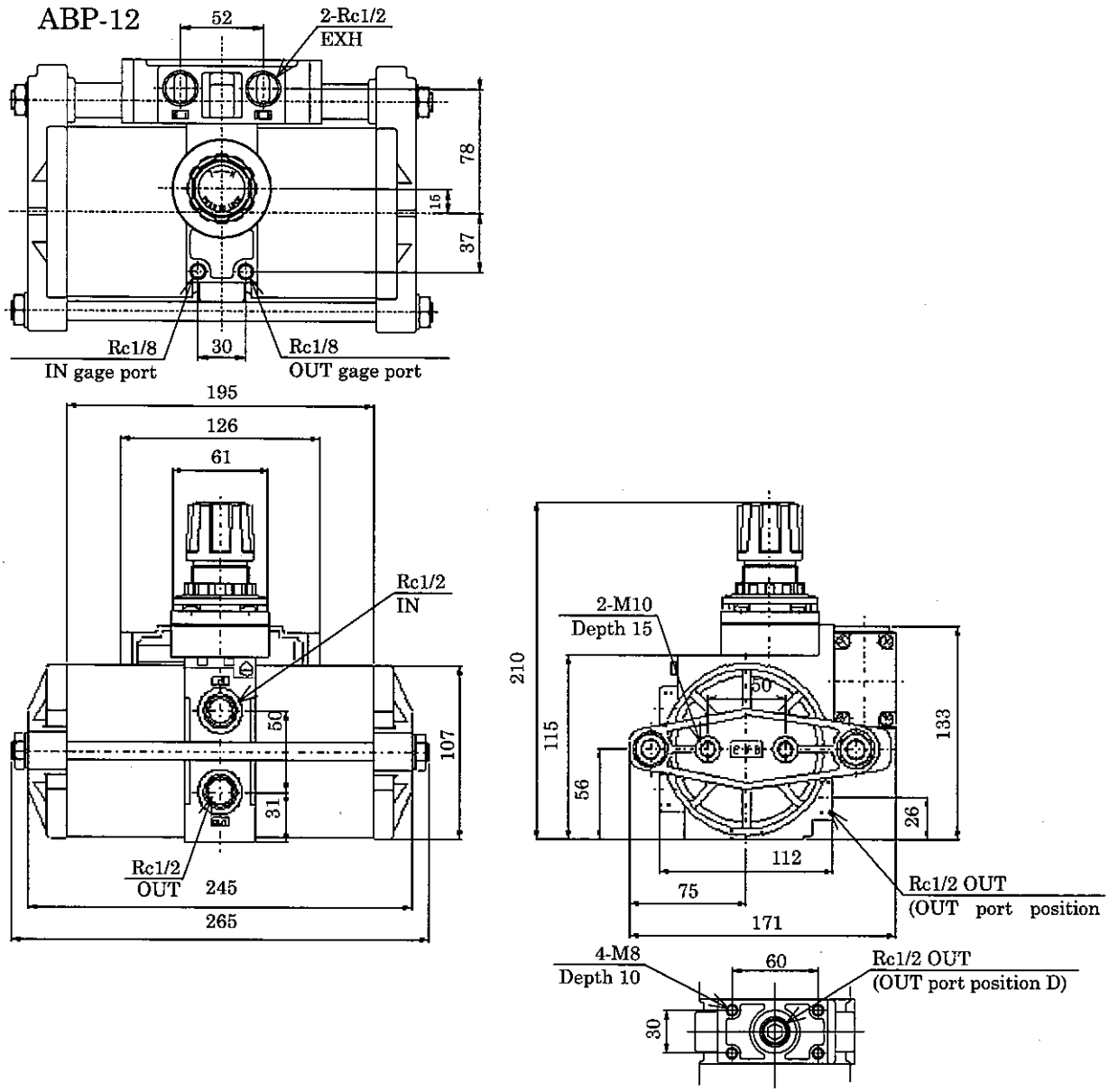


1.2 Specification

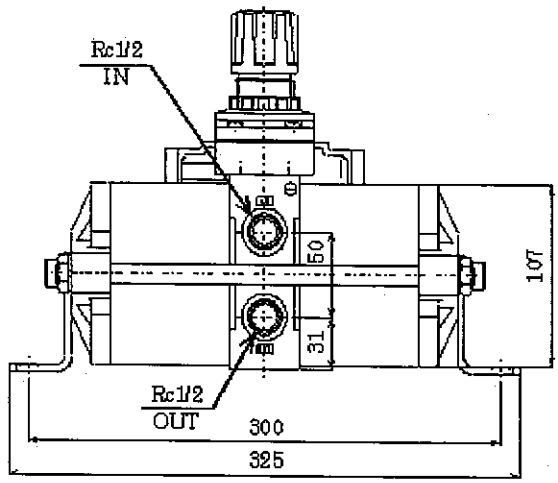
Item		Specification
Media		Compressed air
Max. working pressure	MPa	1.0
Min. working pressure	MPa	0.2
Set pressure range	MPa	0.2 to 1.0
Proof pressure	MPa	1.5
Flow ratio	m³/min	1.2 (IN = OUT) at 0.5 MPa
Pressure boosting ratio		Max 2
Working temperature	℃	0 to 50
Lubrication		Not required. (for lubrication, use turbine oil class 1 ISO VG32)
Port size	Rc	1 / 2
Mass	kg	4.6

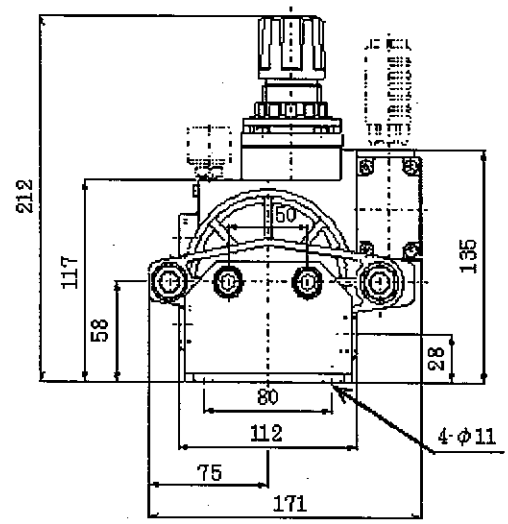
1.3 External dimensions

- ABP-12

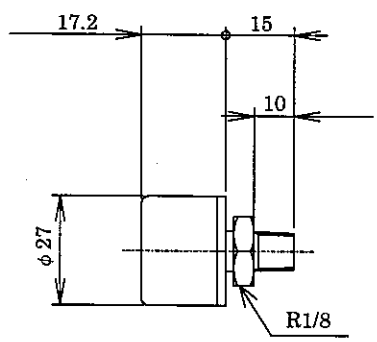


- ABP-12-B (with bracket)

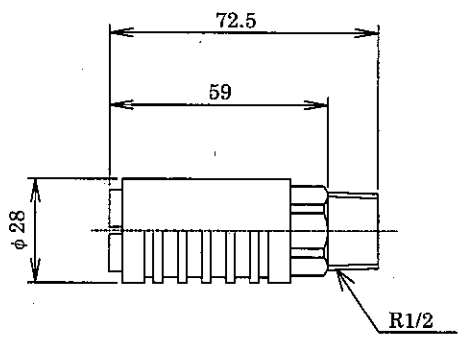




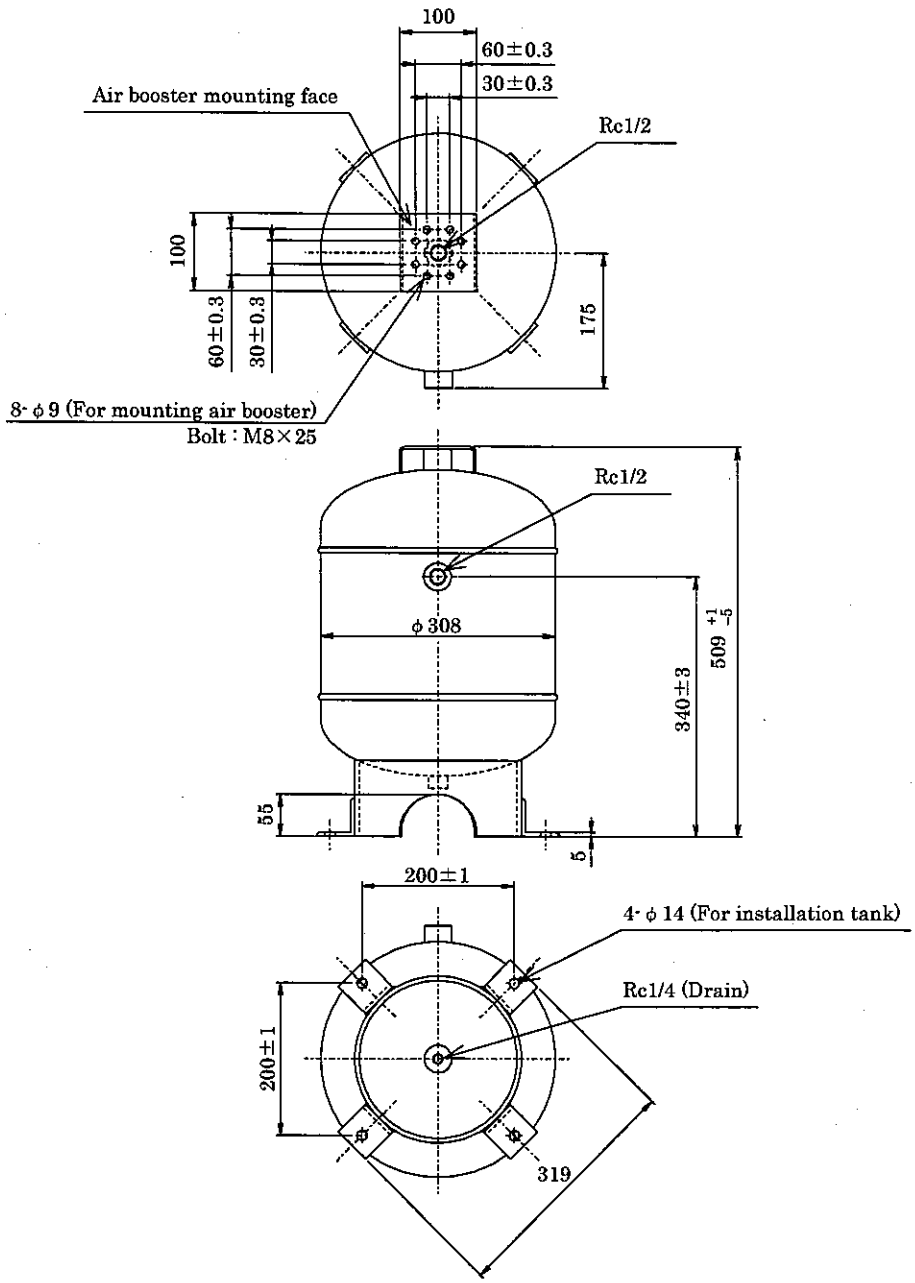
- Pressure gauge (ABP-GAUGE)



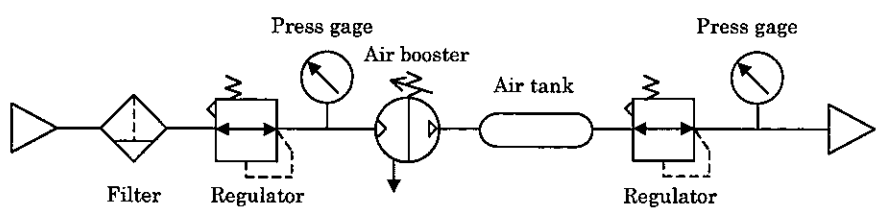
Silencer (SLW-15A)



- Air tank



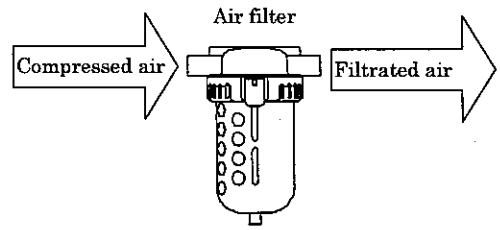
1.4 Fundamental circuit diagram

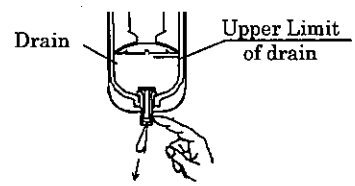


2. CAUTION

2.1 Fluid

1) It is necessary to use dehumidified air that has been filtered from compressed air. Carefully select an adequate filter that has an adequate filtration rate (preferably 5 μ m or less), flow rate and its mounting location (as nearest to the directional control valve as possible).





2) Be sure to drain out the accumulation in the filter periodically.

3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

4) This air booster does not require lubrication. It is recommended, however, to use Turbine oil Class 1, ISO VG32 as lubricant if lubrication is preferred.

3. OPERATION

3.1 Operational cautions

1) Keep prime pressure within 1.0MPa.

2) Pull up Adjusting knob to release locking when setting pressure, then turn the knob.

3) Secondary pressure value is raised by turning knob clockwise.

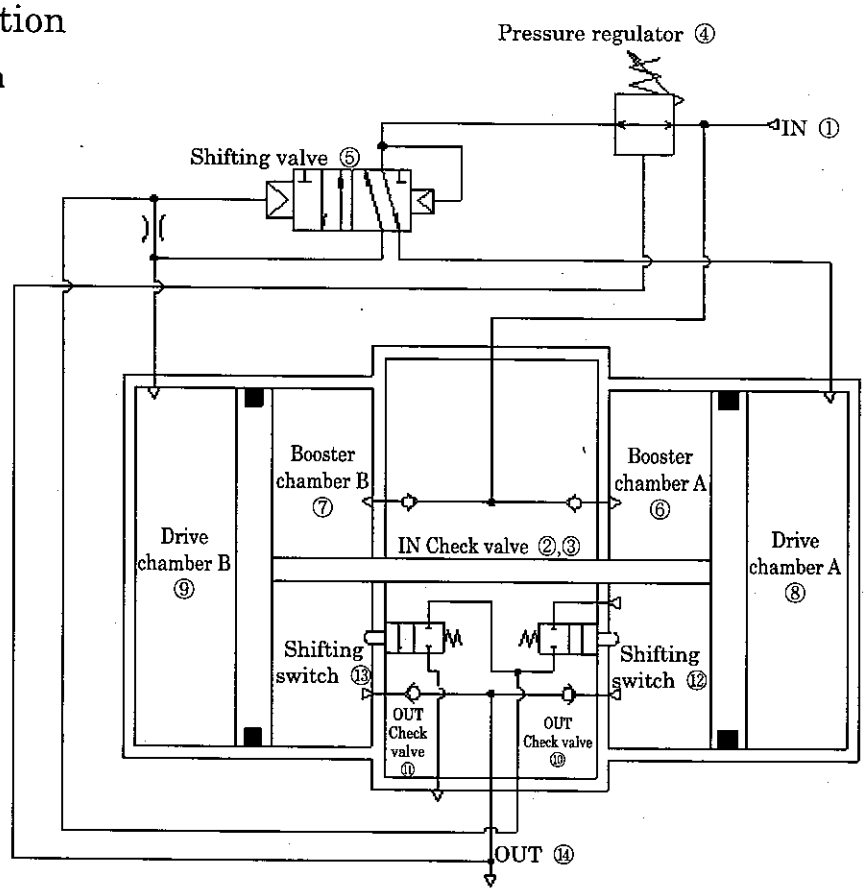
4) Keep setting pressure within 1.0MPa.

5) Pressure is unable to be regulated when prime pressure is higher than set value. Keep it within the set value, otherwise air leaks through the gap of pressure adjusting knob.

6) From June.2006 to improve the operation ability, the part of regulating pressure has changed to the second side pressure relief organization.
From this changing, in the case of the second side pressure rising than the set up pressure, or setting up too high pressure, the second side pressure can be relieved and reduced pressure by loosing the regulating pressure knob.
Please contact to our sales man if you feel any inconvenience in using because of changing the structure that the second side pressure has relieved from regulating pressure knob in the case of rising than the set up pressure.

3.2 Function

- Intern



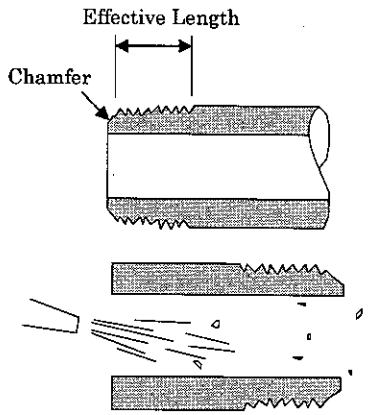
1) Air from IN ① flows into Booster chamber A ⑥ and B ⑦ through IN Check valves ②, ③. Prime pressure also flows into Drive chamber A ⑧ through Pressure regulator ④ and Shifting valve ⑤.
2) Piston is, then, pushed leftward owing to the pressure in Drive chamber A ⑧ while boosting air pressure in Boosting chamber A ⑥. Air in the chamber, ⑥ being boosted comes to OUT ⑭ through OUT check valve ⑩.
3) When the piston reaches its stroke end, it pushes the Shifting switch ⑫. The pilot air is then supplied to the Shifting valve ⑤ and the Shifting valve ⑤ is changed. The air is exhausted from the inside of the Drive chamber A ⑧ and this air flows into the Drive chamber B ⑨.
4) The piston is pushed rightward to boost the air inside the Booster chamber B ⑦. The boosted air is then discharged from the OUT ⑭ through the Check valve ⑪ on the OUT side.
5) When the piston reaches its stroke end, it pushes the Shifting switch ⑬. The pilot air is then supplied to the Shifting valve ⑤ and the Shifting valve ⑤ is changed. The air is exhausted from the inside of the Drive chamber B ⑨ and this air flows into the Drive chamber A ⑧.
6) As the above steps are repeated, the pressure is boosted. The pressure, which has passed through the OUT check valve ⑩, becomes the feedback pressure applied to the Pressure regulator ④. The pressure is boosted until this feedback pressure and the pressure regulation spring are balanced.

4. INSTALLATION

4.1 Piping

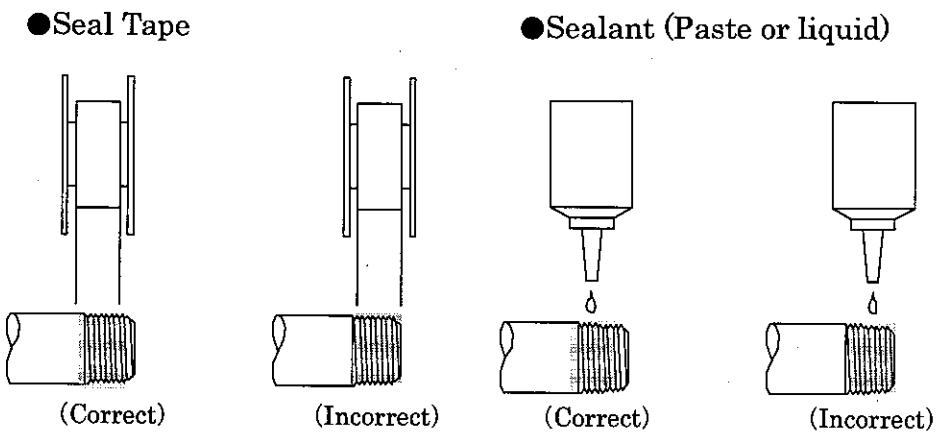
1) For piping beyond the filter, use pipes that hardly get corroded such as galvanized pipes, nylon tubes, rubber tubes, etc.

2) Be sure observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.



3) Flush air into the pipe to blow out foreign substances and chips before piping.

4) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

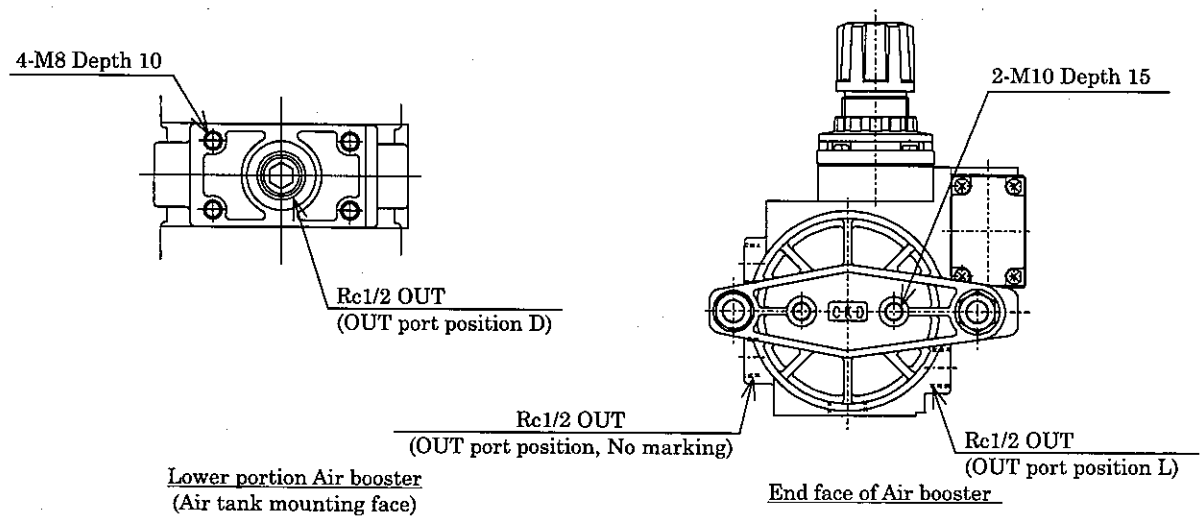


5) Mount a silencer (SLW-15, SL-15) or Exhaust fume cleaner (FA430-15A) at the exhaust port of Air booster. It is recommended to use consolidated exhaust system between E1 and E2 ports when intending to use Exhaust fume cleaner.

6) There is no restriction of mounting posture of Air booster. It is recommended, however, to mount it on a flat surface or horizontal mounting. Avoid using it within the area of more than 49m/s² vibration or of more than shock 294m/s².

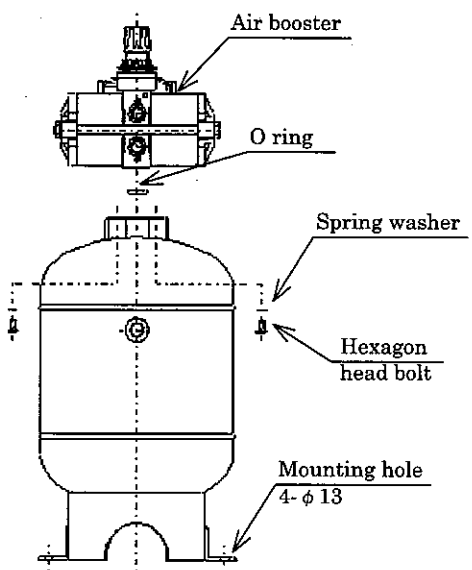
4.2 Installation

1) Install Air booster using either 4 mounting screws (M8, depth 10) to the base or 2 mounting screws (M10, depth 15) to the side flange.
2) Foot bracket is available as an optional item. (Model No. ABP-12-B)



3) For connecting air booster directly to air tank (AT-24), use OUT port position D, after setting attached O-ring to the air booster, fix it on the top of air tank by hexagon head bolt.

(In case of hexagon socket head plug is set on position D of OUT port, remove the plug from it, and other OUT ports (unmarked port, port position L) should be sealde by the hexagon socket head plug)



4.3 Environmental condition

1) Use the booster within the environment of ambient temperature 0 to 50℃. (Not to be frozen)
2) Protect the booster with cover or mounting it in panel box where water drops directly drip over it.
3) Mount silencer or exhaust cleaner to exhaust port so as to protect booster from dust falling into its ports, if there are much dust around it.

5. MAINTENANCE

5.1 Trouble shooting

Trouble	Possible causes	Remedies
Doesn't boost at all	Source of power is shut off.	Turn ON the source of power.
	Spool of shifting valve remains at neutral position.	Reduce prime pressure to zero then charge pressure up.
	Check valve on IN side is loose.	Re-assemble chuck valve or replace it.
	Shifting switch doesn't function.	Replace shifting switch.
Doesn't boost up to set value	Insufficient prime pressure	Connect two boosters in series
	Excessive consumption of air	Connect two or three boosters in parallel.
Air leaks from relief port.	Foreign particle on the rubber lining face of valve seat.	Disassemble, clean and re-assemble the pressure regulator.
	Foreign particle between bottom plug and valve seat	
	Foreign particle on disc seal	
	Prime pressure is higher than set vale	Install a regulator to keep prime pressure within set value.
Air leaks from shifting valve	Foreign particle on spool or spool packing	Disassemble Shifting valve to replace packing then assemble it back
	Damaged piston packing	Disassemble piston to replace piston packing.

5.2 Disassembling (Refer to 5-6 Internal structure illustration.)

1) Pressure regulator
   (1) Loosen Adjusting spring ㊾ by turning Knob ㊻ counterclockwise.
   (2) Turn Mounting nut ㊽ off Cover ㊼ and seperate Knob ㊻.
   (3) Remove Cross-recessed tapping screw ㊿ with cross-point screwdriver to take out Cover ㊼.
   (4) Remove Adjusting ass'y ㊻, Adjusting spring ㊾, Diaphragm ass'y ㊿ and Regulator body ass'y ㊽.
   (5) Ply up Stud ㊺ by a screw driver inserted through IN port so as to pull out Valve seat ㊸.
   (6) Take Valve ass'y ㊼ and Bottom spring ㊹ by turning Stud ㊺ counterclockwise.

2) Cylinder
   (1) Pull out Tie rod ⑮ after removing Hex. nut ⑳ by wrench (nominal 19).
   (2) Pull out Cylinder tube ㉔ by removing Head cover ㉘ and Pipe ⑭.
   (3) Pull Piston ㉖ out of Piston rod㉕ after removing Hex. nut ⑳ by wrench (nominal 19).
   (4) Pull Piston rod ㉕ out of Body block ass'y ⑤.

3) Shifting switch
   (1) Remove Snap ring ② by snap ring pliers (for hole).
   (2) Remove Cross recessed head machine screws with washer ㉞ (for mounting spring seat) out of Shifting valve. Screw in M4 screw to the tip of Valve stem(A) ①. Pull it out of Body block ass'y ⑤ together with Detecting valve ⑫.
   (3) Pull both Detecting valve ⑫ and take out Spring ⑥ and O ring ③.

4) Check valve
   (a) IN side
   (1) Remove Snap ring ㊺ by snap ring pliers (for hole).
   (2) Pick up Spring washer ㊻, Spring ㊼ and Check valve ㊽ using long nose plier.
   (b) OUT side
   (1) Remove Snap ring ㊺ by snap ring pliers (for hole).
   (2) Charge air of approx. 0.1MPa from OUT end to press out Valve seat ㊸.
   (3) Pick up Spring washer ㊻, Spring ㊼ and Check valve ㊽ using long nose plier.
   (4) Insert cross-point screwdriver from reverse end of Body block to push out Valve seat ㊸ to take out Spring washer㊻, Spring ㊼ and Check valve㊽.

5) Valve ass'y

(1) Take out both end Cap ㉙ after removing Hexagon socket head cap screw ㉞ .

(2) Take Piston ㊳ , Spool ㊴ and Piston ㉜ .

(3) Tap cylinder ㉝ with resin hammer to take Cylinder ㊱ .

(4) Push Stopper ㊵ to the side of ㊱ and push out Cylinder ㉝ , Stopper ㊵ Soft packings ㊶㊹ and Spacers ㊷㊸.

5.3 Assembling

Carry out assembling in the room with least amount of dust. Remove whole dust and foreign particle and apply Lithium alkaline base grease on Packings, O ring and Seals. For assembling, comply with reversed sequential order of disassembling.

Applicable grease (grease grade is different corresponding to the area)
Switching valve ····· silicone grease G30M (Shin-Etsu Chemical Co., Ltd.)
Other area ····· Lithium soap radical grease

1) Shifting valve

(1) Beware appropriate direction of Cylinders ㉝㊱ and Pistons ㉜㊳ .

(2) Pay attention to the position of Soft packing ㊶ (transparent), ㊹ (green) Spacer ㊸ (polyacetal) and Spacer ㊷ (Aluminum alloy, die casted).

2) Check valve

(1) Beware of direction of check valve for IN end and OUT end.

3) Shifting switch

(1) Beware of different shape of valve stems for left ① and right ⑬.

(2) Beware of direction of Packing ⑪ .

4) Cylinder

(1) Carefully keep Packings ㉑ ,㉗ and O rings ⑧ ⑯ ㉓ from damaged during the course of assembling.

5) Pressure regulator

(1) Carefully avoid blocking air path during the course of assembling Regulator body ass'y ㊽.

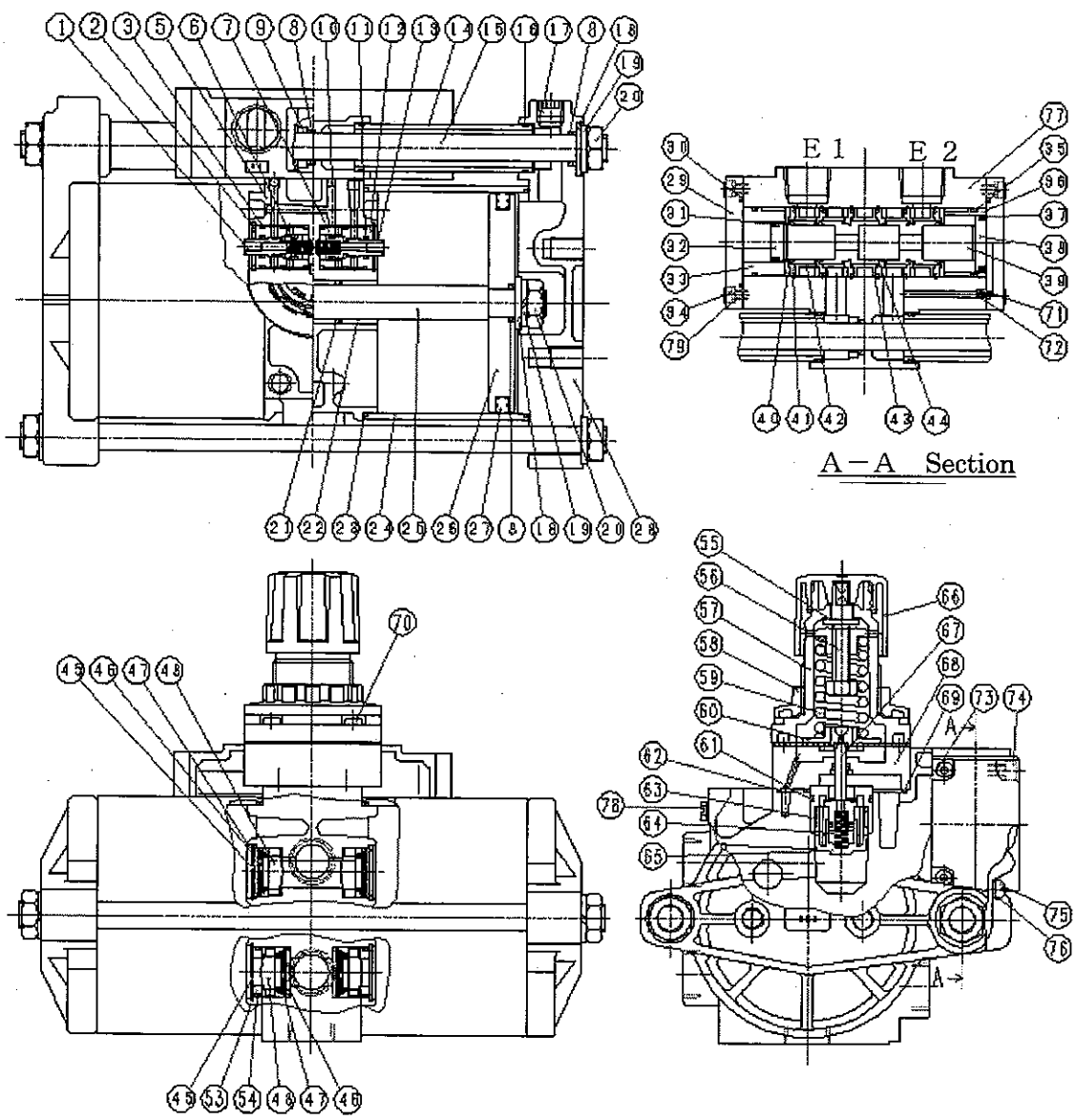
5.4 Inspection

1) Confirm non occurrence of any air leakage applying rated air pressure.
2) Confirm proper boosting function.

5.5 Disassembling tools

Machine spot tool	Qty	Applicable parts No.
Cross-point screwdriver	1	70, 65, 34, 53, 5
Hexagon bar spanner (3mm)	1	34
Wrench (Nominal 19)	2	20
Snap ring plier (for Hole)	1	2, 45
Long nose plier	1	46, 47, 48
Standard driver (9×200)	1	52
Resin hammer	1	33

5.6 Internal structure drawing



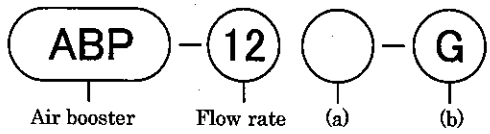
5.7 Parts list

No.	Name of parts	Material	Qty	No.	Name of parts	Material	Qty
1	Valve stem (A)	Stainless steel	1	41	Soft packing	Urethane rubber	4
2	Snap ring	Stainless steel	2	42	Spacer	Aluminum alloy die-casting	4
3	O ring	Nitrile rubber	5	43	Spacer	Polyacetal resin	1
4	—	—	—	44	Soft packing	Urethane rubber	2
5	Body block ass'y	Aluminum alloy die-casting	1	45	Snap ring	Stainless steel	4
6	Spring	Stainless steel	2	46	Spring washer	Stainless steel	4
7	O ring	Nitrile rubber	1	47	Spring	Stainless steel	4
8	O ring	Nitrile rubber	5	48	Check valve	Nitrile rubber	4
9	Spacer	Aluminum alloy die-casting	1	49	—	—	—
10	Steel ball	Alloy steel	3	50	—	—	—
11	Packing	Nitrile rubber	2	51	—	—	—
12	Detecting valve	Copper alloy	2	52	—	—	—
13	Valve stem (B)	Stainless steel	1	53	Valve seat	Aluminum alloy	2
14	Pipe	Stainless steel	2	54	O ring	Nitrile rubber	2
15	Tie rod	Steel	2	55	Slip ring	Polyacetal resin	1
16	O ring	Nitrile rubber	4	56	Adjusting ass'y	Steel	1
17	Hexagon socket plug	Stainless steel	2	57	Cover	Polyacetal resin	1
18	Plain washer	Steel	4	58	Mounting nut	Polyacetal resin	1
19	Spring washer	Steel	6	59	Adjusting spring	Steel	1
20	Hex. nut	Steel	6	60	Diaphragm ass'y		1
21	MY packing	Nitrile rubber	2	61	O ring	Nitrile rubber	1
22	Rod bushing	Oil impregnated bearing alloy	3	62	O ring	Nitrile rubber	1
23	O ring	Nitrile rubber	4	63	Valve seat	Copper alloy	1
24	Cylinder tube	Aluminum alloy	2	64	Bottom spring	Stainless steel	1
25	Piston rod	Steel	1	65	Stud	Polyacetal resin	1
26	Piston	Aluminum alloy	2	66	Knob	Polyacetal resin	1
27	Piston packing	Nitrile rubber	2	67	Valve ass'y		1
28	Head cover	Aluminum alloy die-casting	2	68	Regulator body ass'y		1
29	Cap	Aluminum alloy die-casting	2	69	O ring	Nitrile rubber	1
30	Gasket	Nitrile rubber	2	70	Cross-recessed tapping screw	Steel	4
31	Rip packing	Nitrile rubber	1	71	Fixing orifice	Copper alloy	1
32	Piston	Polyacetal resin	1	72	O ring	Nitrile rubber	1
33	Cylinder	Aluminum alloy	1	73	Master valve gasket	Nitrile rubber	1
34	Hexagon socket head cap screw	Alloy steel	8	74	Hexagon socket head cap screw	Alloy steel	2
				75	Cross headed pen small screw	Alloy steel	1
35	O ring	Nitrile rubber	2	76	Gasket	Nitrile rubber	1
36	Cylinder	Aluminum alloy	1	77	Valve body	Nitrile rubber	1
37	Rip packing	Nitrile rubber	1	78	Plug	Copper alloy	1
38	Piston	Polyacetal resin		79	Spring washer	Steel	8
39	Spool	Aluminum alloy	1				
40	Stopper	Polyacetal resin	2				

5.8 Expendable Parts list

No.	Packing Set	Parts		Qty
1	Packing set for Shifting switch ABP-K1	1	Valve stem (A) ass'y	1
		3	O ring	5
		6	Spring	2
		11	Packing	2
		12	Detecting valve	2
		13	Valve stem (B) ass'y	1
2	Packing set for Cylinder ABP-K2	8	O ring	5
		16	O ring	4
		21	MY packing	2
		23	O ring	4
		27	Piston packing	2
3	Seal ass'y for Shifting ABP-K3	31	Rip packing	1
		32	Piston	1
		37	Rip packing	1
		38	Piston	1
4	Seal ass'y for Shifting valve ABP-K4	40	Stopper	2
		41	Soft packing	4
		42	Spacer	4
		43	Spacer	1
		44	Soft packing	2
6	Diaphragm ass'y ABP-K6	60	Diaphragm ass'y	1
7	Valve ass'y for Pressure adjusting valve ABP-K7	61	O ring	1
		62	O ring	1
		67	Valve ass'y	1
		69	O ring	1
			O ring for stem	1
8	Check valve ass'y ABP-K8	48	Check valve	4
		53	Valve seat	2
		54	O ring	2
	Bracket ABP−B		Bracket	2
			Hexagon socket head cap screw (M10×20)	4
			Spring washer	4
	Pressure gauge ABP−GAUGE		Pressure gauge	1
	Air tank assembly kit AT−K1		Hexagon socket head cap screw (M8×15)	4
			Spring washer	4
			O ring (P24-1A)	1

6. HOW TO ORDER



(a) OUT port position		(b) Option	
No code	Same plane with IN port	G	Pressure gauge
D	Underneath (Direct to air tank)	S	Silencer
L	Rear side of IN port	B	Foot bracket

Note : Pressure gauge, silencer are to be built in to booster and Bracket is delivered together with booster.