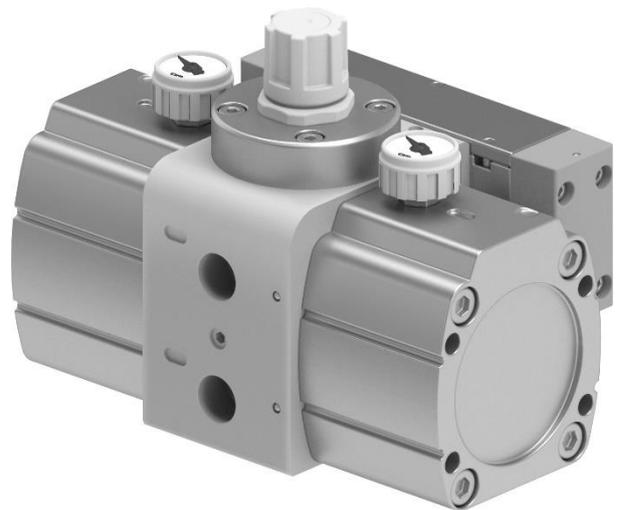


Air Booster ABP2-HP1 Series

INSTRUCTION MANUAL

SM-A50870-A



- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

PREFACE

Thank you for purchasing CKD's "**ABP2-HP1 Series**" Air Booster.

This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.

Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product is intended for users who have basic knowledge about materials, piping, electricity, and mechanisms of pneumatic components. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the fluid control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

ISO 4414, JIS B 8370, JFPS 2008 (the latest edition of each standard), the High Pressure Gas Safety Act, the Industrial Safety and Health Act, other safety rules, organization standards, relevant laws and regulations

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.

Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

**Thoroughly read and understand this Instruction Manual
before using the product.**

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

 DANGER	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
 WARNING	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
 CAUTION	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation. All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.



Indicates general precautions and tips on using the product.

Precautions on Product Use

WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications. Also, the product must not be modified and additional work on the product must not be performed.

The product is intended for use in devices or parts for general industrial machinery. It is not intended for use outdoors or in the conditions or environment listed below.

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For special applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where life or properties may be adversely affected and special safety measures are required.

(Exception is made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Do not handle the product or remove pipes and devices until confirming safety.

- Inspect and service the machine and devices after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that incorporates pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

Precautions on Design and Selection

WARNING

Do not use the air booster for continuous operation such as in a compressor.

The Air Booster is a device for partial pressure increase in the factory. As with a compressor, its use in high frequency continuous operation will shorten its life. Use as a guideline 60 or less of the average operation cycle per minute. (Air boosters have a nominal life of 10 million cycles in normal use) Refer to catalog (No.CC-1533A) for the estimated service life calculation.

CAUTION

If the secondary side flow rate must be 1, the primary side requires a flow rate of $1 + 1 = 2$.

Pressure is raised by air pressure, so half of the air is discharged during boosting.

Because the internal has a cylinder structure, 60 to 75dB (A) noise (primary side 0.5MPa→ secondary side 0.95MPa, measurement distance 1 m) is generated during pressure boosting.

* This is the noise when the silencer is used.

Precautions on Product Disposal

CAUTION

When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

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1. PRODUCT OVERVIEW

1.1 Part Name

Pressure adjusting knob, No tool required. One pushing locks it.

Made axially compact

Pressure gage (Options),
For prime/secondary

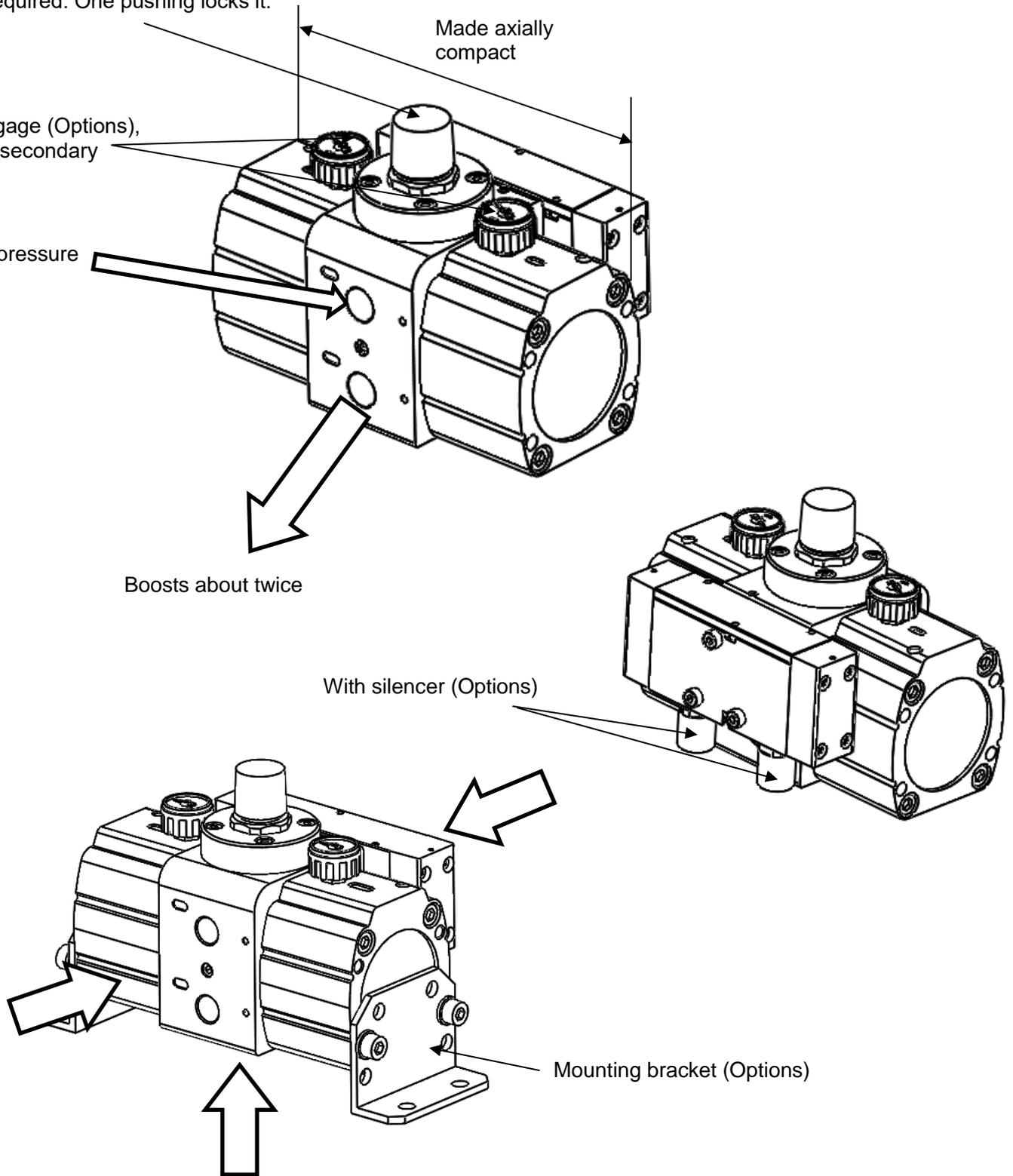
Prime pressure

Boosts about twice

With silencer (Options)

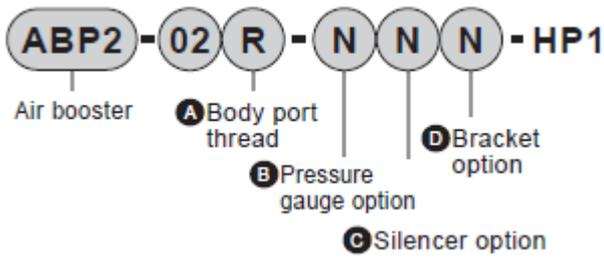
Mounting bracket (Options)

Piping available from 3 surfaces



1.2 Model Number Indication

1.2.1 ABP2-HP1 Series



Code	Description
A Body port thread	
R	Rc thread
N	NPT thread (made to order)
G	G thread (made to order)
B Pressure gauge option	
N	No
G	Pressure gauge (2 included)
C Silencer option	
N	No
S	Silencer (2 pcs. included)
H	High performance silencer (2 pcs. included)
D Bracket option	
N	No
B	Foot bracket (2 included)
T	Base for mounting tank

1.2.2 AT2 Series



Code	Description
A Internal capacity	
05	5L
10	10L

1.3 Specifications

1.3.1 Product specifications

Model	ABP2-HP1	
Description		
Working fluid	Compressed air	
Max. working pressure	MPa	0.99
Min. working pressure	MPa	0.2
Set pressure	MPa	From a primary pressure of +0.1MPa to twice the primary pressure (max. 0.99MPa)
Proof pressure	MPa	1.5
Flow rate	m ³ /min(ANR)	Refer to the flow characteristics in the graph on the next page.
Boosting ratio	Max. twice (or equivalent)	
Ambient temp	°C	0 to 50 (no freezing)
Lubrication	Not available	
Port size	Rc1/4 (bottom, back Rc1/8)	
Weight	kg	2.0
Durability	10 million cycles (nominal)	

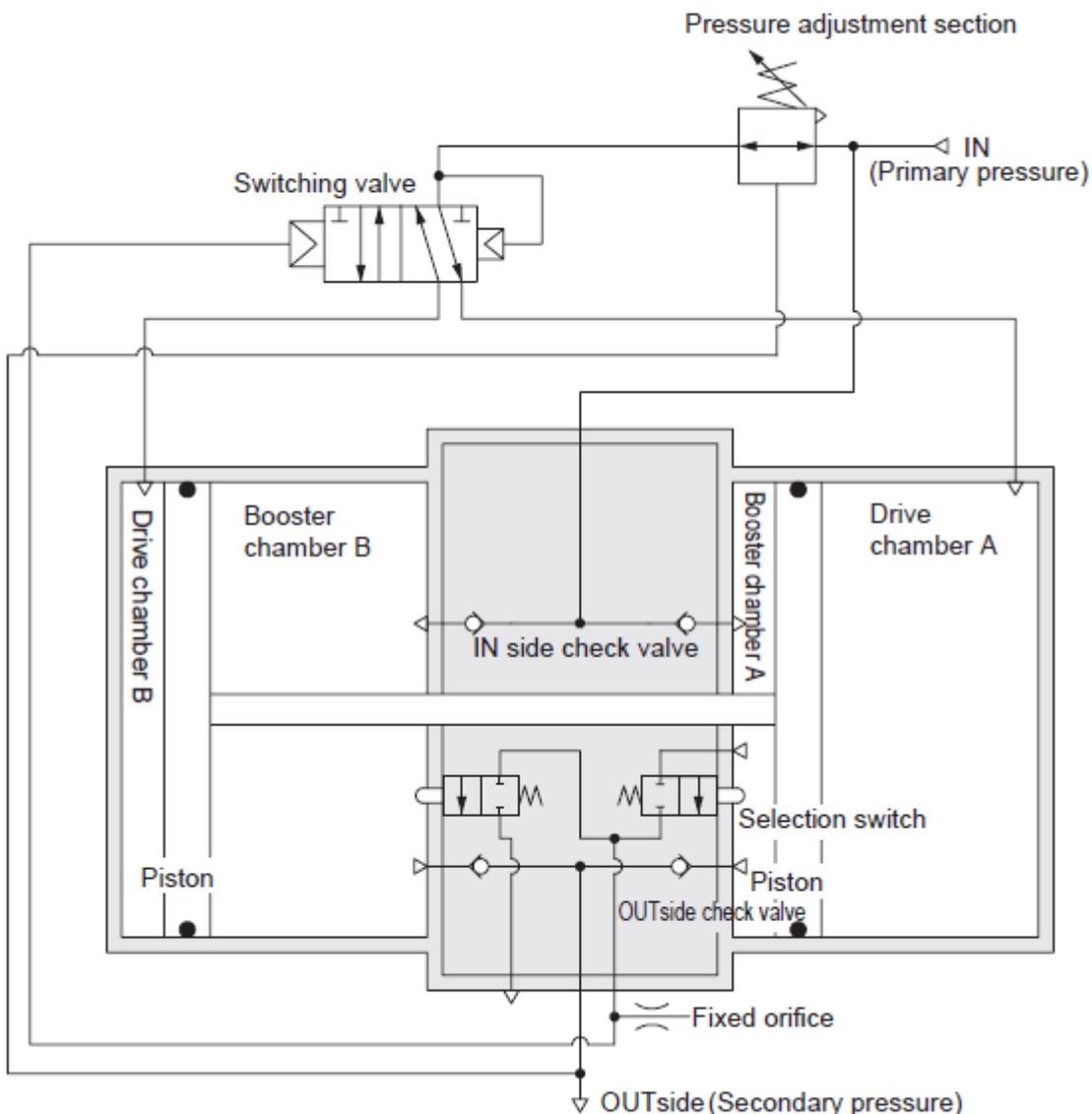
Model	AT2-05S		AT2-10S	
Description				
Working fluid	Compressed air			
Max. working pressure	MPa	0.99		
Water test pressure	MPa	1.5		
Ambient temperature	°C	0 to 50 (no freezing)		
Internal capacity	L	5	10	
Port size	Rc3/8			
Material	Stainless steel			
Weight	kg	7.3	10.5	

1.4 Feature Description

- Primary pressure from IN passes through the check valve on IN side, and flows into booster chambers A and B. The primary pressure passes through the pressure adjustment section and switching valve, and flows into the driving chamber A. The piston moves to the left due to the pressure of the driving chamber A. Air in booster chamber A is compressed, passes through the check valve on the OUT side, and goes to the OUT side.
- When the piston reaches the stroke end, the changeover switch will be pushed, causing compressed air to be supplied to the switching valve pilot chamber and causing the switching valve to change over. Then the air in drive chamber A is exhausted, and the air is delivered to drive chamber B.
- Therefore, the piston moves to the right and air in booster chamber B is compressed, passes through the check valve at the OUT side and moves OUT.

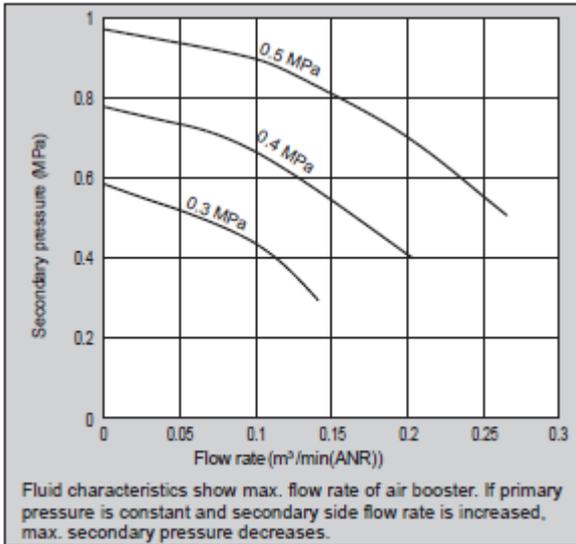
If the above operations are repeated, pressure will be increased on the OUT side. Feedback pressure is transmitted to the pressure adjustment section due to the OUT side pressure, and boosting is continued until the pressure adjustment spring pressure is balanced.

■ Internal air circuit diagram



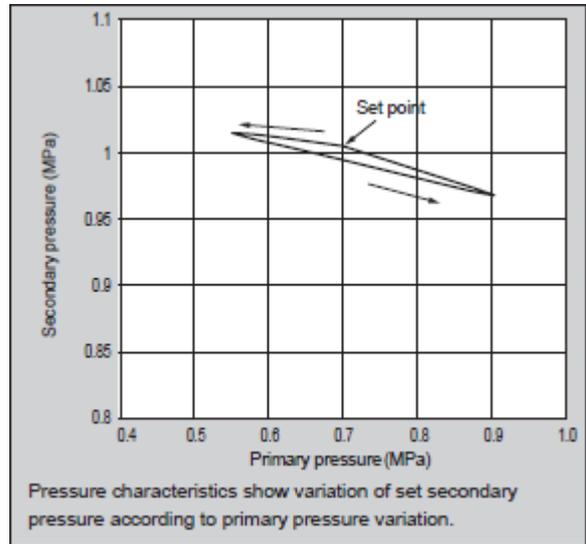
Flow characteristics

(with the 5 L air tank, equivalent to double the pressure increase)



Pressure characteristics

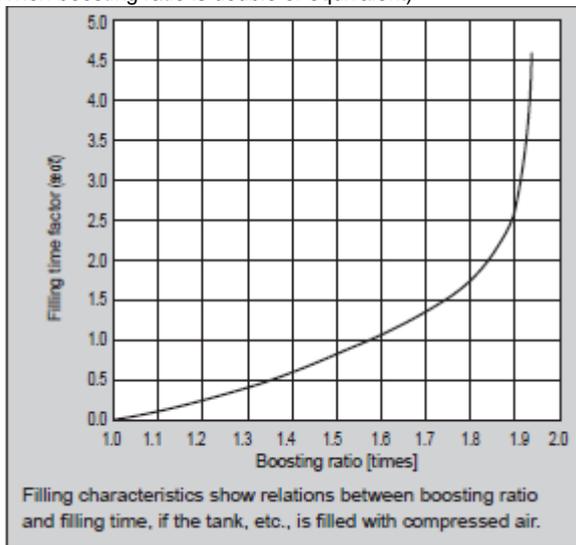
(Setting: primary pressure: 0.7MPa, secondary pressure: 1.0MPa, flow rate: 0.02m³/min (ANR))



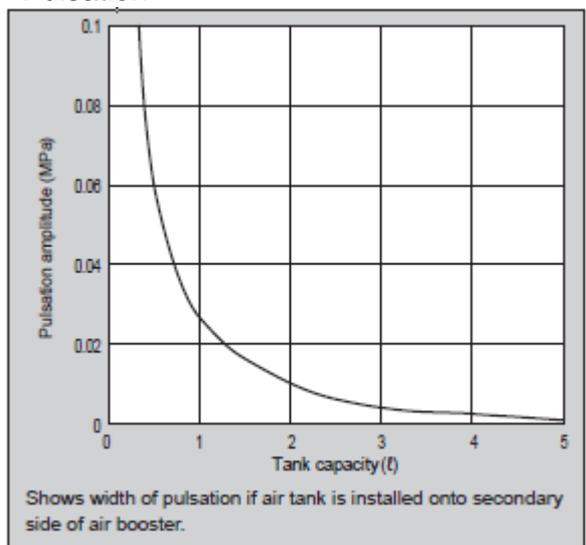
Note) Air booster needs approx. twice secondary side flow rate (max.) for primary side due to structure. Confirm that the instantaneous flow rate is within the curve.

Filling characteristics

(When boosting ratio is double or equivalent)



Pulsation



The time required to fill the tank with air can be calculated as follows. With the primary side pressure P_0 , inner tank pressure before filling P_1 , inner tank pressure after filling P_2 , pre-filling ratio between primary side pressure and inner tank pressure k_1 , and post-filling ratio between primary side pressure and inner tank pressure k_2 , the formula will be $k_1 = \frac{P_1}{P_0}$, $k_2 = \frac{P_2}{P_0}$.

Calculate k_1 and k_2 , find the filling time factors t_1 and t_2 at the boosting ratio points k_1 and k_2 in the graph and substitute the values into $t = (t_2 - t_1) A$ to obtain the filling time t of the tank capacity A (ℓ).

< Formula for air booster operational cycle >

$$N = \frac{Q \times 10^3}{0.95P + 0.096}$$

N: Operational cycle
Q: Required flow rate (m³ /min (ANR))
P: Primary pressure (MPa)

< Formula for air booster service life >

Since the nominal life of the operation cycle is 10 million cycles,

$$T = \frac{10,000,000}{N \times 60}$$

T: Service life (hours)



The characteristics above are typical examples, not guaranteed values.

2. INSTALLATION

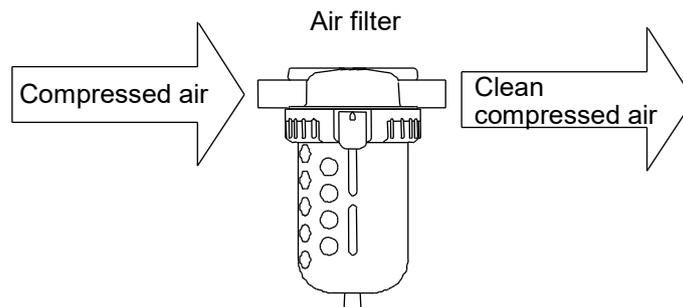
2.1 Environment

CAUTION

When using the product in a cutting, casting, or welding plant, install a cover to prevent foreign matters such as cutting fluid, chips, powder, and dust from entering.

Do not use the equipment in the following environments.

- Where cutting oil can splash onto the product (abrasives and polishing powder in the oil can abrade the sliding section)
 - Where organic solvents, chemicals, acids, alkalis, and kerosene are present
 - Where water can splash onto the product
- Use the product within the following ambient temperature range.
0°C to 50°C (no freezing)
 - For compressed air, use clean and dry air that has been passed through an air filter. Use an air filter in the circuit and be careful with the filtration rate (a filter that removes particles exceeding 5 µm is desirable), flow rate, and mounting position (install the filter near the directional control valve).



2.2 Unpacking

- Check that the model number ordered and the model number indicated on the product are the same.
- Check the exterior of the product for any damage.
- When storing the product, take proper measures to prevent foreign matters from entering the Air booster.

2.3 Mounting

⚠ CAUTION

Do not use this product if vibration exceeds 50 m/s² or impact exceeds 300 m/s².

Install a filter on the primary side to remove rust, foreign matter and drainage.

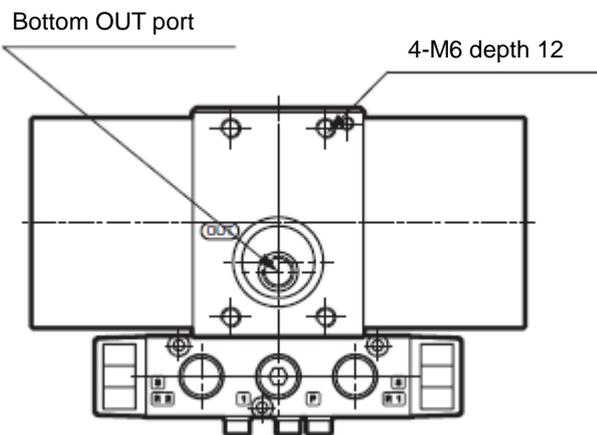
The air booster compresses compressed air so drain is discharged easily from the secondary side. Installation of a filter is recommended to remove any moisture from the piping.

■ Mounting orientation

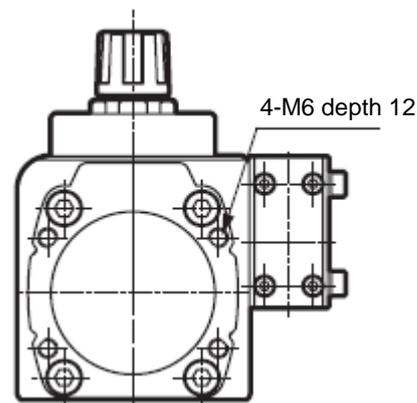
There are no set regulations regarding the air booster's mounting orientation: it should optimally be horizontally installed on a flat surface.

■ Mounting method

- Install the air booster using 4-M6 depth 12 screw holes on the bottom or both sides. Only use these screw holes for installing the air booster.



Air booster bottom



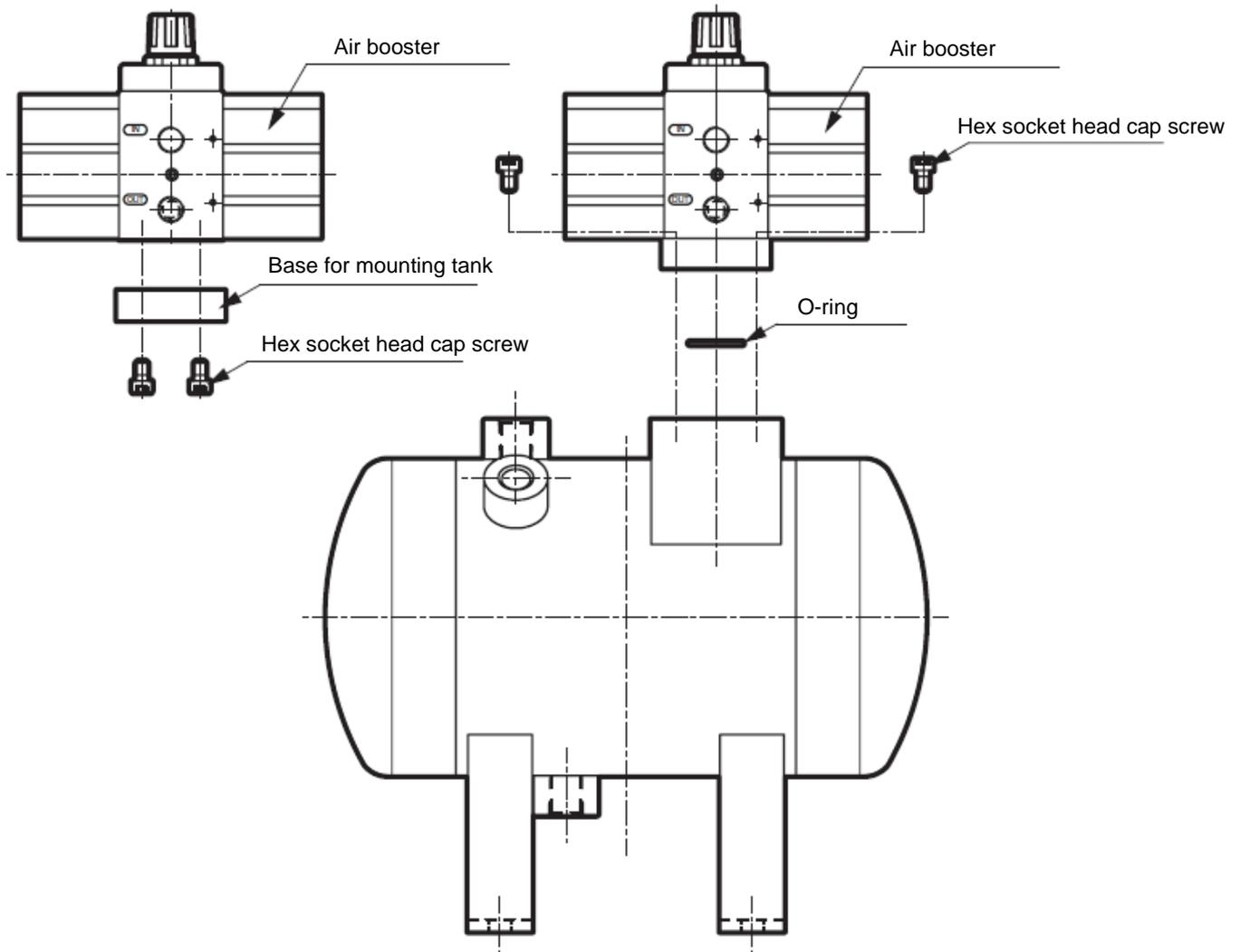
Air booster side

- The bolt used to install the air booster must not exceed the screw hole depth. Forcibly tightening a long bolt could damage the screw hole and cause air leakage.
- Install a silencer on the exhaust port of the air booster.
- A foot bracket installed on both ends is available as an option.

Model
ABP2-02-B

■ Air tank

- Fix the air tank with the 4- ϕ 11 anchor bolt hole on the bottom.
- When connecting the air booster directly to the air tank, fix the tank mounting base to the air booster with the included hexagon socket head cap screw, attach the included O-ring to the tank mounting base using the bottom port, and fix the air tank top with the hexagon socket head cap screw.



- Installation of an air tank and regulator after the air booster is recommended for attaining stable secondary pressure.

2.4 Piping

WARNING

Insert the tube into the fitting until it firmly rests on the tube end and make sure that the tube does not come off before use.

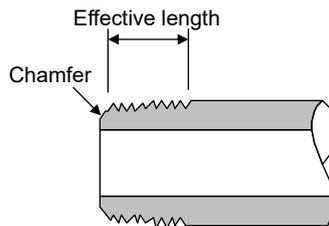
Select a large pipe on the primary side to attain sufficient flow.

Recommended fitting: effective cross-sectional area 30mm² or more, tube \varnothing 12 or more

Use piping with a stop valve at the air tank's drain port.

Regularly discharge drain from the tank.

- Use pipes that are made of corrosion-resistant materials after the filter such as zinc-plated pipes, nylon tubes, and rubber tubes.
- Use pipes with an effective cross-sectional area that allows the cylinder to achieve the predetermined piston speed.
- Install the filter for removing rust, foreign matters, and drainage from the piping as close as possible to the solenoid valve.
- Observe the effective thread length for the gas pipes.
- In addition, chamfer the threaded end of the pipes by about a 1/2 pitch.



■ Pipe cleaning

Before piping, blow air into the pipes to clean the interior and to remove cutting chips and foreign matters.



■ Seal material

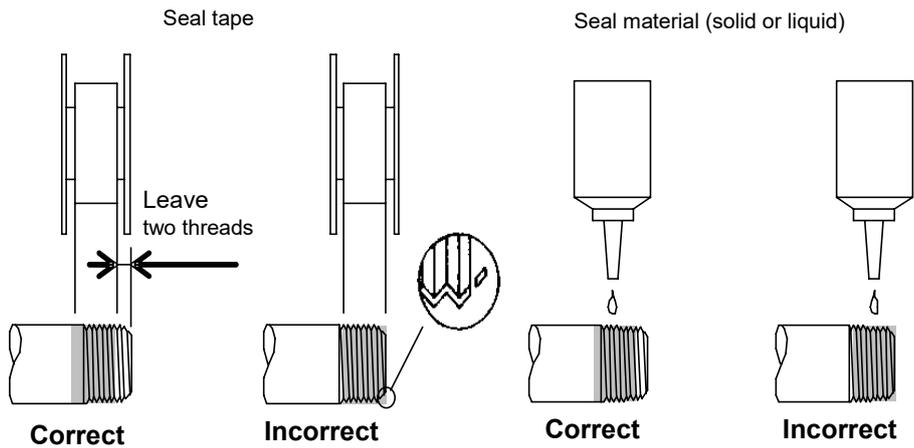
Use a seal tape or a seal material to stop leakage from piping.

Apply a seal tape or seal material to the screw threads leaving two or more threads at the pipe end uncovered or uncoated. If the pipe end is fully covered or coated, a shred of seal tape or residue of seal material may enter inside of the pipes or device and cause a failure.

When using a seal tape, wind it around the screw threads in the direction opposite from the screw threads and press it down with your fingers to attach it firmly.

When using a liquid seal material, be careful not to apply it to resin parts. The resin parts can become damaged and this may lead to a failure or malfunction.

Also, do not apply seal material to the internal threads.



3. USAGE

3.1 Using the Air booster

CAUTION

When the air booster is not used, stop the primary pressure.
Stop unnecessary operation and prevent air consumption.

3.2 Method of operation

WARNING

Do not supply pressure exceeding 0.99 MPa onto the primary side.

Check that set pressure does not exceed 0.99 MPa.

■ Pressure adjustment knob

When setting pressure, lift the pressure adjustment knob to release the lock, and then turn the pressure adjustment knob.

Secondary pressure increases when the pressure adjustment knob is turned clockwise.

The pressure adjustment knob must be locked after use.

■ Pressure fluctuations

If primary pressure exceeds the set pressure due to fluctuations in pressure, etc., air is released from the pressure adjustment knob.

Set a regulator on the primary side, and adjust the pressure at least 0.1 MPa lower from the set pressure.

4. MAINTENANCE AND INSPECTION

⚠ WARNING

Stop the primary pressure and release the secondary pressure before maintenance, inspection, or repair of the air booster.

⚠ CAUTION

The silencer and pressure gauge are consumable parts and must be replaced regularly.

4.1 Periodic Inspection

In order to use the product under optimum conditions, perform a periodic inspection once or twice a year.

4.1.1 Inspection item

- Actuation state
- Air leakage
- Silencer clogging
- Looseness of bolts

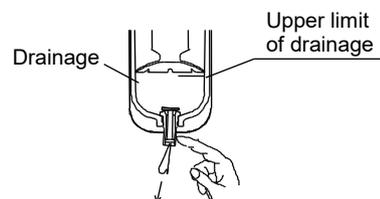
Check the items above and refer to "5. TROUBLESHOOTING" to correct any abnormality found. If there are loose threaded connections, tighten them.

4.1.2 Maintenance of the product

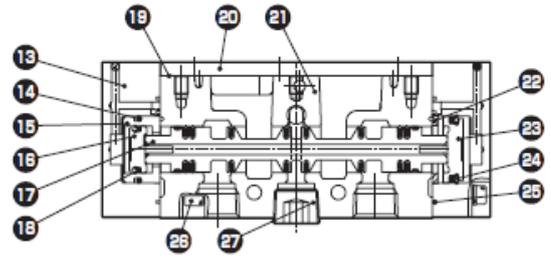
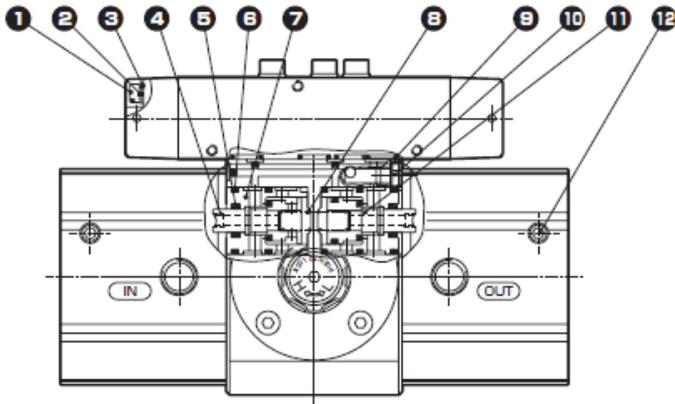
This cylinder does not require lubrication.

4.1.3 Maintenance of the circuit

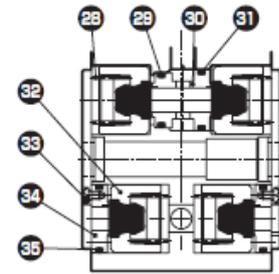
- Discharge the drainage accumulated in the air filter periodically before it exceeds the specified line.
- Since foreign matters such as carbide (carbon or tar substance) from the compressor oil may contaminate the circuit and cause an operation fault of the solenoid valve or the cylinder, be careful when performing maintenance or inspection of the compressor.



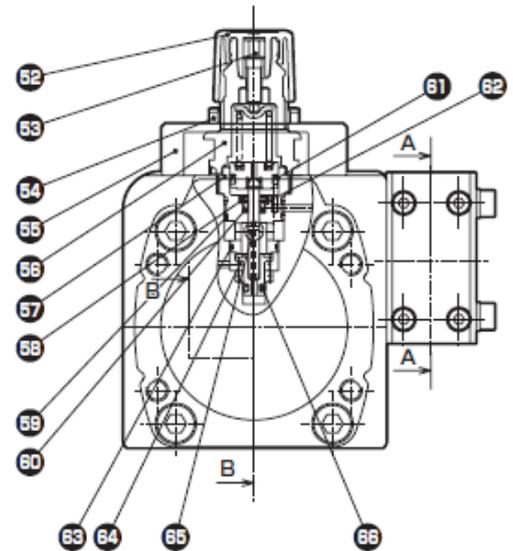
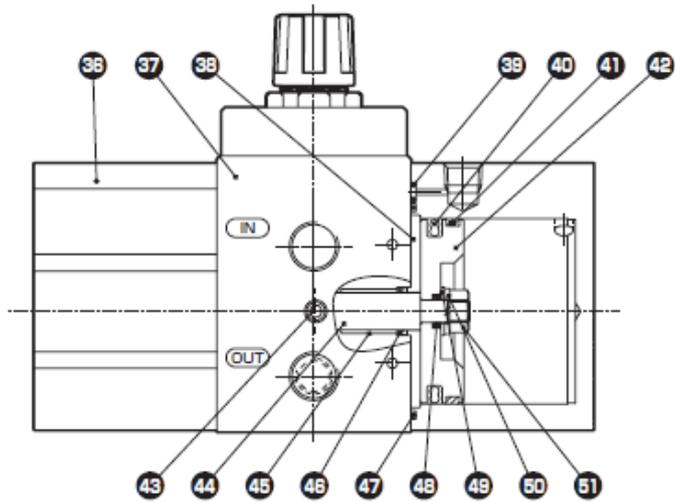
4.1.4 Internal structure



A-A cross section



B-B cross section



Parts list

No.	Part name	Material	No.	Part name	Material
1	Hexagon socket head cap screw	Stainless steel	34	Valve seat	Aluminum alloy
2	Spring washer	Stainless steel	35	O-ring	NBR
3	Flat washer	Stainless steel	36	Cylinder body	Aluminum alloy
4	Valve bar	Stainless steel	37	Body	Aluminum alloy
5	Packing	NBR	38	Side plate	Aluminum alloy
6	O-ring	NBR	39	O-ring	NBR
7	Detection valve body	Aluminum alloy	40	Packing	NBR
8	Spring	Steel	41	Wear ring	Resin
9	O-ring	NBR	42	Piston	Aluminum alloy
10	Fixed orifice	Stainless steel	43	Hexagon socket set screw	Stainless steel
11	Valve bar	Stainless steel	44	Piston rod	Stainless steel
12	Hexagon socket set screw	Stainless steel	45	Bush	Oiles drymet
13	Pilot cap	Resin	46	Packing	NBR
14	O-ring	NBR	47	O-ring	NBR
15	Valve piston spacer	Aluminum alloy	48	O-ring	NBR
16	Piston	Resin	49	Flat washer	Stainless steel
17	Spool assembly	-	50	Spring washer	Stainless steel
18	Packing	NBR	51	Hexagon nut	Stainless steel
19	Adaptor gasket	NBR	52	Knob	Resin
20	Adapter	Aluminum alloy	53	Regulator piston assembly	-
21	Valve body	Aluminum alloy	54	Nut	Resin
22	Valve piston spacer	Aluminum alloy	55	Cover holder	Aluminum alloy
23	Piston	Resin	56	Cover	Aluminum alloy
24	Packing	NBR	57	Stem holder	Aluminum alloy
25	Gasket	NBR	58	CR ring	Stainless steel
26	Hexagon socket head cap screw	Stainless steel	59	O-ring	NBR
27	Plug	Steel	60	Packing	NBR
28	Spring	Steel	61	Packing	NBR
29	O-ring	NBR	62	Cap	Stainless steel
30	Valve seat	Aluminum alloy	63	O-ring	NBR
31	O-ring	NBR	64	Spring	Steel
32	Check valve assembly	-	65	Valve assembly	-
33	Cross-recessed pan head machine screw	Stainless steel	66	O-ring	NBR

Optional parts individual list

Part name	Model No.	Remarks
Bracket	ABP2-02-B	Quantity per unit
Base for mounting tank	ABP2-02-T	Hexagon socket head cap screw for tank mounting, O-ring included
Pressure gauge	G29D-6-P15	Pressure gauge x 1
Silencer	SLW-8S-2PC	Silencer x 2
High performance silencer	SLW-8A-H-2PC	Silencer x 2

5. TROUBLESHOOTING

5.1 Problems, Causes, and Solutions

If the product does not operate properly, check the table below for a possible solution.

5.1.1 Air booster

Problem	Cause	Solution
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 value.	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.
Decrease in exhaust speed	The silencer is clogged	Replace with a new silencer.

If you have any other questions or concerns, contact your nearest CKD sales office or distributor.

6. WARRANTY PROVISIONS

6.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.

However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.

When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

6.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.