OPERATION MANUAL VBA-M3

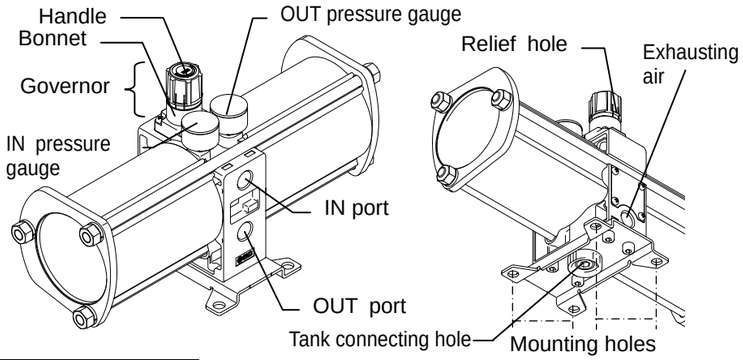
Booster regulator

VBA1□A / 2□A / 4□A Series

Contents

Thank you for choosing this SMC product. This operation manual provides essential information to ensure its optimum performance and lifespan. Keep this manual accessible and refer to it if problems occur. Please refer to the latest catalogue, drawings and maintenance procedures for product configuration and specifications.

● Descriptions and specifications of the components



Specifications

Model	VBA10A	VBA11A	VBA20A VBA40A	VBA22A VBA42A	VBA43A
Pressure increase ratio	MAX.2	2 to 4	MAX.2		
Fluid	Compressed air				
Set pressure range	0.2 to 2.0MPa		0.2 to 1.0MPa		0.2 to 1.6MPa
Supplied pressure range	0.1 to 1.0MPa				
Proof pressure	3MPa		1.5MPa		2.4MPa
Ambient and operating fluid temperature	2 to 50°C (No freezing)				
Lubrication	Lubrication is not allowed				
Mounting posture	Horizontal				
Governor* (Pressure adjusting mechanism)	Handle-operated type			Air-operated type	Handle-operated type
	Relief function				

***The default pressure of the handle is 0. When the air is supplied, the pressure is relieved.**

● Handling Precautions

To ensure safe and optimum operation, confirm the product's specifications before use. Operating the product out of the scope of its specifications may cause failure or accident.

Operating Location

⚠ CAUTION

- Do not install the product where it can be exposed to rain or direct sunlight.
- Do not install the product where it can be affected by vibration.

Installation

- Since the booster regulator vibrates due to the reciprocation of the internal piston, mount 4 bolts onto the mounting holes and tighten them completely.

Model	Bolt size	Tightening torque
VBA1□A	M5	3Nm
VBA2□A, 4□A	M10	24Nm

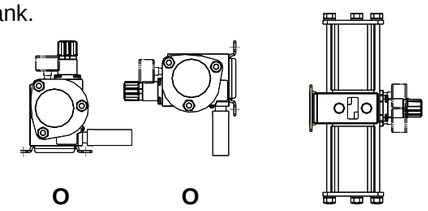
⚠CAUTION

(1)**Lifting**

- When transporting this product, hold it lengthwise with both hands. Never hold it by the black handle that protrudes from the centre because the handle could become detached from the body, causing the body to fall and leading to injury.

(2)**Installation**

- Mount the booster regulator so that the tie-rod/cover are placed horizontally.
  A malfunction will occur if it is vertical.
- If vibration of the booster regulator may cause problems, take countermeasures in your application to prevent vibration.
- Ensure there is enough space for maintenance.
- When connecting the booster regulator with the VBAT tank, be sure to read the operation manual and use the accessories provided with the tank.

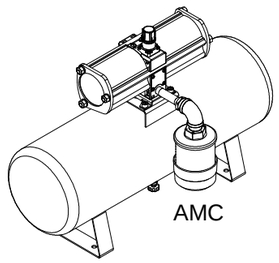


O O X

Key
O: Can be used
X: Cannot be used

Piping

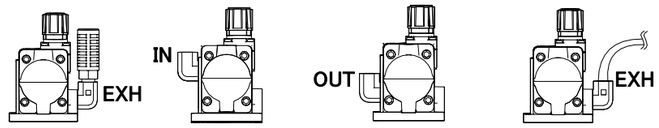
- Connect IN port with the air source, and OUT port with an actuator. Install a silencer or exhaust cleaner at the exhaust port of the booster regulator to reduce noise, if necessary.



Booster regulator model	Exhaust cleaner model No.	Installation distance
VBA1□A	AMC310-03	200mm
VBA2□A	AMC510-06	270mm
VBA4□A	AMC610-10	300mm

* Separate piping should be prepared to connect the booster regulator with the exhaust cleaner.
* If the tank is not used, mount the booster regulator away from the floor in accordance with the installation distance stated above.

- The elbow for silencer (option) can be used only for mounting a silencer to the exhaust port. Do not use it for the IN port and the OUT port. Prepare piping separately to exhaust remotely by connecting pipes to the exhaust port.



O X X X

- When preparing piping for the booster regulator, always fasten the threads with correct tighten torque as shown in the below table.

Port size	1/8	1/4	3/8	1/2
Tightening torque	7 to 9N·m	12 to 14N·m	22 to 24N·m	28 to 30N·m

- When mounting the silencer and the elbow for silencer, hold the end of the body (the side without thread) and screw it in. When the screw becomes slightly tight, tighten it further for approximately 1/4 turn with a spanner whose size is appropriate for the width across flat of the hexagon head.

⚠CAUTION

(1)**Flushing** ··· Care should be taken especially for the precision parts.

- Before piping, flush pipes to remove cutting chips, cutting oil, and dust which may cause malfunction or lower the durability of the booster regulator. If they enter inside the booster regulator, they could cause the booster regulator to malfunction or its durability could be affected

(2)**Piping size**

- Ensure that the piping size corresponds to the port size to achieve the full function of the booster regulator. If the piping is too small, the function will be reduced due to the pressure loss.

(3)**Exhaust air**

- Individual piping is necessary for exhaust air of the booster regulator. Using common piping for exhaust may cause malfunction due to back pressure.
- If inlet pressure and outlet pressure are set close together, air may leak from the exhaust port. This is normal. This occurs when the booster regulator is on standby for switching.

(4)**Particle generation**

- There is a sliding part inside the booster regulator, and it generates particles. Install an air filter or mist separator at the outlet if necessary.
- The booster regulator contains lubrication (grease / turbine oil) in the exhaust air.

Air Supply

⚠CAUTION

(1)**Quality of Air Source** ··· Take care especially for precision parts.

- Connect a mist separator at the inlet of the booster regulator. If the quality of compressed air is not fully controlled, it may cause a malfunction or deterioration of durability.

- Although a wire mesh is installed at the IN port of the booster regulator to prevent simple particles from entering, it cannot continuously filter particles or separate drainage. Make sure to install a mist separator (model AM Series) at the inlet of booster regulator.
- If dry air (atmospheric pressure dew point –23°C or less) is used, the life expectancy may be shortened because dry air will accelerate evaporation of grease inside.
- If necessary connect the lubricator only at the outlet. Accumulation of oil in the booster regulator may cause malfunction.

• If the product is used in a condition in which large amounts of drainage remain in the filter, mist separator, and tank, drainage may flow out the booster cause malfunction. Exhaust drainage from filters once a day to prevent such failure. For the auto-drain type, also check the operation once a day.

Pneumatic Circuit

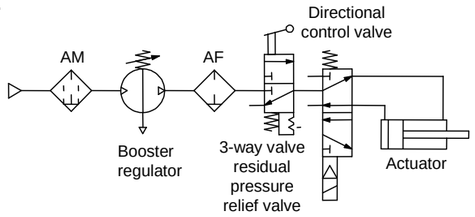
⚠WARNING

(1)**Against abnormal outlet pressure**

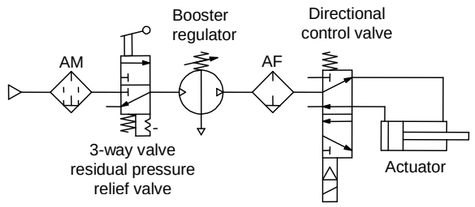
- When it is foreseen that an unexpected failure of the booster regulator world cause a significant damage to your system, please take appropriate safety measure in your system design.
- If the inlet pressure fluctuation is large, the outlet pressure maybe over the setting range of governor, and that will result in an unexpected accident. Take appropriate safety measures.

(2)**Dealing With Residual Pressure**

• To quickly exhaust residual pressure downstream of the booster regulator for maintenance, connect a 3-way valve to the OUT port of the booster regulator (see drawing below). Please note that the booster regulator downstream pressure cannot be exhausted through the booster even if the 3-way valve is installed in the IN port of the booster regulator.



• After exhausting the downstream piping, exhaust supply pressure at the booster regulator inlet side using the residual pressure relief valve upstream the booster regulator .This will stop unnecessary operation and prevent malfunction.



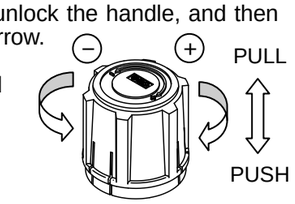
Pressure Control

(1)**Handle operation type**

• To increase the set the pressure by unlocking the handle slightly pulling it up, and, rotating it in the (+) direction of the arrow. To decrease the set pressure after the pressure has been set, unlock the handle, and then rotate the handle in the (-) direction of the arrow.

• The handle is locked when it is pushed down(PUSH), and released when it is pulled up (PULL).

• The residual air will be released from the area of the handle, due to the relief construction of the handle.

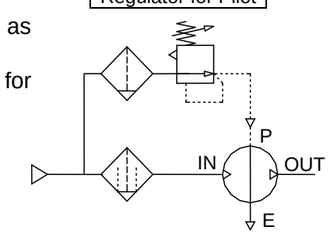


(2)**Air operated type**

• Connect a regulator to the pilot port as shown below.

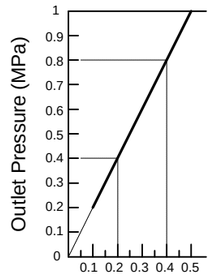
• AR20 and AW2000 are recommended for the pilot regulator.

Regulator for Pilot



• As shown in the drawing on the right, the outlet pressure is twice of pilot pressure at zero flow rate consumption.

• When booster supply pressure is 0.4MPa and pilot pressure is 0.2MPa to 0.4MPa the outlet pressure is 0.4MPa to 0.8MPa at zero flow rate.



Pilot pressure(MPa)
(Outlet flow rate:0L/min)

⚠WARNING

• Operate the booster regulator within its maximum operating pressure and set pressure range.

• Do not rotate the handle to a pressure exceeding the max. set pressure.

Model	VBA1□A	VBA2□A, 4□A	VBA43A
Maximum set pressure	2.0MPa	1.0MPa	1.6MPa

• Do not supply 0.5MPa or more of pilot pressure for VBA22A and VBA42A.When the inlet pressure becomes 0.5MPa or more, the outlet pressure will increase and finally exceed the operating pressure range.

• The lower limit of the set pressure should be the inlet pressure plus 0.1MPa or more. When the booster regulator is operated with the minimum operating pressure (0.1MPa) or less, the directional control valve may stop at the intermediate position.

⚠CAUTION

• The pressure of the handle is set to 0 before shipment. When the air is supplied, the pressure is relieved.

• It is not possible to reduce the pressure to the inlet pressure or less. This product does not have a pressure regulator function.

• There are upper and lower limits to the handle operation. If the handle is rotated too far, it will break.

Selection

• This product consumes air because it uses compressed air to boost the pressure. The air consumption is approx. 1.2 times (ratio of intensified pressure 2) and approx. 2.7 times (ratio of intensified pressure 4) as much as air consumed on the outlet side. Therefore, inlet air supply should be approx. 2.2 times (ratio of intensified pressure 2) as more than the air consumed on the outlet side. Inlet air supply should be approx. 3.7 times (ratio of intensified pressure 4).

• When running continuously for extended periods of time, confirm the life expectancy. The life expectancy of a booster regulator depends on the operational cycle. Thus the more frequently the actuator operates in the outlet side or the higher the pressure, the shorter the life expectancy will be.

● Check the following points in the event of product failure before returning to SMC to perform service investigation

Troubleshooting by end user

Trouble	Possible cause	Time of occurrence	Countermeasures
Leakage from the handle (Relief air does not stop.)	Inlet pressure is higher than the set pressure.	Initial phase Middle phase	Set the pressure to the inlet pressure or more with the handle. If the inlet pressure fluctuation is large, stabilize it with a regulator.
	Sealing failure of the governor due to foreign matter.	Initial phase Middle phase	Disassemble the governor and remove the foreign matter (Refer to the maintenance procedure).
Outlet pressure does not increase.	IN and OUT piping connected the wrong way round.	Initial phase	Reconnect the piping properly.
	Insufficient supply of Inlet pressure and flow rate. Outlet flow rate (amount used) is too much.	Initial phase Middle phase	(1)Decrease the operating pressure and flow rate. (2)Change the size of the booster valve (from VBA2 to VBA4). (3)Increase the number of the booster valve (use in parallel or in series).
	The silencer is clogged.	later	Replace the silencer.
	The handle is turning idly (handle breakage).	Initial phase	Remove the handle and rotate the square nut with a spanner wrench.
Does not operate.	The booster valve stopped because the pressure was lower than the minimum operating pressure. (Intermediate stop of the directional control valve)	Initial phase Middle phase	Relieve the supply pressure after the operation is stopped. If the inlet pressure fluctuation is large, stabilize it with a regulator.
	Operation is stopped due to intrusion of foreign matter. (Intermediate stop of the directional control valve due to increase in internal resistance.)	Initial phase Middle phase later	(1) Supply air and increase the exhaust pressure while holding the exhaust port with your finger. Then release your finger quickly. (2) Relieve the air from IN and OUT ports. After that, supply the air again and increase the pressure rapidly.
Operation does not stop. When there is no air consumption from the outlet port.	Air is leaking from the equipment or piping on the downstream side of the outlet.	Initial phase	Check where the air is leaking from and fix it.
	Sealing is worn out or broken due to intrusion of foreign matter or lubrication running out.	Middle phase later	Change the seals (Refer to the maintenance procedure).

(1) **The life of the booster regulator depends on the air quality and operating conditions. The following are signs that it is reaching the end of its life.**

• Even when the outlet flow rate is 0, the booster regulator doesn't stop. (When the interval of the exhaust noise is less than 30 seconds, the seals are being worn out or damaged.)

• Sliding noise (abnormal noise). (This indicates that lubrication is running out).

• The silencer mounted on the exhaust turns black due to dirt. (Seals are getting worn out, so particles get stuck in the silencer.)

(2) **Maintenance**

• Only personnel who are fully trained and experienced in pneumatically operated machinery and equipment should perform the maintenance in accordance with the maintenance manual.

• Refer to the maintenance manual for the replacement parts.

(3) **When making a request for maintenance to SMC**

• Remove accessories such as fittings mounted on the booster parts before returning to SMC.

• Non-consumables parts (example: body, tube, covers) which are worn out or damage cannot be replace as part of the maintenance request.

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