



ORIGINAL INSTRUCTIONS

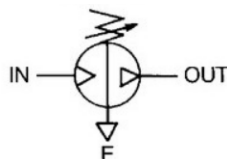
Instruction Manual

Booster Regulator
56 – VBA Series



Refer to Declaration of Conformity for relevant Directives

II 3 GD



56-VBA10A 56-VBA11A 56-VBA20A 56-VBA22A 56-VBA40A 56-VBA42A 56-VBA43A	EX h IIB T6 Gc	2°C ≤ Ta ≤ 50°C
	Ex h IIB T71°C Dc	

The intended use of this ATEX Category 3 Booster Regulator is to convert the potential energy provided by compressed air into a force which causes mechanical linear motion. The mechanical linear motion is then used to increase the pressure of the compressed air.

Certificate Number:	SMC. 19.0046 X
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Note 1: The X at the end of the certificate number represents that this product is subject to "Special Conditions of Use", please see Section 2.2.

ATEX Marking Description

- Ex Specific Marking for Explosion Protection
- II Equipment Group
- 3 Equipment Category
- GD Environment (Gas/Dust)
- Ex h General Protection Level Symbols
- IIB Gas Sub-division
- IIC Dust Sub-division
- T Temperature Classification
- Gc/Dc Equipment Protection Level
- Ta Ambient Temperature Range

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) ⁽¹⁾, and other safety regulations.

⁽¹⁾ ISO 4414: Pneumatic fluid power - General rules relating to systems.
ISO 4413: Hydraulic fluid power - General rules relating to systems.
IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots -Safety. etc.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

	Caution	CAUTION indicates a hazard with a low level of risk, which if not avoided, could result in minor or moderate injury.
	Warning	WARNING indicates a hazard with a medium level of risk, which if not avoided, could result in death or serious injury.
	Danger	DANGER indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.

1 Safety Instructions (continue)

Warning

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.
- Since the products specified here can be used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet specific requirements.
- Compressed air can be dangerous if an operator is unfamiliar with it. Trained and experienced personnel should perform assembly, handling or repair of pneumatic systems.
- Do not service machinery/equipment or attempt to remove components until safety is confirmed.
- Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
- When equipment is to be removed, confirm the safety process as mentioned above. Switch off air and electrical supplies and exhaust all residual compressed air in the system.
- Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Supply air into the system gradually to create back pressure, i.e. incorporate a soft-start valve).
- Do not use this product outside of the specifications. Contact SMC if it is to be used in any of the following conditions:
 - a) Conditions and environments beyond the given specifications, or if the product is to be used outdoors.
 - b) Installations in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, space, military or safety equipment.
 - c) An application, which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Caution

Quality of air source:

- Connect a mist separator to the inlet side near the booster regular. If the quality of the compressed air is not thoroughly controlled, the booster regulator could malfunction (without being able to boost) or its durability could be affected.
- If dry air (atmospheric pressure dew point: -23°C or less) is used the life expectancy maybe shortened because dry air will accelerate evaporation of grease inside.

2 Specifications

2.1 Specifications
56 - VBA Series Specifications

Model	Handle-operated				Air-operated		
	56-VBA10 A-02	56-VBA11 A-02	56-VBA20A -03	56-VBA40A -04	56-VBA43A -04	56-VBA22A -03	56-VBA42A -04
Fluid	Compressed air						
Max. Pressure ratio	2	2 to 4	2				
Max. Flow rate ^{NOTE1} L/min (ANR)	230	70	1000	1900	1600	1000	1900
Set pressure (MPa)	0.2 to 2.0		0.2 to 1.0		0.2 to 1.6		0.2 to 1.0
Supply pressure (MPa)	0.1 to 1.0						
Proof pressure (MPa)	3	1.5		2.4	1.5		
Port size (IN, OUT, EXH), (Rc)	1/4	3/8	1/2		3/8	1/2	
Pressure gauge port size (IN, OUT), (Rc)	1/8						
Pilot port size (Rc)	----					1/8	
Pilot pressure (MPa)	----						0.1 to 0.5
Ambient & Fluid temp. (°C)	2 to 50 (No freezing)						
Installation	Horizontal						
Lubrication	Grease (Non-lube)						
Weight (kg)	0.84	0.89	3.9	8.6		3.9	8.6

2 Specifications (continue)

Note 1: If the OUT pressure is higher than the set handle, excessive pressure is exhausted from the back of the handle. Flow rate at IN = OUT = 0.5MPa. The pressure varies depending on the operating conditions.

Note 2: 56-VBA10A/11A/20A/40A/43A Handle-operated with relief mechanism.

2.1 Production Batch Code

The production batch code printed on the label indicates the month and year of production as per the following table.

Year	2007	2008	2009	...	2021	2022	2023	...
Month	L	M	N	...	Z	A	B	...
Jan	o	Lo	Mo	No	...	Zo	Ao	Bo
Feb	P	LP	MP	NP	...	ZP	AP	BP
Mar	Q	LQ	MQ	NQ	...	ZQ	AQ	BQ
Apr	R	LR	MR	NR	...	ZR	AR	BR
May	S	LS	MS	NS	...	ZS	AS	BS
Jun	T	LT	MT	NT	...	ZT	AT	BT
Jul	U	LU	MU	NU	...	ZU	AU	BU
Aug	V	LV	MV	NV	...	ZV	AV	BV
Sep	W	LW	MW	NW	...	ZW	AW	BW
Oct	X	LX	MX	NX	...	ZX	AX	BX
Nov	y	Ly	My	Ny	...	Zy	Ay	By
Dec	Z	LZ	MZ	NZ	...	ZZ	AZ	BZ

2.2 Special Conditions of Use

- **CLEAN ONLY WITH DAMP CLOTH!**
- **AVOID HITTING THE PRODUCT WITH METALLIC OBJECTS!**
- **TURN OFF COMPRESSED AIR WHEN PERFORMING MAINTENANCE!**

3 Installation

3.1 Installation

Warning

- **Do not install the product unless the safety instructions have been read and understood.**
- 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.
- Install this product so that the tie rods/ cover are horizontal.
- Considering the transmission of piston cycle vibration, for mounting use retaining bolts (56-VBA1*A: M5, 56-VBA2*A/4*A: M10) and tighten them to the specified torque (56-VBA1*A: 3Nm, 56-VBA2*A/4*A:24Nm).
- If it is necessary to prevent the transmission vibration, place an isolating rubber material in between the product and the mounting surface.

3.2 Operating Environment

Warning

- **Do not use in the following environments, as this can cause failure.**
 - a) Locations with an atmosphere of corrosive gases, organic solvents or chemical solutions, and where there may be contact with the same.
 - b) Locations where there is contact with sea spray, water or steam.
 - c) Locations where ultraviolet deterioration or overheating of resin may occur due to direct sunlight.
 - d) Locations near heat sources with poor ventilation (heat sources should be shielded by heat insulating material).
 - e) Locations with impact or vibration.
 - f) Locations with excessive moisture and dust.
- Do not use the product submersed in water (liquid). Otherwise, liquid will enter the openings inside the product resulting in malfunction.

3.3 Piping

Caution

- **Flushing**
Use an air blower to thoroughly flush the piping or wash the piping thoroughly remove any cutting chips, cutting oil or debris from the

3 Installation (continue)

piping inside, before connecting them. If they enter the inside of the booster valve to malfunction or its durability could be affected.

- **Piping size**
Use the IN, OUT port size of the booster regulator as a reference for air piping size. Product performance will be affected if smaller pipes are used for laying of the product pipeline, especially for the upstream pipeline.
- **Tightening torque**
When preparing piping for booster regulator, always fasten the threads with correct tightening torque as shown in the below table:

Threads	Tightening torque Nm
1/8	7 ~ 9
1/4	12 ~ 14
3/8	22 ~ 24
1/2	28 ~ 30

3.4 Lubrication

Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, refer to catalogue for details.

3.5 Design Precaution

Warning

- **Against abnormal outlet pressure**
 - a) When it is foreseen that an unexpected failure of the booster regulator would cause a significant damage to your system, please take appropriate safety measure in your system design.
 - b) 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.
 - c) Operate the equipment within its maximum operating pressure and set pressure range.

- **Dealing with residual pressure**

- a) 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 (Fig.2).

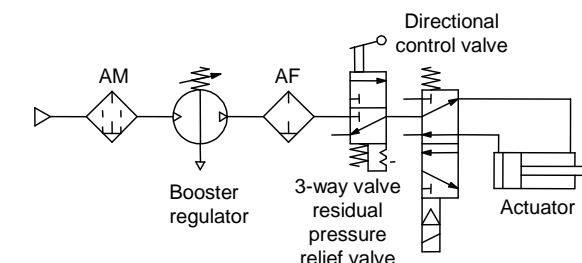


Fig.2 Circuit example (1)

- b) Please note that the booster regulator downstream pressure cannot be exhausted through the booster even if the check valve is installed in the IN port of the booster regulator.
- c) After exhausting the downstream piping, exhaust supply pressure at the booster regulator inlet side using the residual pressure relief valve upstream the booster regulator (see Fig.3). This will stop unnecessary operation and prevent malfunction

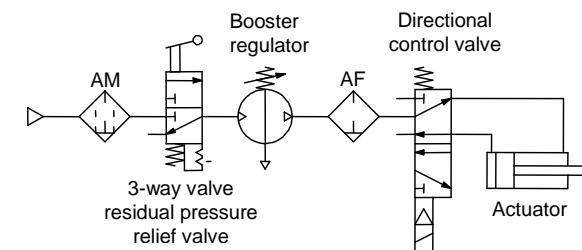


Fig.3 Circuit example (2)

3 Installation (continue)**Caution****• System configuration**

- 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.
- 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.
- If necessary, connect air lubricator only at booster regulator outlet. Accumulation of oil in the booster regulator may cause malfunction.

• 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.
- Install a silencer or exhaust cleaner at the exhaust port of the booster regulator to reduce noise, if necessary.

• Maintenance space

Ensure there is enough space around the product for maintenance.

4 Settings**Warning****• Pressure setting**

- Do not rotate the governor handle (56-VBA10A, 11A, 20A, 40A, 43A) or supply pilot pressure (56-VBA22A, 42A) more than the set pressure. When the upstream pressure increases, the downstream pressure also increases, and it may exceed the maximum set pressure.
- Secondary pressure should be set higher than the primary pressure by 0.1MPa or more. If differential pressure is less than 0.1MPa, operation may be unstable and cause failure.

• Pressure setting for handle-operated type (56-VBA10A, 11A, 20A, 40A, 43A)

- To increase the set pressure by unlocking the handle slightly pulling it up, and, rotating it in the (+) direction of the arrow (see Fig.4).

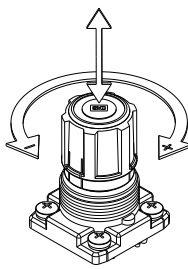


Fig.4 Governor handle

- There is an upper and lower limit for the handle rotation. If over-rotating the handle even after reaching the upper limit, the internal parts may be damaged. If the handle suddenly feels heavy while being turned stop turning the handle.
- Once the setting is complete push the handle down to lock the handle.
- 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 (see Fig.4). The residual air will be released from the area of the handle, due to the relief construction of the governor.
- To reset the pressure to a lower valve first reduce the pressure so that it is lower than the desired pressure; then increase it to the desired set pressure.

• Pressure setting for air-operated type (56-VBA22A, 42A)

- Connect the downstream piping of a pilot regulator for remote control to the pilot port.
- Refer to Fig.5 for the relation between pilot pressure and downstream pressure.

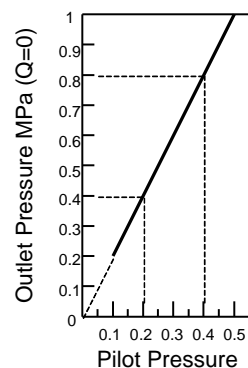
4 Settings (continue)

Fig.5 Performance characteristics

- AR20 and AW20 are recommended for the pilot regulator.
- Downstream 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.

Caution**• Drainage Exhaust**

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.

• Air Exhaust

When the booster regulator is switching between 'Idle' and 'Pressurized' state, the exhaust air may take a long period of time to exhaust (Note: This is normal).

5 How to Order

Refer to the product catalogue for "How to Order".

6 Outline Dimensions (mm)

Refer to the product drawings or catalogues for outline dimensions.

7 Maintenance**7.1 General Maintenance****Warning**

- If handled improperly, compressed air can be dangerous. Only qualified personnel should perform maintenance of pneumatic systems.
- Before performing maintenance, ensure the supply pressure is shut off and all residual air pressure is released from the system.

Caution

- Perform maintenance in accordance with the procedures in the maintenance manual specific to each 'VBA' model. If handled improperly, this can cause damage or malfunction in machines and equipment, etc. (Contact SMC for the specific maintenance manual).**

- After maintenance apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, verify product set-up parameters.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by the maintenance manual.
- Do not step on or place heavy objects on the unit.** The equipment may be deformed or damaged.
- Perform demounting of the product in accordance with the procedures below.**

- Shut off the air supply and release the air pressure in the system.
- In the case of the automatically operated type, shut off the air supply and exhaust the compressed air in the pilot piping.
- Demount the product.

7 Maintenance (continue)

- Life expectancy varies depending on the quality of air and operating conditions. As a symptom of the end of life expectancy, it can be found breathing all the time beneath the handle or hearing the exhausting sound from booster regulator in 10 to 20 second intervals despite no air consumption in the outlet side. Conduct maintenance earlier than scheduled in such cases.

7.2 Maintenance Spare Parts List**56-VBA Series spare part list**

Model	Maintenance kit part number	Contents
56-VBA10A	KT-VBA10A-1	Maintenance parts set
	KT-VBA10A-4	Seal set
56-VBA11A	KT-VBA11A-20	Maintenance parts set
	KT-VBA11A-4	Seal set
56-VBA20A	KT-VBA20A-1	Maintenance parts set
	KT-VBA20A-4	Seal set
56-VBA22A	KT-VBA22A-1	Maintenance parts set
	KT-VBA22A-4	Seal set
56-VBA40A	KT-VBA40A-1	Maintenance parts set
	KT-VBA40A-4	Seal set
56-VBA42A	KT-VBA42A-1	Maintenance parts set
	KT-VBA42A-4	Seal set
56-VBA43A	KT-VBA43A-1	Maintenance parts set
	KT-VBA43A-4	Seal set

8 Limitations of Use**8.1 Limited warranty and Disclaimer/Compliance Requirements**

Refer to Handling Precautions for SMC Products located on www.smcworld.com.

Caution**8.2 Obligations of the end-user**

- Ensure the product is used within the specification outlined.
- Ensure that the maintenance periods are suitable for the application.
- Ensure any cleaning processes to remove dust layers are made with the atmosphere in mind (e.g. using a damp cloth to avoid static build up).
- Ensure that the application does not introduce additional hazards by mounting, loading, impacts or other methods.
- Ensure that there is sufficient ventilation and air circulation around the product.
- If the product is subject to direct heat sources in the application, they should be shielded so that the pump temperature stays within the stated operating range.

Caution

- SMC products are not intended for use as instruments for legal metrology.**

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Danger

- Do not exceed any of the specifications listed in Section 2 of this document as this will be deemed improper use.
- Air equipment has an air leakage during operation within certain limits. Do not use this equipment when the air itself introduces additional hazards and could lead to an explosion.
- Do not use this product in the presence of strong magnetic fields that could generate a surface temperature higher than the product specification.

9 Contacts

Refer to Declaration of Conformity and www.smcworld.com for contacts.

SMC Corporation

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