Doc. no. DOC1058584

Operation Manual

PRODUCT NAME

Compact Vacuum Ejector

MODEL / Series / Product Number

ZA Series

SMC Corporation

Contents

Doc. no. DOC1058584

Compact Vacuum Ejector /ZA Series
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 and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1:Robots
etc.

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

⚠ Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

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Compact Vacuum Ejector /ZA Series
Safety Instructions

⚠ Caution

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing business.
Use in non-manufacturing business is not covered.
Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.
The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.
Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

■Safety Instructions

⚠ Warning	
 Disassembly prohibited	■Do not conduct disassembly, modification (including the replacement of board), or repair that is not instructed in this manual. Otherwise, an injury or failure can occur.
 Do not	■Do not operate the product outside of the specifications. Do not use for flammable or harmful fluids. Fire, malfunction, or damage to the product can result. Verify the specifications before use.
 Do not	■Do not operate in an atmosphere containing flammable or explosive gases. Fire or an explosion can result. This product is not designed to be explosion proof.
 Do not	■Do not use the product in a place where static electricity is a problem. Otherwise it can cause failure or malfunction of the system.
 Do not	■Do not cut off the power and compressed air supplied to this product while it is operating. Otherwise, it can cause injury due to dropping of workpieces or damage to the system.
 Instruction	If using the product in an interlocking circuit. -Provide a double interlocking system, for example a mechanical system -Check the product regularly for proper operation Otherwise malfunction can result, causing an accident.
 Instruction	■The following instructions must be followed during maintenance. -Turn off the power supply -Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance. Otherwise an injury can result.
 Do not touch	■Do not touch the terminals and connectors while the power is on. Otherwise electric shock, malfunction or damage to the product can result.
 Instruction	Perform sufficient trial run. Otherwise, injury or damage to the system can result due to suction failure depending on the conditions of the suction of the workpiece or the pressure switch settings. Perform sufficient verification before using this product.
 Instruction	■After maintenance is complete, perform appropriate functional inspections and leak test. Stop operation if the equipment does not function properly or there is leakage of fluid. If there is leakage from parts other than the piping, the product might be broken. Cut off power supply and stop supplying fluid. Do not supply fluid if there is leakage. Safety cannot be assured in the case of unexpected malfunction.

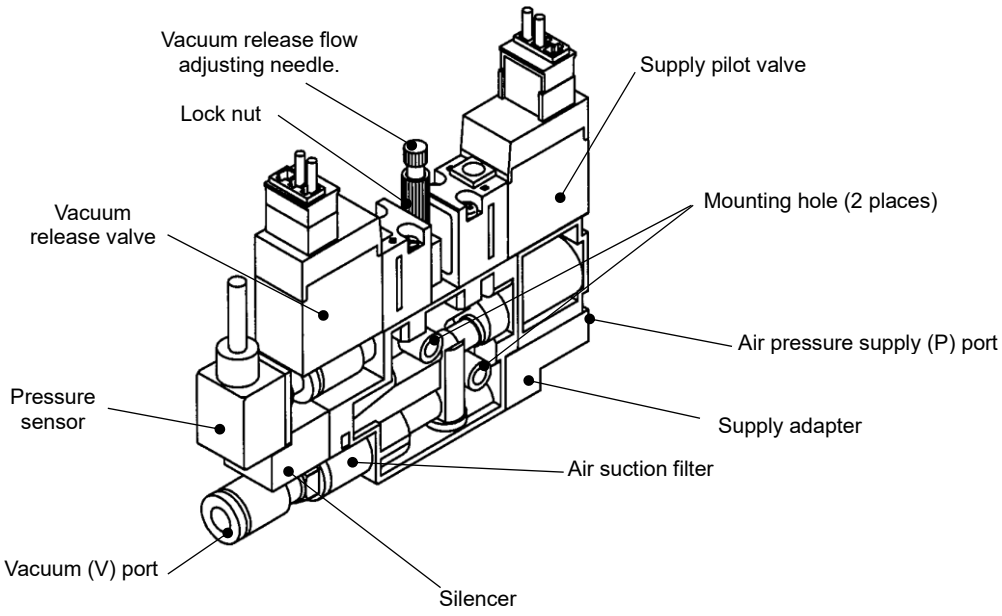
1. Specifications

Refer to the catalog for product specifications.

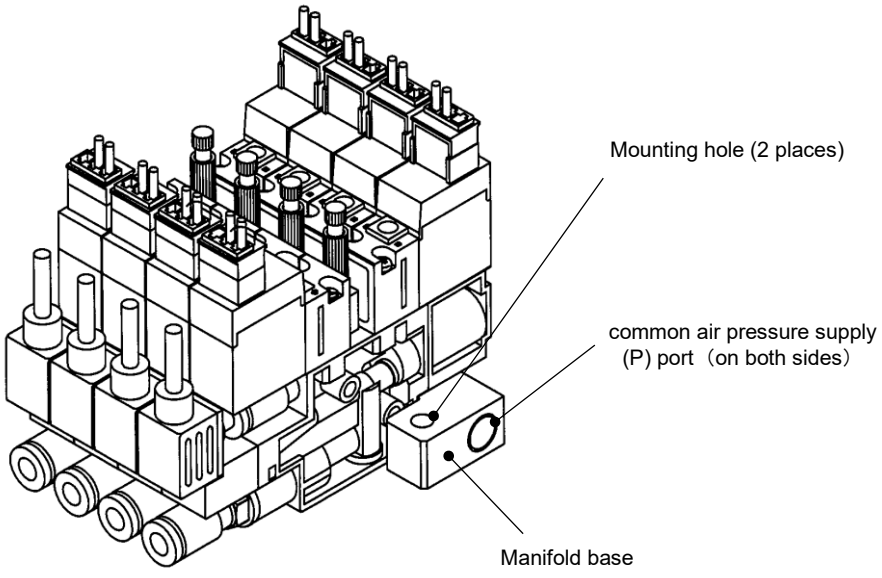
2. Names of Product Components

2.1 Names of Product Components

Single unit



Manifold product



3. Mounting and Installation

3.1 Mounting

3.1.1 Single unit

1) Directly mount the product on the wall surface, etc. by using the mounting holes (2 x ϕ 2.7) in the side of the body.

2) Use the recommended tightening torque (0.54 to 0.66 Nm) to mount the product.

3.1.2 Manifold product

1) Directly mount the manifold product on the floor surface, etc. by using the mounting holes (2x ϕ 3.2) in the manifold base.

2) Use the recommended tightening torque (0.54 to 0.66 Nm) to mount the product.

3.1.3 Precautions

1) When mounting the product, ensure there is sufficient space for maintenance and inspection.

2) Tightening to a tightening torque exceeding the recommended tightening torque range may cause the product and mounting screws to be broken. Insufficient torque can cause displacement of the body from its proper position as well as as looseness of the mounting screws.

3) Do not drop or hit the product, or apply an excessive shock to the product. The exterior and internal parts of the product, supply pilot valve, release valve, and pressure sensor may be broken, causing the product to malfunction.

3.2 Environment

1) Do not use the product in an atmosphere where corrosive gases, chemicals, sea water, water, or steam is present and may adhere to the product. These may cause failure or malfunction.
2) Do not use the product in an environment where the product could be splashed by oil or chemicals. If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, the pressure switch may be adversely affected (damage, malfunction, or hardening of the lead wires).
3) The suction filter used in this product is a simple one. When used in a dusty or dirty environment, the filter will quickly clog. If this is the case, consider using the ZFC series or other air suction filter along with it.
4) Do not use the product in an area with a surge source present. When there are machines or equipment that generate large surge near the pressure switch (magnetic type lifter, high frequency inductive furnace, motor, etc.), this can result in deterioration and damage of the internal elements. Take measures against the surge sources, and prevent the lines from coming into close contact.
5) Do not use a load that generates a surge. When a surge-generating load such as a relay or solenoid is directly driven, use the product with built in surge protection.
6) The product is CE/UKCA marked, but not immune to lightning surges. Therefore, take measures against lightning surges.
7) Do not install this product at a location subject to vibration and impact. Otherwise damage or malfunction can occur.
8) Do not let foreign matter, such as wire debris, get inside the product because they may cause a failure or malfunction.
9) Do not use the product in an environment exposed to temperature cycles. Heat cycles other than ordinary changes in temperature can adversely affect the product.
10) Do not use the product at a location subject to direct sunlight. If the product is exposed to direct sunlight, shade the product from sunlight. Otherwise it can cause damage or malfunction.
11) Observe the operating fluid temperature and ambient temperature ranges during use of this product. Operating the product at low temperatures may lead to damage or malfunction due to frozen moisture in the air. Protection against freezing is necessary. Installation of an air dryer is recommended for elimination of drainage and water. Avoid abrupt temperature changes even within the specified temperature range.
12) Do not use the product at a location where it is exposed to radiant heat from surrounding heat sources. Otherwise, malfunction can occur.

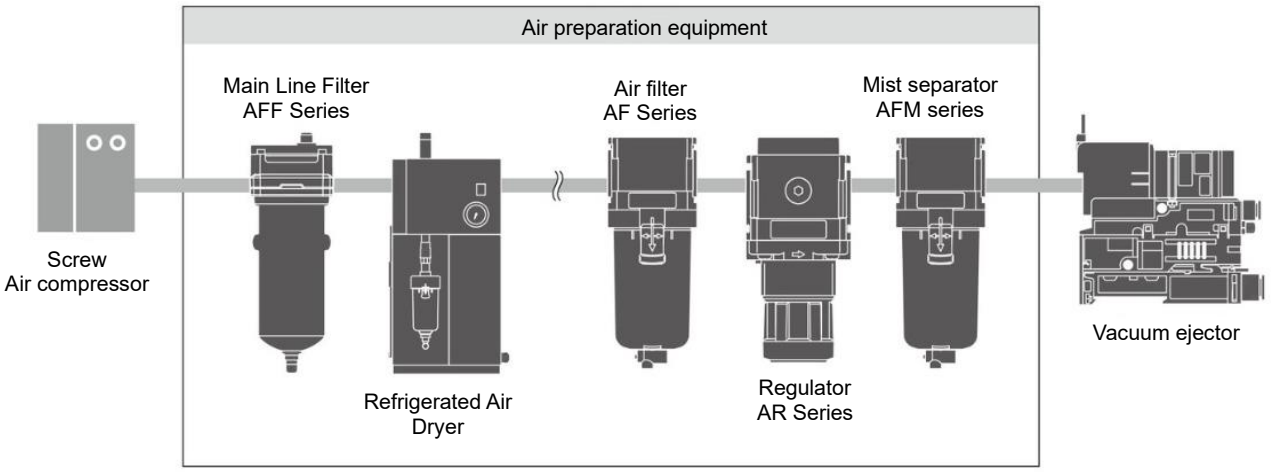
3.3 Air Supply

3.3.1 Air quality

1) Use of compressed air that contains chemical, synthetic oil containing organic solvent, salt, corrosive gas, or the like can cause breakage or malfunction of the product. Do not use compressed air that contains harmful impurities.

2) If the compressed air in use contains a large amount of drainage or carbon powder, it can adhere to the inside of the vacuum generating part (nozzle, diffuser) of the ejector, solenoid valve, or pressure switch for vacuum, and may cause performance degradation or malfunction.

3) As the quality of supply air, the compressed air purity class "2:6:3" in accordance with ISO8573-1: 2010(JIS B 8392-1: 2012) is recommended. Supply air containing foreign matter, water, oil or condensate,etc. can cause malfunction of supply valve or release valve. Install an air filter or mist separator to the upper stream to prevent condensate from entering to the product and perform maintenance periodically to control the supply air properly.



※ISO8573-1: 2010(JIS B8392-1: 2012) compressed air purity class

2 : 6 : 3

● Solid particles

Class	Maximum particle count per m^3 for particle diameter d(μm)		
	0.1 < d ≦ 0.5	0.5 < d ≦ 1.0	1.0 < d ≦ 5.0
1	≦ 20,000	≦ 400	≦ 10
2	≦ 400,000	≦ 6,000	≦ 100
3	Not specified	≦ 90,000	≦ 1,000
4	Not specified	Not specified	≦ 10,000
5	Not specified	Not specified	≦ 100,000

●Moisture

Class	Pressure dew point(℃)
1	≦ -70
2	≦ -40
3	≦ -20
4	≦ +3
5	≦ +7
6	≦ +10

●Oil content

Class	Oil concentration (mg/m^3)
1	≦ 0.01
2	≦ 0.1
3	≦ 1
4	≦ 5

3.3.2 Air pressure

1) If the product is used with an operating pressure exceeding the maximum operating pressure, the product may be broken.

3.4. Piping

3.4.1 Port sizes

The port sizes and operating pressure ranges are listed below.

Note that in the manifold specifications, the ports are common ports of the manifold base. When supplying from one side, plug the port not in use.

Port sizes and supply pressure range

Port name	Application	Port size and applicable tube O.D.[mm]	Operating pressure range
Air pressure supply(P)port	Compressed air supply for operating ejector	Single unit type：M3、Φ4 Manifold type：M5、Φ4、Φ6	0.2 to 0.5[MPa]
Vacuum (V)port	Connection of suction equipment including pad	Φ3.2、Φ4	-

3.4.2 Piping to ports

1) When piping fittings are connected to the air pressure supply (P) port (M3) for the single unit type, secure the supply adapter by tightening it by hand, and using a tool to tighten a further quarter of a turn. (Recommended tightening torque: 0.4 to 0.5 Nm).
2) When piping fittings are connected to the air pressure supply (P) port (M5) for the manifold type, secure the manifold base by tightening it by hand and using a tool to further tighten one sixth of a turn.（Recommended tightening torque: 1.0 to 1.5Nm）.
3) Arrange the piping to prevent twisting force, tension, moment loads, vibration, or impact from being applied to the product body and connected piping parts.

3.4.3 Piping with one-touch fittings

■Tube attachment

1) Take a tube having no flaws on its periphery and cut it off at a right angle. When cutting the tube, use tube cutters. If the tube is cut by any tools other than a tube cutter, the cut surface of the tube will be slanted or flat, making it difficult to connect securely, causing the tube to come off or air leakage after the tube is connected. Also, allow a sufficient margin of tube length.
2) Grasp the tube and push it in slowly, inserting it all the way to the back.
3) After inserting the tubing all the way to the back, pull it gently to confirm it is secure. If the tubing is not inserted all the way, air leakage or disconnection can occur.
4) Do not use the product in such a manner that may cause connected tube to be swung or rotated. The fitting may be damaged.

■ Removal of the tube

1) Press the release button evenly and firmly.
2) Pull out the tubing while keeping the release button pressed. If the release button is not held down with a sufficient force, the tubing cannot be removed.
3) If the removed tubing is to be reused, cut off the used section of the tubing. Reusing the squeezed portion of the tube can cause problems such as air leakage or difficulty in removing the tube.

■ Other manufacturer's tube

When using a brand of tube other than SMC, confirm that the following specifications are satisfied with respect to the tube outside diameter tolerance.

1) Nylon tube Within ±0.1 ㎜
2) Soft Nylon tube Within ±0.1 ㎜
3) Soft polyurethane tube Within ±0.15 mm or −0.2 mm

Do not use tubing that does not meet these outside diameter tolerances. Otherwise, connection to the fitting may fail, air leakage can happen, or the tube may become disconnected from the fitting during use.

3.4.4 Precautions for air tubes

1) Route tubes to prevent twisting, tension, moment loads, vibration or impact from being applied to the tubes. Failure to follow this instruction may cause damage to the fittings, crushing or bursting of the tubing, or disconnection of the tubing during use.
2) Piping to the product is assumed to be static piping. If the tube moves, it may become worn due to sliding, elongate due to tensile forces, torn, or disconnected from the fitting. Make sure that the tube is in a static condition at all times before using.
3) Do not lift the product by holding the tube after piping. This may lead to damage of the filter case or one-touch fitting.
4) Before piping, perform air blow (flushing) or cleaning to remove any cutting chips, cutting oil, dust, etc. from the piping Otherwise damage or malfunction can occur.
5) When connecting tubing, consider factors such as changes in the tubing length due to pressure, and leave enough slack. Failure to do so may result in fitting breakage or detachment of the tubing.
   Refer to Fittings & Tubing Precautions from 1 to 4 shown in Best Pneumatics 6 on SMC's website （URL http://www.smcworld.com） for the recommended piping conditions.

3.5 Wiring

1) Do not strongly pull the lead wires for the supply pilot valve, release valve, and pressure sensor, and do not lift the body by pulling the lead wire. The interior of the supply pilot valve, release valve and pressure sensor may be broken, causing the product to malfunction or come off from the connectors.

2) Avoid repeatedly bending or stretching the lead wires, or placing a heavy load on or applying a force to them. Repetitive bending stress or tensile stress applied to the lead wire can cause the sheath of the wire to come off.
   If the lead wire can move, fix it near the body of the product.
   The recommended bend radius of the lead wire is 6 times the outside diameter of the sheath, or 33 times the outside diameter of the insulator, whichever is larger.
   Replace the damaged lead wire with a new one.

3) Wire correctly. Depending on the details of wrong wiring, the supply pilot valve, release valve, and pressure sensor may malfunction and may be broken.

4) Do not perform wiring while the product is energized. The interior of the supply pilot valve, release valve, and pressure sensor may be broken, causing the product to malfunction.

5) Do not route wires and cables together with power or high voltage cables. Route the wires of the supply pilot valve, release valve, and pressure sensor separately from the power or high voltage lines in order to prevent noise or surge from entering the signal line.

6) Check the insulation performance of the wiring. If there is any poor insulation (interference with other circuits, poor insulation between terminals, etc.), an excessive voltage or current may apply to the supply pilot valve, release valve, and pressure sensor, possibly leading to breakage.

7) Make sure that reverse current does not flow in when the circuit is opened or the product is forced to operate for operational checks. Depending on the circuit in use, insulation may not be maintained, allowing reverse current to flow, which can cause the supply pilot valve, release valve, and pressure sensor to malfunction or to be broken.

8) Keep wiring as short as possible to prevent interference by electromagnetic noise and surge voltage. Do not use a cable longer than 10 m. Wire the DC (-) line as close as possible to the power supply.

4. How to Order

Refer to the catalog of this product.

5. Dimensions

Refer to the catalog of this product.

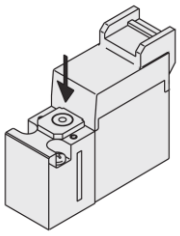
6.Supply Pilot Valve and Release Valve

6.1 Manual override

It is possible to generate vacuum and release vacuum by manual operation. Before performing manual operation, confirm that the safety is ensured even when the product is operated.
Manual operation can be performed by following the steps shown below.

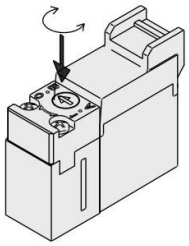
For N.C. type supply pilot valve and release valve

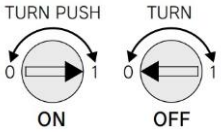
■Non-locking push type（Tool required）



Pressing this button in the direction indicated by the arrow until it stops turns it ON and releasing the button turns it OFF.

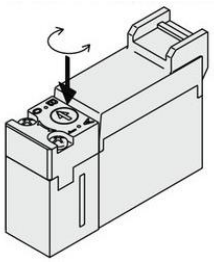
■Locking type（Tool required）

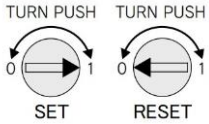




Turning the manual switch clockwise to set to the "1" position and push the switch locks it in an ON state.
Turning the manual switch counterclockwise to set to the "0" position releases the lock and returns the manual switch to the original position.

For latching type supply pilot valve

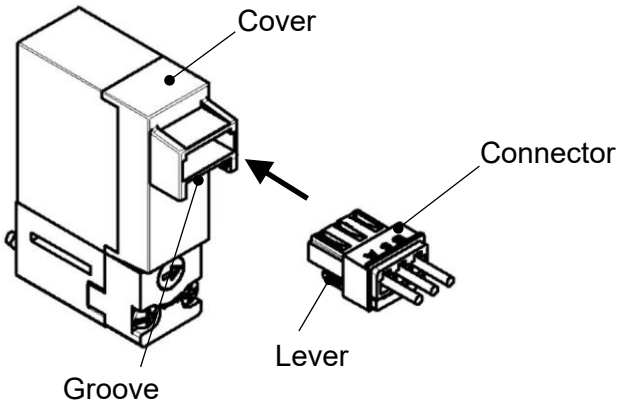




Turning the manual switch clockwise to set to the "1" position and push the switch locks it in an vacuum generation state.
Turn the manual switch counterclockwise to the "0" position to stop the vacuum generation.

6.2 Connecting/Disconnecting the Connector

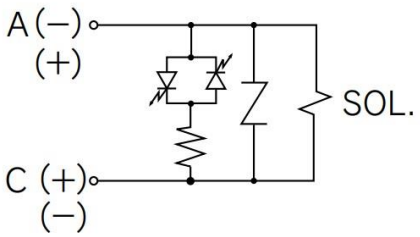
To install the connector, while supporting the solenoid valve, insert the connector straight while holding down the connector lever with your fingers. Ensure that the connector lever clip is properly inserted into the groove of the cover. To remove the connector, hold the solenoid valve and pull out the connector straight pushing the connector lever clip.



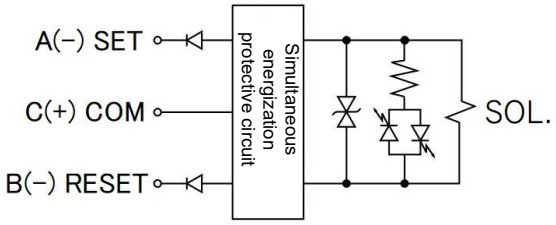
6.3 Internal circuit

Light/surge voltage suppressor circuit is equipped. While the solenoid valve installed in the product has no polarity, only the latching type (supply pilot valve) is + common or − common type.

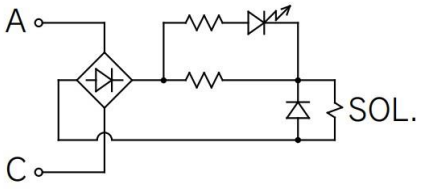
Single solenoid type（DC）



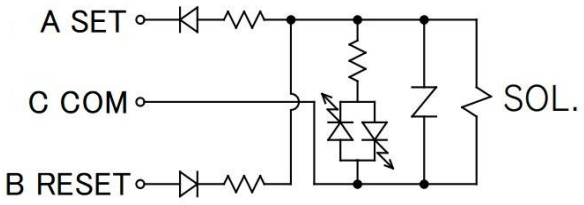
Latching solenoid type (DC)
(+ common)



Single solenoid type（AC）



Latching solenoid type（AC）



6.4 Initial state

When the valve assembly is delivered, the supply valve is on the OFF position, but it may be on the ON position due to the vibration or impact during transportation or device installation. Move supply valve to OFF position manually or energizing before use.

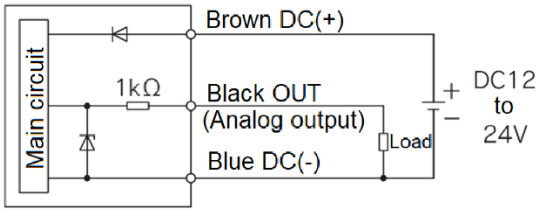
6.5. Precautions

1) Use the product at the specified voltage. Otherwise, failure, malfunction or short life can result.
2) If a valve is energized for an extended period of time without a break, the rise in temperature due to heating of the coil may cause the solenoid valve performance to decline, reduce the service life, or have adverse effects on peripheral devices. The energized time in one day should be shorter than the non-energized time.
3) The supply pilot valve and release valve mounted on this product are VQ100 series. Refer to the operation manual for the VQ100 Series for details.

7.Pressure Sensor

7.1 Internal circuit and wiring example

PES54□
Voltage output type:1～5V
Output impedance
Approx. 1 kΩ



*For details, refer to the operation manual for PSE54□ Series.

7.2. Precautions

1) If a commercially available switching power supply is used, be sure to install the frame ground (FG) terminal.
2) Do not forcefully pull the lead wire, or lift the product by holding the lead wire (tensile strength: 50 N or below). The pressure sensor may be broken, leading to failure and malfunction.
3) Do not repeatedly bend or stretch the lead wires, or place a heavy load or apply force to them.
   Wiring subject to repetitive bending stress or tensile stress can cause the sheath of the wire to come off.
   If the lead wire can move, fix it near the pressure sensor.
4) Use the pressure sensor at the specified voltage. Otherwise failure, malfunction or short life can result.
5) Connect a load before turning the power supply on. Turning on the pressure sensor with no pressure sensor load connected may cause an excessive current to flow, possibly breaking the pressure sensor.
6) Do not short-circuit the load. The pressure sensor may be damaged.
7) When using the pressure sensor to detect very small pressure differences, warm it up for 20 to 30 minutes first. For 10 minutes after turning on of power supply, the analog voltage may fluctuate by 1%.

8. Vacuum Release Flow Adjusting Needle.

8.1. Vacuum release flow adjusting method

Vacuum release air is output by turning the release valve ON. The flow rate of vacuum release air can be adjusted by adjusting the vacuum release flow adjusting needle.
Loosen the lock nut and adjust the vacuum release flow adjusting needle using a flat blade screwdriver. Turning the vacuum release flow adjusting needle clockwise decreases the vacuum release flow rate, while turning it counterclockwise increases the vacuum release flow rate.
Tighten the lock nut after finishing the adjustment of the vacuum release flow adjusting needle and fix the adjusted position.

8.2. Precautions

1) The leakage cannot be completely eliminated when the needle is fully closed. A certain amount of leakage is allowed for in the product specifications. Tightening the needle to achieve zero leakage may result in equipment damage.
2) The vacuum release flow adjusting needle has a retaining mechanism. Therefore, it will not turn further when it reaches the rotation stop position. The needle may break if it is rotated more than 12 revolutions.
3) When tightening the lock nut, tighten it by approximately 15 to 30 degrees after manually tightening it. Pay attention not to cause breakage due to over tightening.

9.Construction and Replacement Parts

Refer to the catalog of this product.

10.Maintenance and Checks

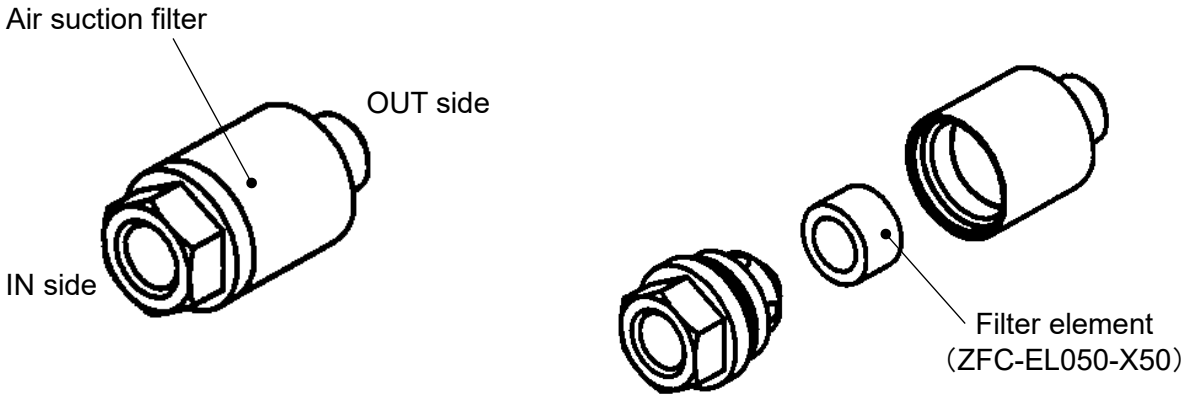
Implement the maintenance and checks shown below to use the small-size vacuum ejector safely and appropriately for a long period of time.

10.1 How to replace the filter element

1) Use a spanner on the hexagonal surface (width across flats: 7 mm) located on the IN side of the suction filter to remove the suction filter from the product.
2) Use a spanner on the hexagonal surface located on the IN side of the suction filter and a hexagon wrench on the hexagon socket (width across flats: 2 mm) located inside on the OUT side, disassemble the suction filter and replace the filter element (ZFC-EL050-X50).
3) Using the spanner and the hexagon wrench, which were used at the time of disassembly, to assemble the suction filter.

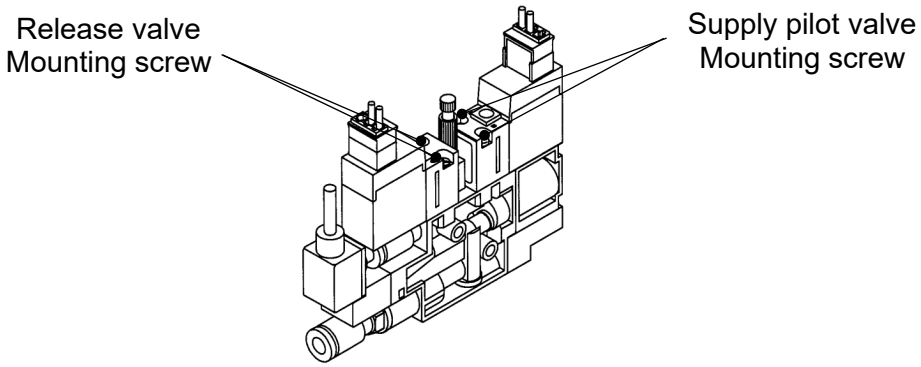
   (Recommended tightening torque: 0.5 to 0.7 Nm)
4) Use a spanner on the hexagonal surface located on the IN side of the suction filter to attach the suction filter to the product.

   (Recommended tightening torque: 0.5 to 0.1 Nm)



10.2 How to replace the supply pilot valve and release valve

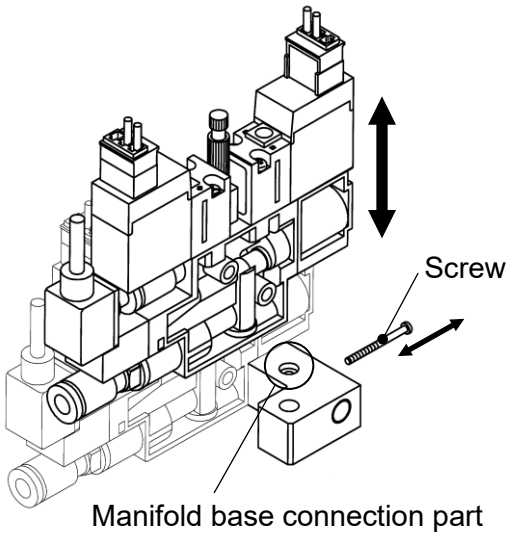
1) By loosening the two mounting screws, remove the supply pilot valve or release valve.
2) Replace the supply pilot valve or release valve and assemble it by using the two mounting screws.
   (Recommended tightening torque: 0.11 to 0.13 Nm)

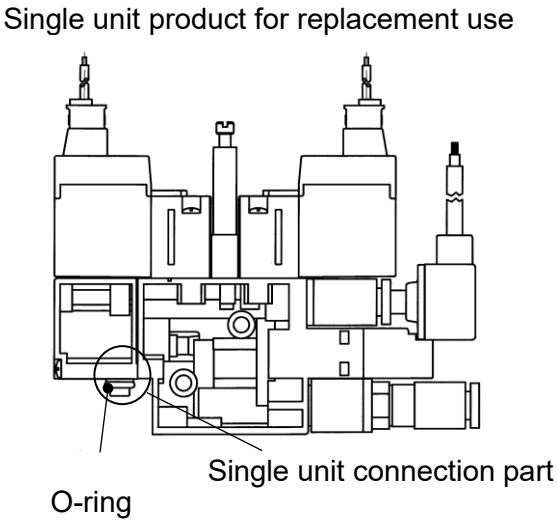


10.3 How to replace single unit of manifold type

1) Loosen the screws that assemble the single unit to the manifold base, and remove the unit to be replaced.
2) Insert the connection part of a new single unit to the connection part of the manifold base while paying attention to the location of the O-ring.
3) By using the screws that assembled the single unit to the manifold base, secure the single unit.
   （Recommended tightening torque: 0.16 to 0.20 Nm）

The screws to secure the single unit to the manifold base and the O-ring at the connection part can be ordered by the item code ZA1-OP-1 (set containing 10 pieces each).





10.4. Precautions

1) Conduct maintenance according to the procedure indicated in the operation manual. If handled improperly, malfunction and damage of machinery or equipment may occur.
2) Compressed air can be dangerous when it is handled incorrectly. Protection of the product as well as element replacement and other maintenance tasks should be performed by a person with good knowledge and experience with pneumatic devices.
3) Remove drainage from air filters and mist separator periodically. If the collected drainage is drained to the downstream side, it can stick inside of the product, causing operation failure and failure to reach the specified vacuum pressure. If the draining management is difficult, use of a filter with auto drain is recommended.
4) Periodically replace the filter element incorporated in the ejector. It is recommended to replace the filter element when the pressure drops by 5 kPa as a guide although the replacement cycle varies depending on the operating conditions, atmosphere in the operating environment, and supply air quality. However, if there is a vacuum pressure drop and/or delay in the vacuum (suction) response time which poses a problem with the settings during operation, stop the operation of the product and replace the filter element regardless of the above-mentioned replacement guideline.
5) When dismounting the product, turn off the power supply and the supply pressure, discharge the compressed air from the piping, and check the condition of air release to atmosphere before starting the work. When mounting the product after conducting various maintenance works, supply compressed air and power supply, and conduct appropriate function checks and leakage inspection.
6) Do not disassemble or modify the components other than the components subject to maintenance specified in this manual.
7) Do not use solvents such as benzene, thinner, etc. to clean the product. Doing so can damage the surface of the body and erase the markings on the product. Use a soft cloth to remove stains. For heavy stains, use a damp cloth that has been soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

11.Handling Precautions

11.1. Exhaust from the Ejector

The exhaust resistance should be as small as possible to obtain the full performance of the vacuum ejector.

There should be no shield around the exhaust port for the silencer exhaust specification. Sound absorbing material is gradually clogged in the following cases:

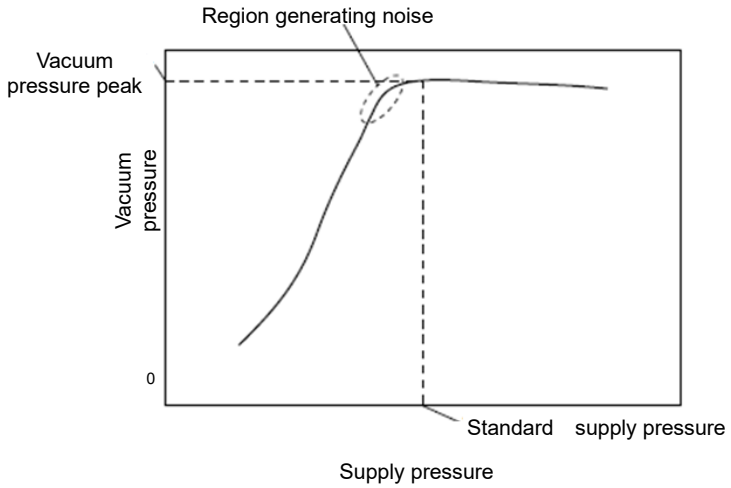
- Suction of dust in the environment at the time of adsorption, or
- When the air is not clean enough.

Clogging causes resistance in the ejector's exhaust, decreasing suction flow and vacuum pressure. (Regular replacement of the sound absorbing material is recommended.)

11.2. Exhaust Noise from Ejector

When the vacuum ejector generates vacuum, intermittent sound (abnormal sound) can be heard from the exhaust port at the standard supply pressure at which the vacuum pressure reaches the peak. This makes the vacuum pressure unstable.

If the vacuum pressure range is adequate for adsorption, there should not be a problem. If the noise causes a problem or affects the setting of the pressure switch, change the supply pressure slightly to avoid the pressure range of the noise.



12. Troubleshooting

If the product fails in any way, perform the following troubleshooting measures.

Failure phenomenon		Possible causes		Countermeasures
Vacuum absorption failure	Vacuum is not generated	Clogging by foreign matter or particles		See (1) and (2)
	Vacuum pressure decreased	Supply valve does not operate	Decline in the power supply voltage	See (3) and (4)
			Electrical wire failure	See (4) and (5)
			The supply pressure exceeds the	See (6)
			Entry of oil mist	See (14)
		Control failure	Simultaneous energization	See (7)
			Leakage voltage	See (8)
		Incorrect assembly during maintenance	Mounting failure of the gasket	See (9)
		Insufficient supply pressure		See (6) and (10)
Fluctuation of vacuum pressure	Intermittent sound is heard from exhaust at the time of vacuum suction and the vacuum pressure slightly fluctuates.	Vibration of fluid when vacuum pressure is generated		See (11)
Vacuum release failure	Release air is not output	The vacuum break flow adjusting needle is fully closed		See (12)
		Release valve does not operate		See (3), (4), (5), (6) and (13)
	Workpiece is not released smoothly.	Adhesion of the workpiece and pad		See (14)
		Control failure	Simultaneous energization	See (7)
			Leakage voltage	See (8)

■Countermeasures

No.	Countermeasure
(1)	Oil mist in the supply air or particles in the piping cause clogging if they enter into the ejector. This may cause operation failure. Blow the air piping with air to eliminate particles. As a further supply air cleaning measure, install a mist separator and an air filter. Perform regular maintenance on the mist separator and filter. Refer to the product catalog or operation manual for details of the maintenance.
(2)	Substances adhering to the surface of the workpiece may enter the product, causing clogging. Install an air suction filter with high filtration accuracy in the piping of the pad and ejector against foreign matter in the suction air (fine substances penetrating the built in filter element). Perform regular maintenance for the filter. Refer to the product catalog or operation manual for details of the maintenance.
(3)	Adjust the rated voltage so that the supply voltage for the solenoid valve is within ±10% of the rated voltage while the simultaneously energized equipment is turned ON. When the digital pressure switch is wired to the common power supply, the rated voltage shall be maintained while the switch is energized.
(4)	Check the correct connection of the power supply and wiring of plug connectors.
(5)	The lead wire that comes with the product will be broken as it is repeatedly bent. When the product is installed to the moving part, use the wiring for moving part in the section subject to repetitive bending. Fix the wiring to the device so that it is not affected by vibrations.
(6)	If the supply pressure is lower than the operating pressure range, it may cause operation failure of the main valve. Additionally, if the supply pressure is higher than the operating pressure range, it may cause an operation failure due to early wear of valve element and sliding part seals. Adjust the supply pressure appropriate for the specification for each port. This product (the manifold type in particular) consumes a large amount of air during operation. Therefore, make sure that the supply pressure is within the operating range.
(7)	Vacuum pressure decreases if the release valve is energized while the supply valve is operating. Check the control program and wiring.
(8)	Leakage voltage may cause the valve to malfunction. Keep the leakage voltage at 0.72 V or less.
(9)	The gasket came out or was displaced during filter element maintenance or the valve assembly replacement must be put back in the correct position before reassembly in order to avoid the leakage of vacuum or air during operation. In this case, disassemble the parts and reassemble the gasket correctly. If the gasket is lost or broken, replace it with a new one.
(10)	If the supply pressure during the operation of the ejector decreases, the generated vacuum pressure decreases. Use an adequate flow rate so that the supply pressure is satisfactory when other air equipment operates at the same time.

No.	Countermeasure
(11)	When the product suctions a workpiece by generating a vacuum, high speed air coming out of the nozzle collides into the diffuser's inner diameter and bounces back, generating vibration in the exhaust air. Because of this, the vacuum pressure fluctuates slightly and is not stabilized. The workpiece can be suctioned when the ejector is used in this condition. However, if the intermittent sound is bothersome or there is a problem with the setting of the vacuum pressure switch, changing the supply pressure can eliminate generation of this noise. Adjust the pressure regulating valve for supply pressure while checking the exhaust sound and vacuum pressure to configure the setting at which the vibration of the exhaust noise is eliminated. Ejector may generate noise due to the increase of exhaust resistance. When the silencer becomes dirty, replacement of the silencer element may improve the condition.
(12)	Release air is not output if the vacuum release flow adjusting needle is fully closed. Adjust the needle to an appropriate position.
(13)	If oil mist enters the product, the grease of the valve assembly and main valve is washed away with the mist, adversely affecting the valve operation. In addition, the life of the main valve may be shortened. Install the mist separator and air filter to the supply air piping for the product.
(14)	The vacuum pad surface in contact with the workpiece deteriorates according to the number of contacts. The workpiece may not be contacted correctly if the surface is deteriorated due to the increase of the rubber viscosity. この現象が現れた場合は真空パッドの交換をお願いします。

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Revision history

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