



Operation Manual

PRODUCT NAME

Power Valve
Precision Regulator

MODEL / Series / Product Number

VEX1□3⁰/₃ Series

SMC Corporation

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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 10218-1992: Manipulating industrial robots -Safety.

etc.



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.

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. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



Safety Instructions

Caution

1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

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 regulation 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.



VEX1□3₃⁰ Series Regulator / Precautions 1

Be sure to read this before handling.

Design/Selection

Warning

1. Confirm the specifications.

Products represented in this catalog are designed only for use in compressed air systems.

Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the specifications.)

Please contact SMC when using a fluid other than compressed air. We do not guarantee against any damage if the product is used outside of the specification range.

2. Please consult with SMC if the intended application calls for absolutely zero leakage due to special atmospheric requirements or if the use of a fluid other than air is required.

3. The grease used on internal sliding parts and seals may come in contact with outlet side components. Please consult with SMC if this is not desirable.

4. Do not disassemble the product or make any modifications, including additional machining.

It may cause human injury and/or an accident.

Caution

1. Select a model that is suitable for the desired air cleanliness by referring to SMC's Best Pneumatics catalog.

Mounting

Warning

1. Operation manual

Install the products and operate them only after reading the operation manual carefully and understanding its contents. Also, keep the manual where it can be referred to as necessary.

2. Ensure sufficient space for maintenance activities.

When installing the products, allow access for maintenance.

3. Tighten threads with the proper tightening torque.

When installing the products, follow the listed torque specifications.

Caution

1. To avoid reversed connections of the air inlet/outlet, make connections after confirming the "1(P)/2(A)" mark that indicate the direction of air flow. Reversed connections can cause malfunction.

2. Ensure sufficient top, bottom and front clearance for maintenance and operation of each component. Refer to the dimensions section for the minimum clearance of each component.

Piping

Warning

1. To screw a piping material into a component, tighten with the recommended tightening torque while holding the female thread side.

If the tightening torque is not enough, looseness and seal failure can occur. On the other hand, excess tightening torque can cause damage to the threads. Furthermore, tightening without holding the female thread side can cause damage due to the excess force that is applied directly to the piping bracket.

Recommended Tightening Torque

Unit: N·m

Connection thread	M5	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2
Torque	1 to 1.5*1	3 to 5	8 to 12	15 to 20	20 to 25	28 to 30	36 to 38	40 to 42	48 to 50	48 to 50

*1 After tightening by hand, use a tightening tool to tighten an additional 1/6 to 1/4 turn as a guideline.

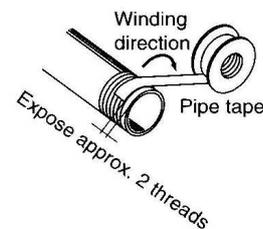
Caution

1. Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

2. Wrapping of pipe tape

When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not enter the piping. Also, if pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



Air Supply

Warning

1. Type of fluids

Please consult with SMC when using the product in applications other than compressed air.

2. Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.

Compressed air that contains a large amount of drainage can cause malfunction of pneumatic equipment such as regulators. Therefore, take appropriate measures to ensure air quality, such as by providing an aftercooler, air dryer, or water separator.



VEX1□3⁰ Series Regulator / Precautions 2

Be sure to read this before handling.

Air Supply

Warning

3. Drain flushing

If condensation in the drain bowl is not emptied on a regular basis, the bowl will overflow and allow the condensation to enter the compressed air lines. It causes malfunction of pneumatic equipment.

If the drain bowl is difficult to check and remove, installation of a drain bowl with an auto drain option is recommended.

For compressed air quality, refer to Air Preparation Equipment Selection Guide (Best Pneumatics No.5)

4. Use clean air.

Do not use compressed air that contains chemicals, synthetic oils including organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

When synthetic oil is used for the compressor oil, depending on the type of synthetic oil used, or on the conditions of use, there may be adverse effects on the resin of the pneumatic equipment or on the seals if the oil is flowed out to the outlet side, so the mounting of a main line filter is recommended.

Caution

1. Ensure that the fluid and ambient temperature are within the specified range.

When using at low temperatures, drain or moisture could solidify or freeze, causing damage to the seals and equipment malfunction. If the fluid temperature is less than 5°C, the moisture in the circuit could freeze, causing damage to the seals and equipment malfunction. Therefore, take appropriate measures to prevent freezing.

For compressed air quality, refer to Air Preparation Equipment Selection Guide (Best Pneumatics No.5).

Operating Environment

Warning

1. Do not use in an atmosphere having corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these.
2. Do not expose the product to direct sunlight for an extended period of time.
3. Do not use in a place subject to heavy vibration and/or shock.
4. Do not mount the product in locations where it is exposed to radiant heat.

Maintenance

Warning

1. Perform maintenance inspection according to the procedures indicated in the operation manual.

If handled improperly, malfunction and damage of machinery or equipment may occur.

2. Maintenance work

If handled improperly, compressed air can be dangerous. Assembly, handling, repair and element replacement of pneumatic systems should be performed by a knowledgeable and experienced person.

3. Drain flushing

Remove drainage from air filters regularly.

4. Removal of equipment, and supply/exhaust of compressed air

When components are removed, first confirm that measures are in place to prevent workpieces from dropping, run-away equipment, etc. Then, cut off the supply pressure and electric power, and exhaust all compressed air from the system using the residual pressure release function.

When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent cylinders from sudden movement.

Design/Selection

Warning

1. Attach a safety device if damage or malfunction of equipment and devices on the outlet side may result from the output pressure exceeding the set pressure.
2. Even if the inlet pressure is discharged, it might take time to release the residual pressure (exit pressure removal). Confirm the exit side pressure when residual pressure is released.
3. Please contact SMC if air will not be consumed in the system for long periods of time, or if the outlet side will be used with a sealed circuit and a balanced circuit, since this may cause the set pressure of the outlet side to fluctuate.
4. Since a safety margin is calculated into the maximum regulating pressure value of set pressure range appearing in the catalog's specification table, the set pressure may exceed the range.
5. Please contact SMC when a circuit requires the use of a regulator having relief sensitivity with high precision and setting accuracy.



VEX1□3⁰₃ Series

Regulator / Precautions 3

Be sure to read this before handling.

Mounting

Caution

1. When adjusting the pressure, unlock the knob first, and lock it back after the pressure is set.

Adjustment

Warning

1. Set the regulator while verifying the displayed values of the inlet and outlet pressure gauges. Turning the knob excessively can cause damage to the internal parts.
2. Do not use a tool on the pressure regulator knob as this can cause damage. It must be operated by hand.

Caution

1. Check the inlet pressure before setting.
2. To set the pressure using the knob, turn the knob in the direction that increases pressure and lock the knob after the pressure is set. If this is done in the direction that decreases pressure, the pressure may drop from the original set pressure. Turning the knob clockwise increases the outlet pressure, and turning it counterclockwise reduces the pressure.



VEX1□3₀³ Series

Specific Product Precautions 1

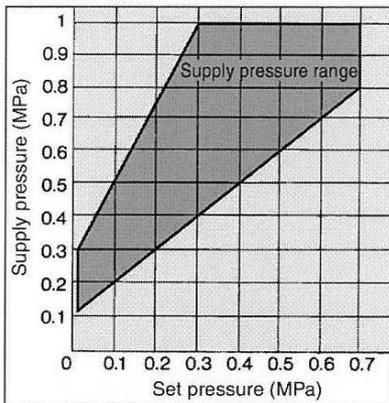
Be sure to read this before handling.

Operating Fluid

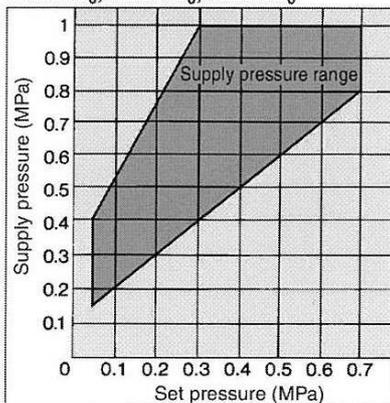
⚠ Caution

1. If drainage or debris is present in the supply pressure line, the fixed throttle becomes clogged, resulting in a malfunction. Therefore, in addition to the air filter (SMC's AF series), make sure to use a mist separator (SMC's AM, AFM series). Concerning the quality of the operating air, refer to SMC's Compressed Air Cleaning Systems on page 14-14-2.
2. Make sure to perform a maintenance periodically on air filter and mist separator (by discharging the drain and cleaning a filter element or replacing with new one).
3. Never use a lubricator on the supply side with the internal pilot remaining in place, doing so will cause the fixed throttle to become clogged, invariably leading to a malfunction.
4. If it is necessary to provide lubrication to a terminal device, connect a lubricator to the output side, when an internal pilot is used. If an external pilot is used, a lubricator can be connected to the supply side, provided that mist separator passage air is used on the pilot valve side.
5. Use a supply pressure in the recommended range (the range indicated in the diagram below).

VEX1A33, VEX1B33



VEX113₀³, VEX123₀³, VEX133₀³
VEX153₀³, VEX173₀³, VEX193₀³



Piping

⚠ Warning

1. If a (solenoid or mechanical) directional switching valve is installed on the supply side of the precision regulator and the valve is turned ON-OFF repeatedly, it will increase the wear of the nozzle flapper, which could lead the set value to deviate. Therefore, avoid using a directional switching valve on the supply side. To install a directional switching valve, do so on the output side of the pressure-reducing valve.

⚠ Caution

1. Tightening the fittings and their torque

When screwing fittings into the valve, make sure to tighten them to the proper torque values given below.

For VEX1133, if the fitting is tightened with a force exceeding the applicable torque, the fitting might come into contact with the components in the P and R ports, leading to deformation or breakage. The thread depth from the body face is 6mm, so when using the G thread, the piping thread should be 6mm or less.

●Connection thread: M5

First, tighten by hand, then use a wrench appropriate for the hexagon flats of the body to tighten an additional 1/6 to 1/4 turn.

A reference value for the tightening torque is 1 to 1.5 N·m.

- Uni One-touch fittings cannot be used. Please use the fitting with a seal.
- For the fitting with sealant R or NPT, first, tighten it by hand, then use a wrench appropriate for the hexagon flats of the body to tighten it a further two or three turns. For a tightening torque guide, refer to the table below.

Connection thread size (R, NPT)	Proper tightening torque (N·m)
1/8	3 to 5
1/4	8 to 12
3/8	15 to 20
1/2	20 to 25
3/4	28 to 30
1	36 to 38
1 1/4	40 to 42
1 1/2	48 to 50
2	48 to 50

2. Ordinarily, air is discharged from the bleed port (PE). The consumption of air through this discharge is normal, owing to the construction of the precision pressure regulator.



VEX1□3₃⁰ Series

Specific Product Precautions 2

Be sure to read this before handling.

Regulator for Signals

(Air operated type only)

⚠ Caution

- Applicable model
Regulator Series IR2000
Series VEX1^A_B 33
- In the case of multiple pressure control, consider using the E-P HYREG[®] Series VY, which can simplify your system.

Zero Adjustment Screw

⚠ Caution

- The zero adjustment screw has been adjusted at the time of shipment to set the signal pressure and the output pressure as close to 1:1 as possible. Thus, it is not necessary to adjust it for operational purposes.

Vibration

⚠ Caution

Vibration is likely to occur under the following conditions.

1. Supply pressure is relatively high (approx. 0.5 MPa or higher), set pressure is low (approx. 0.1 MPa or lower) and the outlet side is open to the atmosphere.
2. Capacity of the precision regulator outlet side is extremely small.

The following measures can be taken.

- a. Set the supply pressure extremely low (+0.1 MPa or more of the set pressure).
- b. Make the capacity of the precision regulator outlet side larger.
- c. Install an exhaust throttle valve with a silencer (ASN2-M5) on the bleed port (PE). Vibration can be avoided by adjusting the exhaust throttle. However, if the bleed is throttled too much, sensitivity may be reduced, resulting in poor performance. Be sure not to apply excessive throttle.

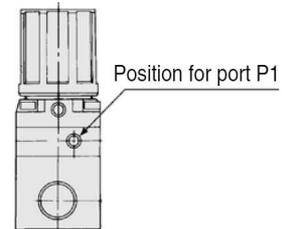
Using the External Pilot

⚠ Caution

1. If a pressure difference over 0.1 MPa between the supply and the set pressure cannot be maintained, change to an external pilot to obtain the necessary pressure difference.
2. If a mist separator cannot be installed on the supply side, change to an external pilot, and make sure to install a mist separator on the pilot side. If a mist separator cannot be installed on the supply side, change to an external pilot, and make sure to install a mist separator on the pilot side.

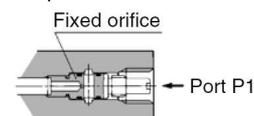
How to Switch to External Pilot

1. Using a flat head screwdriver, remove the fixed orifice from port P1.
↓
P1.
2. Install the fixed orifice facing in the opposite direction (external pilot). Install it carefully to prevent damage to the O-ring.
↓
3. Tighten the fixed orifice again and connect the pilot piping to port P1 using an M5 fitting.

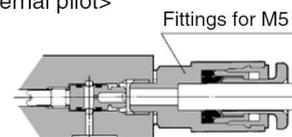


Dimensions of port P1

<Internal pilot>



<External pilot>



- For VEX1□3□ (NBR seals)
Fixed orifice assembly (with O-ring) part no.: VEX1-A30-3
- For VEX1^A_B 33B (FKM seals)
Fixed orifice assembly (with O-ring) part no.: VEX1-A30-3B

Note) O-rings cannot be shipped as a single unit.



VEX1□3⁰₃ Series

Specific Product Precautions 3

Be sure to read this before handling.

Option ⁽¹⁾

Description		Part no.							
		VEX1A33	VEX1B33	VEX1113 ⁰ ₃	VEX123 ⁰ ₃	VEX133 ⁰ ₃	VEX153 ⁰ ₃	VEX173 ⁰ ₃	VEX193 ⁰ ₃
Bracket (With bolt and washer)	B	VEX1-18-1A	—	VEX1-18-1A	—	VEX3-32A	VEX5-32A	VEX7-32A	VEX9-32A
Foot (With bolt and washer)	F	VEX1-18-2A	—	VEX1-18-2A	—	—	—	—	—
Pressure gauge ⁽²⁾	G	G27-10-R1-X207		G27-10-01		G36-10-01	G46-10-01		
Silencer for bleed port (PE)	N	AN120-M5							

Note 1) The optional parts are shipped in the same package.

Note 2) If a pressure gauge other than that which is indicated in the option table is to be used, also enter the part number of the pressure gauge.

Refer to the pressure gauge guide in Best Pneumatics for details.

Example: VEX1333-03

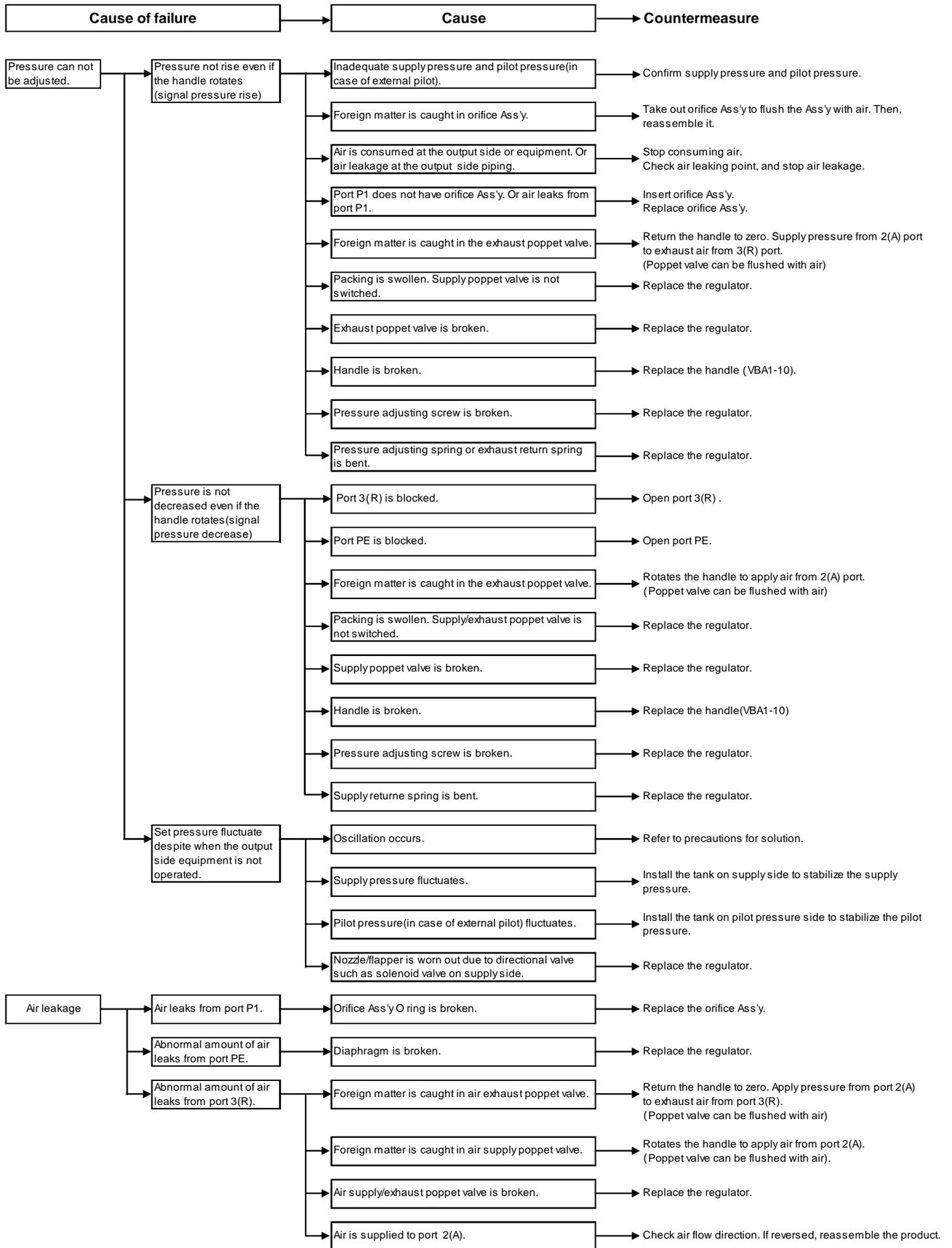
G36-4-01

Sub-plate/Base Gasket Part No.

Valve body size	B	2																																
Sub-plate	<p>VEXB-2-□□P</p> <p>Port size</p> <table border="1"> <thead> <tr> <th>Symbol</th> <th>Port size</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>M5</td> </tr> <tr> <td>B</td> <td>1/8</td> </tr> </tbody> </table> <p>Thread type</p> <table border="1"> <thead> <tr> <th>Symbol</th> <th>Thread type</th> </tr> </thead> <tbody> <tr> <td>Nil</td> <td>Rc</td> </tr> <tr> <td>F</td> <td>G ^{Note)}</td> </tr> <tr> <td>N</td> <td>NPT</td> </tr> <tr> <td>T</td> <td>NPTF</td> </tr> </tbody> </table>	Symbol	Port size	A	M5	B	1/8	Symbol	Thread type	Nil	Rc	F	G ^{Note)}	N	NPT	T	NPTF	<p>VEX1-9-1□□P</p> <p>Port size</p> <table border="1"> <thead> <tr> <th>Symbol</th> <th>Port size</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>1/8</td> </tr> <tr> <td>B</td> <td>1/4</td> </tr> </tbody> </table> <p>Thread type</p> <table border="1"> <thead> <tr> <th>Symbol</th> <th>Thread type</th> </tr> </thead> <tbody> <tr> <td>Nil</td> <td>Rc</td> </tr> <tr> <td>F</td> <td>G ^{Note)}</td> </tr> <tr> <td>N</td> <td>NPT</td> </tr> <tr> <td>T</td> <td>NPTF</td> </tr> </tbody> </table>	Symbol	Port size	A	1/8	B	1/4	Symbol	Thread type	Nil	Rc	F	G ^{Note)}	N	NPT	T	NPTF
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Note) Not conforming to ISO1179-1.

Troubleshooting



Revision history

A	Safety Instructions	Po
B	Renewal	UV

1st printing : MZ

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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