

Power Valve
Precision Regulator

Series **VEX1□3⁰₃**

High precision, large capacity relief regulator

A 3 port large exhaust capacity pressure reducing valve which utilizes a nozzle flapper mechanism available as air operated or manual styles.

Precise pressure setting

Having a relief Flow rate value that is similar to the supply Flow rate value, this regulator responds quickly in order to set a precise secondary pressure even when the secondary volume and the pressure fluctuations are large.

High precision

This regulator is well-suited for balancer applications because it minimizes pressure fluctuations with its large-volume supply/exhaust capability, in addition it features high precision F.S. (full-span) sensitivity within 0.2% and F.S. repeatability of ±0.5%.

Manifold capable

VVEXB/Rc(PT) 1/8 - Up to 10 stations
VVEX2/Rc(PT) 1/4 - Up to 8 stations

Rich line-up

Port sizes available from M5 to Rc(PT) 2, most flow rates and pipes can be accommodated.

Minimum size

VEX1^A_B33/550 ℓ /m(ANR) (Supply side)
/403 ℓ /m(ANR) (Exhaust side)

- Greaseless
- A wide variety of seal materials (NBR, FPM, EPR)



Minimum size



Manual handle style

- VEX113 ⁰/₃/1375 ℓ /m(ANR)
- VEX123 ⁰/₃/1375 ℓ /m(ANR)
- VEX133 ⁰/₃/3242 ℓ /m(ANR)
- VEX153 ⁰/₃/8744 ℓ /m(ANR)
- VEX173 ⁰/₃/17685 ℓ /m(ANR)
- VEX193 ⁰/₃/36352 ℓ /m(ANR)

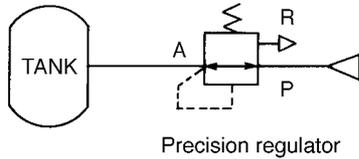


Air operated style

Applications

Relief style regulator

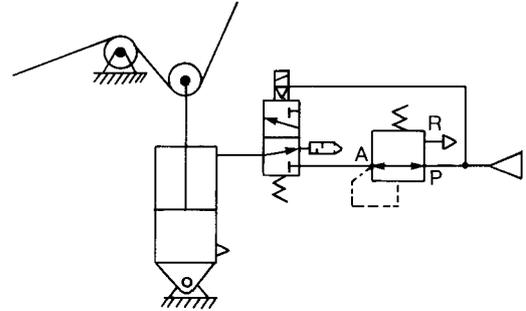
Rapid tank internal pressure adjustment and precise pressure setting



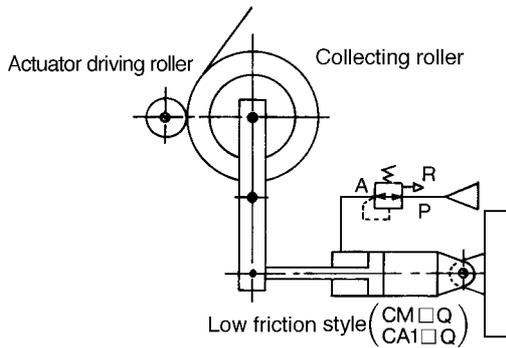
- Large effective areas of both supply and exhaust sides make it possible to set tank internal pressure rapidly.

Precise pressure setting

Sensitivity within 0.2% F.S. (Full Span) Tension control



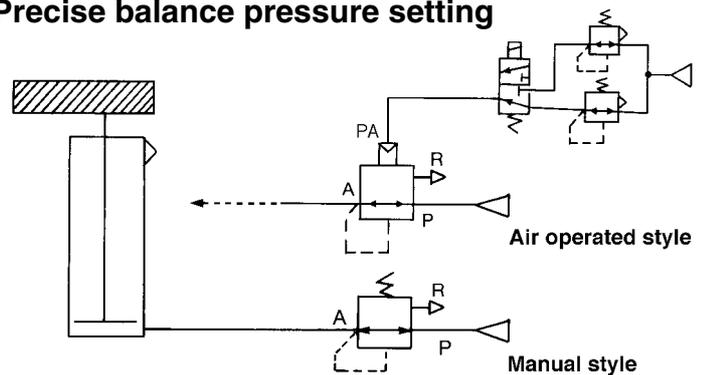
Contact pressure control



- Pressure is kept steady, responding rapidly to the position change of piston in the cylinder.

Balance and driving

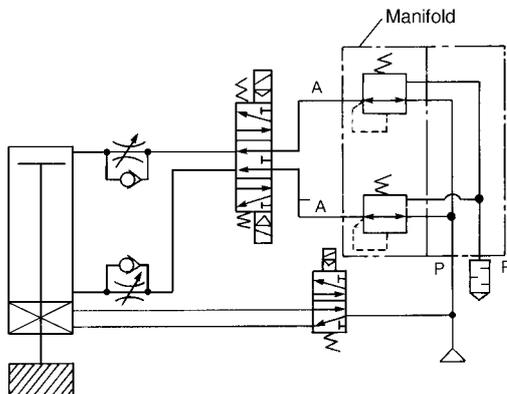
Precise balance pressure setting



- Pressure changes during cylinder actuation are suppressed, balancing the cylinder in both static and dynamic conditions.

Load balance (with superior repeatability)

Within $\pm 0.5\%$ F.S. (Full Span)



- Precise balance pressure setting and superior repeatability prevent actuating play in the cylinder, and make the stop precision steady.
- Manifold can be mounted to "VEX1B33", "VEX1230" and "VEX1233".

Precision Regulator Series VEX1□3⁰₃

Specifications

Model	VEX1A33-M5 ₀₁	VEX1B33-M5 ₀₁	VEX113 ₃ ^{0.01} ₀₂	VEX123 ₃ ^{0.01} ₀₂	VEX133 ₃ ^{0.02} ₀₃ ⁰⁴ ₀₄	VEX153 ₃ ^{0.04} ₀₆ ¹⁰ ₁₀	VEX173 ₃ ^{0.10} ₁₂	VEX193 ₃ ^{0.14} ₂₀											
Operation	Manual (Push locking slotted style)		Manual handle (Push locking slotted style) and Air operated style																
Pilot	Internal pilot  (External pilot can be switched. *Refer to "How to Switch to External Pilot" on p.1.7-4.)																		
Fluid	Refer to applicable fluid table.		Air																
Proof pressure	1.5MPa																		
Supply pressure	(Set pressure +0.1MPa) to Max. 1MPa ⚠ Caution *Refer to "Product Precautions".																		
Setting pressure range	0.01 to 0.7MPa		0.05 to 0.7MPa																
Ambient temperature ⁽¹⁾	0 to 60°C																		
Fluid temperature ⁽¹⁾	0 to 60°C(VEX1 ^A 33) 0 to 99°C(VEX1 ^B 33 ^E)		0 to 60°C																
Repeatability	Within ±0.5% F.S. (Full Span)																		
Sensitivity	Within 0.2% F.S. (Full Span)																		
Air consumption ⁽²⁾	6ℓ/min (ANR) (At supply pressure 0.9MPa)																		
Mounting	Free																		
Linearity ⁽³⁾	—		Within ±1% F.S. (Full Span)																
Signal pressure ⁽³⁾	—		0.05 to 0.7MPa																
Signal port PA ⁽³⁾	—		Rc(PT) ¹ / ₈																
Port size Rc(PT)	Port	M5	01	M5	01	01	02	01	02	02	03	04	04	06	10	10	12	14	20
	P																		
	A	M5	1/8 (4)	M5	1/8 (4)	1/8	1/4	1/8	1/4	1/4	3/8	1/2	1/2	3/4	1	1	1 1/4	1 1/2	2
	R														1 1/4			2	
Effective area	mm ²	5	10/7.4	5	10/7.4	16	25	16	25	36	60	70	130	160	180	300	330	590	670
	Flow rate ℓ/m(ANR)	275	550/403	275	550/403	884	1375	884	1375	1965	3242	3832	7074	8744	9825	16702	17685	32422	36352
Weight (kg)	0.15		0.18 ⁽⁵⁾		0.2		0.3 ⁽⁵⁾		0.5		1.4		2		4				

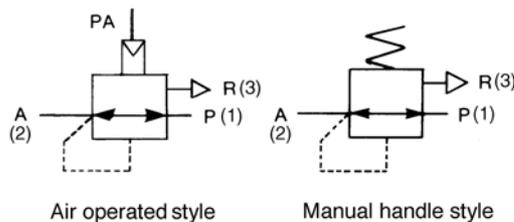


Note1) No condensation.
 Note2) Large amount of air is exhausted all the time.
 Note3) Applicable only to air operated style.
 Note4) Indicates mm² and Cv of (P→A / A→R).
 Note5) With sub-plate.

Applicable fluids

Model	VEX1 ^A 33 (Valve construction: NBR seal)	VEX1 ^A 33 ^B (Valve construction: FPM seal)	VEX1 ^A 33 ^C (Valve construction: EPR seal)
Fluid	Air (Normal, Dry) Carbon dioxide (≤ 0.7MPa) Nitrogen gas (N ₂) Freon 11, 113, 114	Argon Helium High temp. air (MAX. 99°C)	Carbon dioxide (CO ₂ 0.7MPa or less)

Indication



Series VEX1□3⁰₃

How to Order

VEX1 A 3 3 C M5 [] G

Regulator Valve
Precision Regulator
Manual handle

Valve seals

-	NBR seal
B	FPM seal
C	EPR seal

*Refer to the table for applicable fluids.

Options

B	Bracket
F	Foot
G	Gauge
N	Silencer for bleed port

Threads (1/8 only)

-	Rc(PT)
T	NPTF
F	G(PF)
N	NPT

Body size

Body size		Port size	
		Port	P, A, R port
Body ported	A	M5	M5
		01	1/8
Base mounted	B	M5	M5
		01	1/8

VEX1 5 3 3 10 [] G

Regulator Valve
Precision Regulator

Operation

0	Air operated
3	Manual

Options

B	Bracket
F	Foot
G	Gauge
N	Silencer for bleed port

Threads

-	Rc(PT)
T	NPTF
F	G(PF)
N	NPT

Body size

Body size		Port size		
		Port	P, A port	R port
Body ported	1	01	1/8	
		02	1/4	
	3	02	1/4	
		03	3/8	
	5	04	1/2	
		04	1/2	
		06	3/4	
		10	1	
	7	10	1	
		12	1 1/4	1 1/4
9	14	1 1/2		
	20	2	2	
Base mounted	2	-	Without sub-plate	
		01	1/8	
		02	1/4	

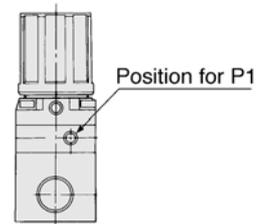
⚠ Caution

Using the external pilot

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

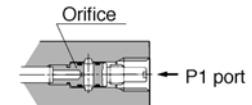
How to change to the external pilot

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

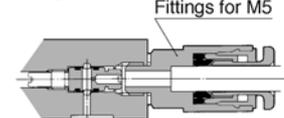


Dimensions of P1 port

<Internal pilot>



<External pilot>



Options*

Description		Part No.							
		VEX1A33	VEX1B33	VEX113 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	—	—	—	—	—
Gauge**	G	G27-10-R1-X207		G27-10-01	G36-10-01	G46-10-01			
Silencer for bleed port (PE)	N	AN120-M5							



* The optional parts are shipped in the same package.

** If a pressure gauge other than that which is indicated in the option table is used, also enter the part number of the pressure gauge. For details, refer to the pressure gauge guide on p.1.16-0.

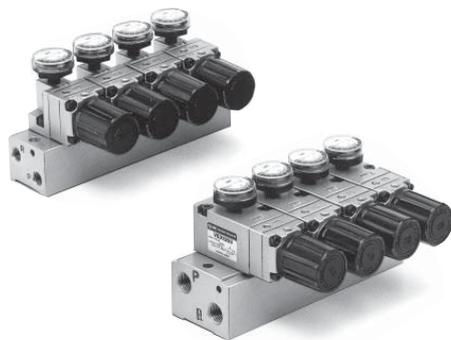
Example: VEX1333.03
G36-4-01

Series VEX1□3⁰₃ Manifold

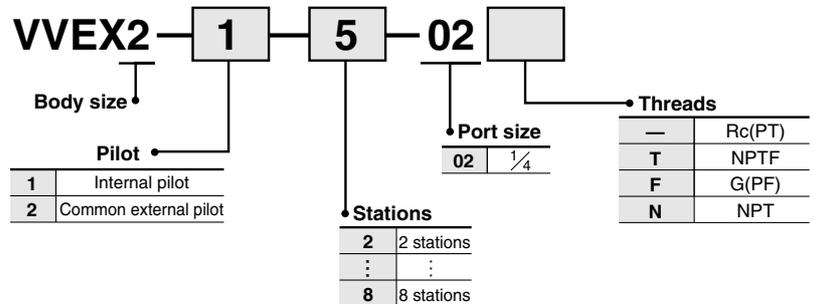
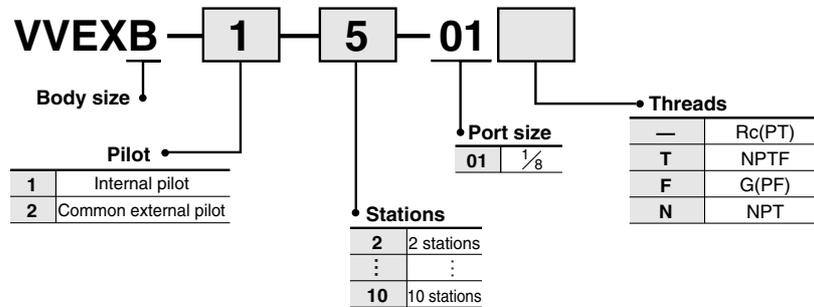
Specifications

Applicable valve	VEX1B33		VEX123 ⁰ ₃									
Valve stations	2 to 10 stations ⁽¹⁾		2 to 8 stations ⁽¹⁾									
Air passage	Common supply, Exhaust style											
Pilot	Internal pilot	Common external pilot	Internal pilot	Common external pilot								
Pilot port size	—	M5 X 0.8	—	M5 X 0.8								
Port size P, A, R port	1/8		1/4									
Blank plate	VEXB-5 □ (With gasket and mounting bolt) <table border="1"> <thead> <tr> <th colspan="2">Gasket material</th> </tr> </thead> <tbody> <tr> <td>—</td> <td>NBR seal</td> </tr> <tr> <td>B</td> <td>FPM seal</td> </tr> <tr> <td>C</td> <td>EPR seal</td> </tr> </tbody> </table>		Gasket material		—	NBR seal	B	FPM seal	C	EPR seal	VEX1-17 (With gasket and mounting bolt)	
Gasket material												
—	NBR seal											
B	FPM seal											
C	EPR seal											

Note 1) Pressurize to P port and exhaust from R port on the both sides for six stations or more of "VEX1B33" and/or five stations or more of "VEX1233".

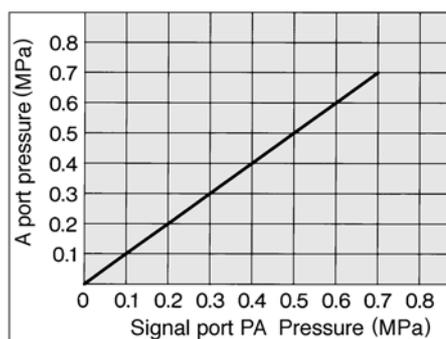


How to Order

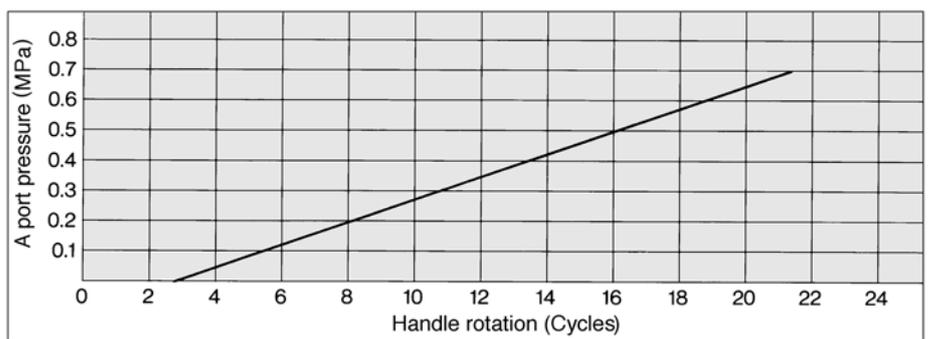


List symbols in the order of valves and blank plates for manifolds from the left hand side (A port faces this side) of the manifold base.
 Example) **VVEX2-2-5-02**
 ● VEX1233-G — 4 pieces
 ● VEX1-17 — 1 piece

Set pressure characteristics (Air operated style)



Set pressure characteristics (Manual handle style)



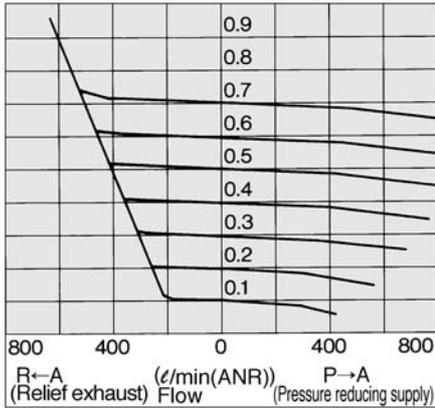
Series VEX1□3⁰₃

Flow Characteristics

Conditions: P port pressure 1MPa

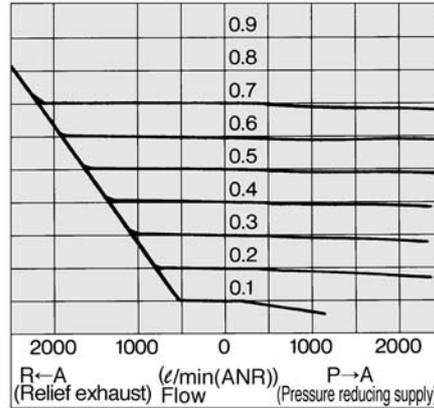
VEX1A33/VEX1B33-01

A port pressure (MPa)



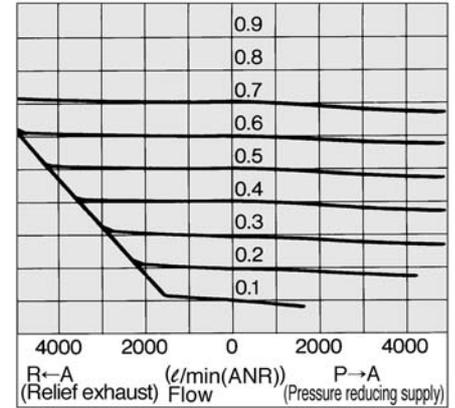
VEX113⁰₃/VEX123⁰₃-02

A port pressure (MPa)



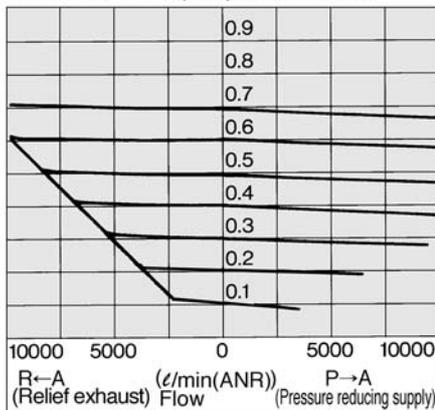
VEX133⁰₃-03

A port pressure (MPa)



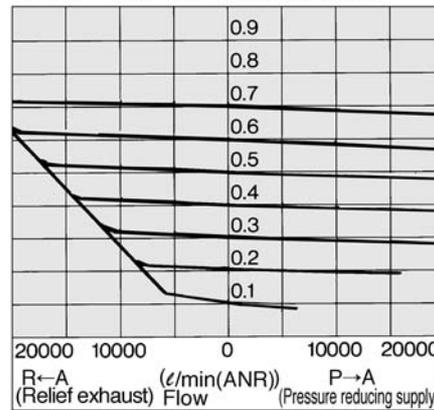
VEX153⁰₃-06

A port pressure (MPa)



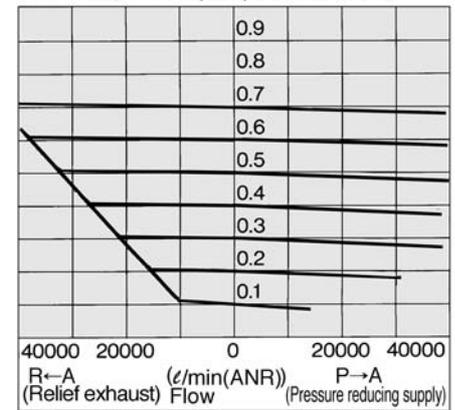
VEX173⁰₃-12

A port pressure (MPa)



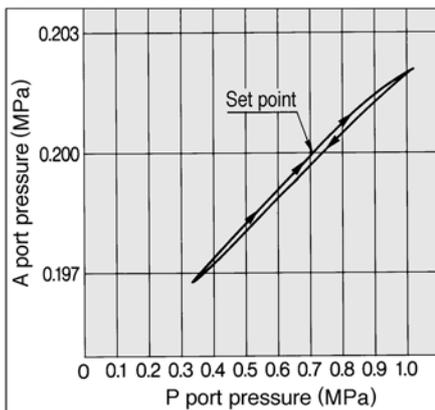
VEX193⁰₃-20

A port pressure (MPa)

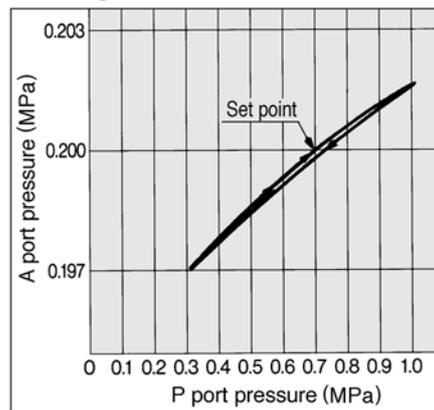


Conditions: P port pressure 0.7MPa, A port pressure 0.2MPa, Flow 0 l/min (ANR)

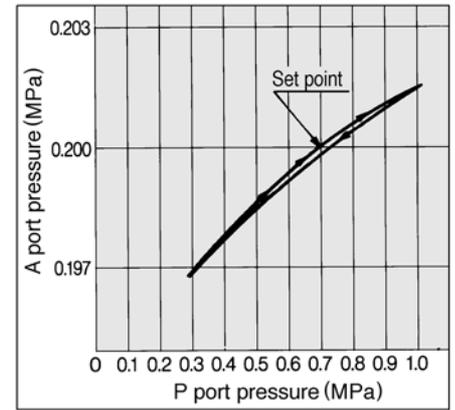
VEX1A33/VEX1B33



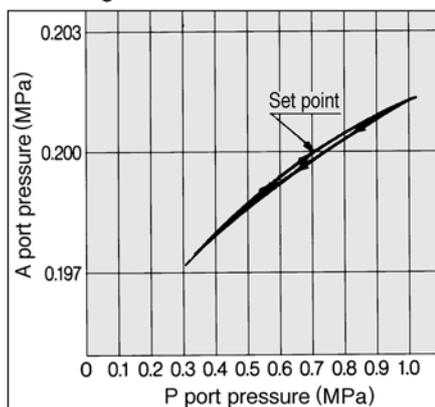
VEX113⁰₃/VEX123⁰₃



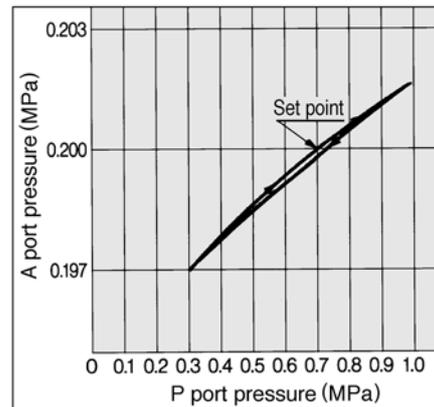
VEX133⁰₃



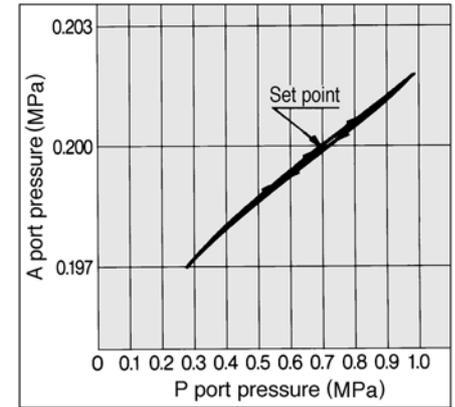
VEX153⁰₃



VEX173⁰₃



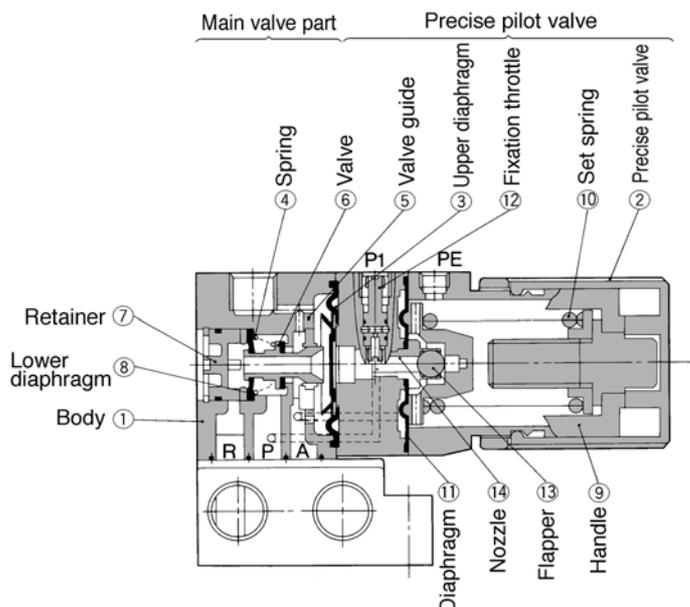
VEX193⁰₃



Precision Regulator Series VEX1□3₃⁰

Construction/Operating Principles

VEX1A33, VEX1B33



When set handle ⑨ is turned clockwise, the force generated by set spring ⑩ causes flapper ⑬ to close nozzle ⑭, allowing the nozzle back pressure to be applied to the right surface of top diaphragm ③. Then, valve ⑥ moves to the left, allowing the supply air to flow from port P to port A. The air pressure that has flowed in is applied to the left surface of top diaphragm ③ and counteracts the force generated by the nozzle back pressure; at the same time, it is applied to the left surface of diaphragm ⑪, and balances with the set pressure that counteracts the compression force of set spring ⑩.

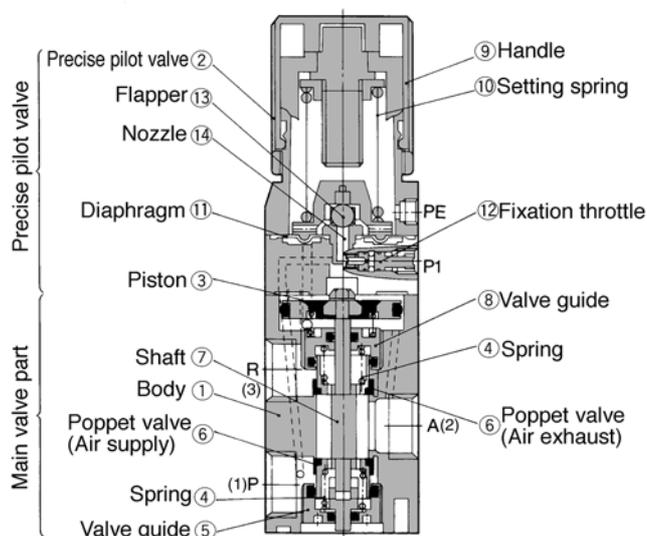
When the secondary pressure increases higher than the set pressure, it pushes diaphragm ⑪ towards the right, and the pressure at the right side of top diaphragm ③ decreases, causing top diaphragm ③ to move to the right. Then, valve ⑥ moves away from the left surface of top diaphragm ③, the secondary pressure flows from port A via the valve hollow and is discharged through port R (atmosphere). If set handle ⑨ is turned counterclockwise, the movement will be the opposite; the secondary pressure will decrease and balance with a newly set pressure.

Component Parts

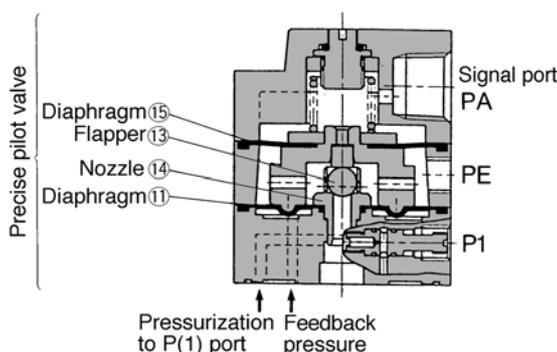
No.	Description	Material
①	Body	Zinc alloy die cast
②	Precise pilot valve	Aluminum alloy die cast
③	Upper diaphragm	NBR/FPM/EPR
④	Spring	Stainless steel
⑤	Valve guide	Stainless steel
⑥	Valve	NBR/FPM/EPR
⑦	Retainer	Polyacetal
⑧	Lower diaphragm	NBR/FPM/EPR

VEX113₃⁰, VEX123₃⁰, VEX133₃⁰, VEX153₃⁰
VEX173₃⁰, VEX193₃⁰

Manual handle style



Air operated style



When set handle ⑨ is turned clockwise, the force generated by set spring ⑩ (via diaphragm ⑮, as the set pressure of the pressure-reducing valve that is connected to the signal port is increased) causes flapper ⑬ to close nozzle ⑭, allowing the nozzle back pressure to be applied to the top of piston ③. Then, via shaft ⑦, poppet valve (supply air) ⑥ opens, allowing the supply air to flow from port P to port A. The air pressure that has flowed in is applied to the bottom surface of piston ③ and counteracts the force generated by the nozzle back pressure; at the same time, it is applied to the bottom surface of diaphragm ⑪, and balances with the set pressure that counteracts the compression force of set spring ⑩.

When the secondary pressure increases higher than the set pressure, it pushes diaphragm ⑪ upward, the pressure at the top surface of piston ③ decreases, causes piston ③ to move upward, opens poppet valve (exhaust) ⑥ via shaft ⑦, and is discharged through port R to the atmosphere.

If set handle ⑨ is turned counterclockwise (if the set pressure of the pressure-reducing valve connected to the signal port is decreased), the movement will be the opposite; the secondary pressure will decrease and balance with a newly set pressure.

Note: Those indicated in parentheses are for the air operated style.

Component Parts

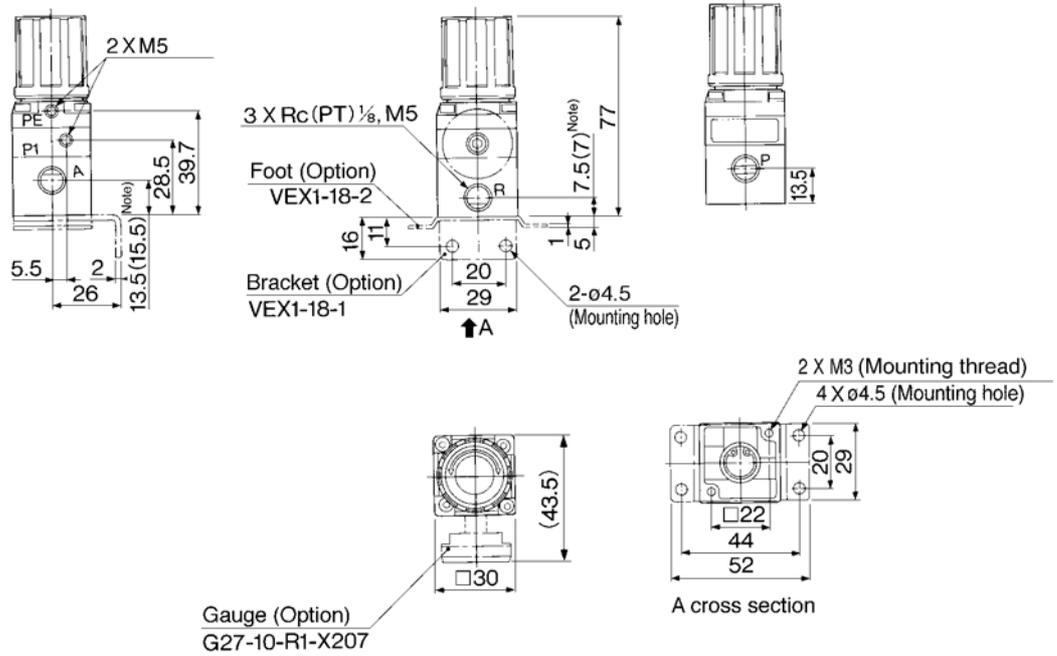
No.	Description	Material
①	Body	Aluminum alloy die cast
②	Precise pilot valve	Aluminum alloy die cast
③	Regulating piston	Aluminum alloy
④	Spring	Stainless steel
⑤	Valve guide	Aluminum alloy
⑥	Poppet valve	NBR
⑦	Shaft	Stainless steel
⑧	Valve guide	Aluminum alloy

Series VEX1□3₃⁰



Body Ported Style

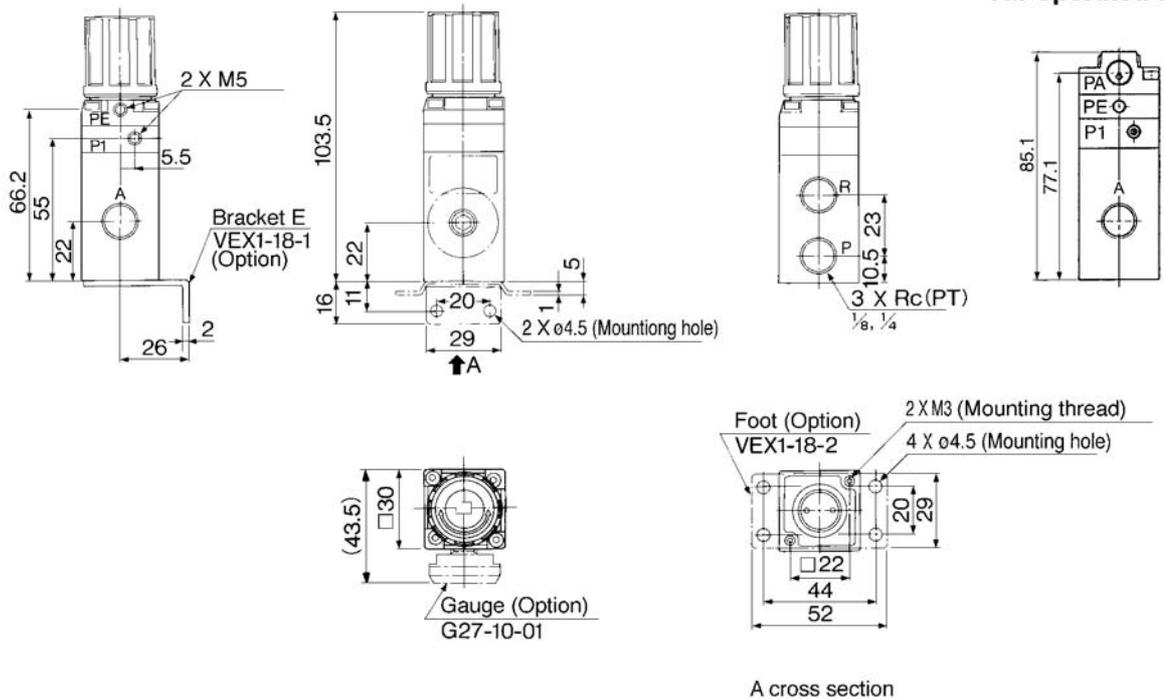
VEX1A33-M5/01



Note) () are the dimensions of "M5".

VEX113₃⁰-01/02

Air operated style



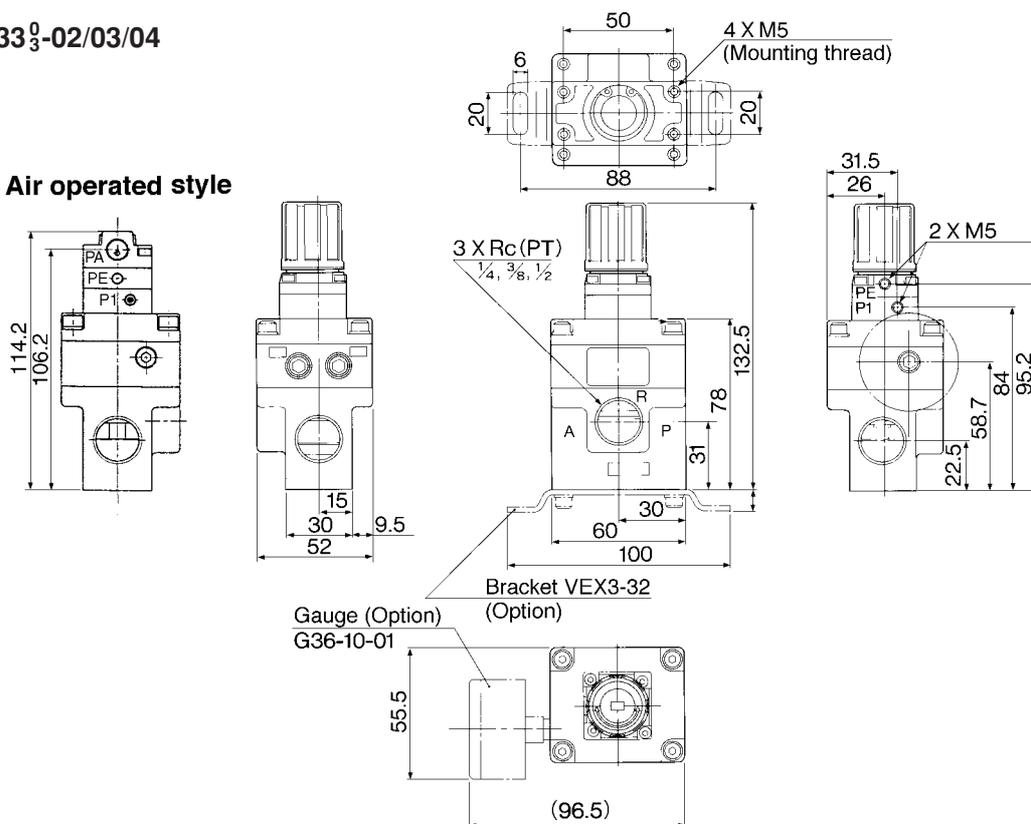
Precision Regulator Series VEX1□3⁰₃



Body Ported Style

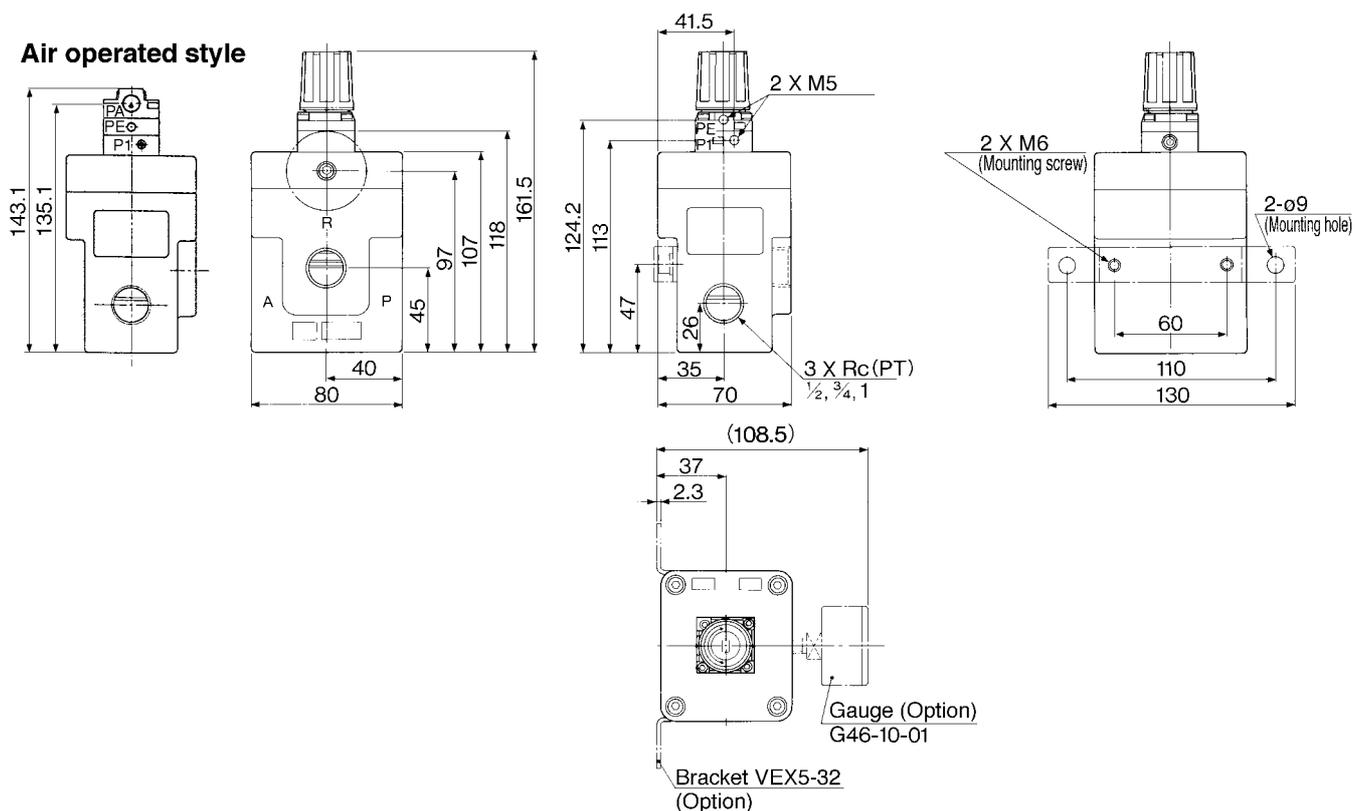
VEX133⁰-02/03/04

Air operated style



VEX153⁰-04/06/10

Air operated style

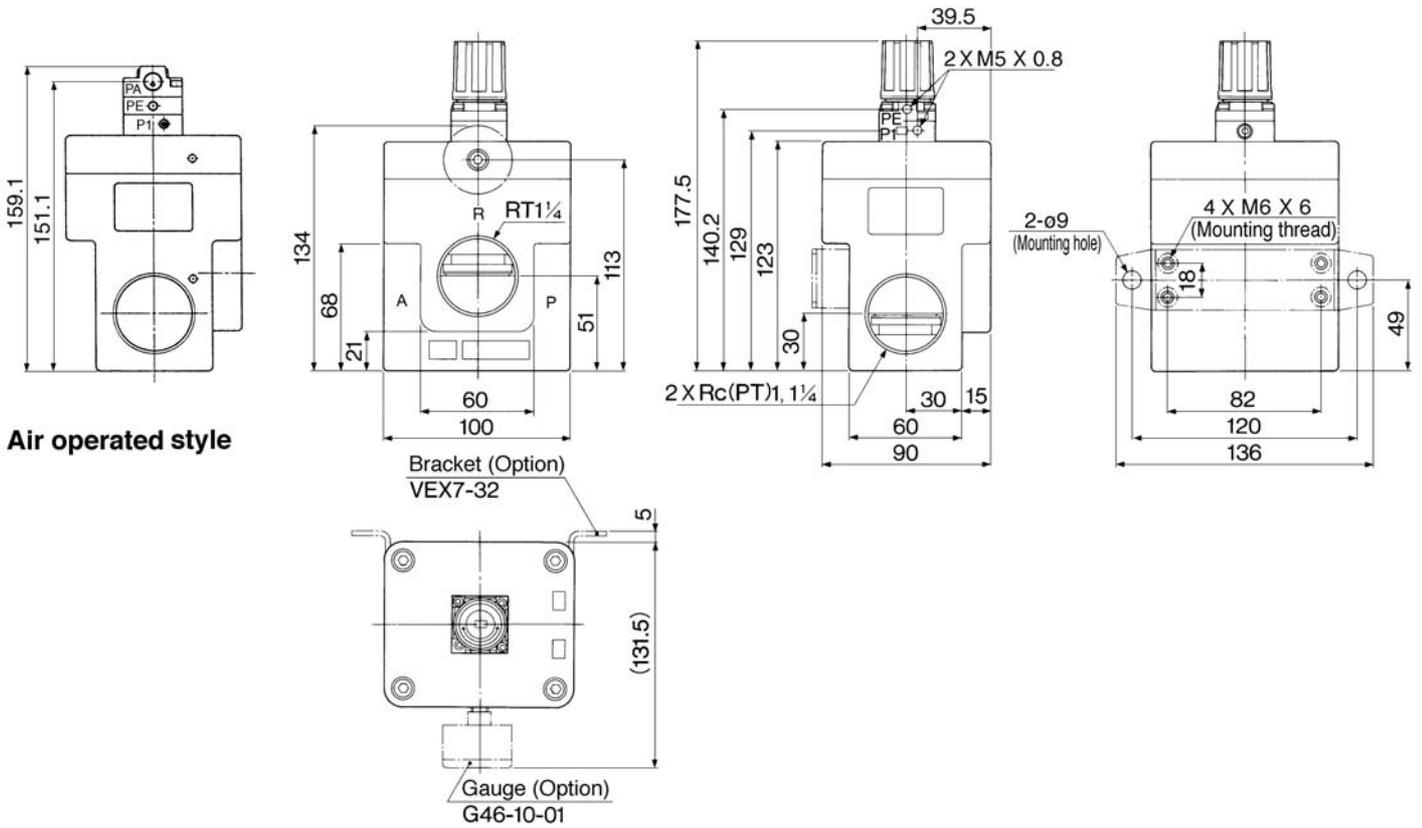


Series VEX1□3⁰₃

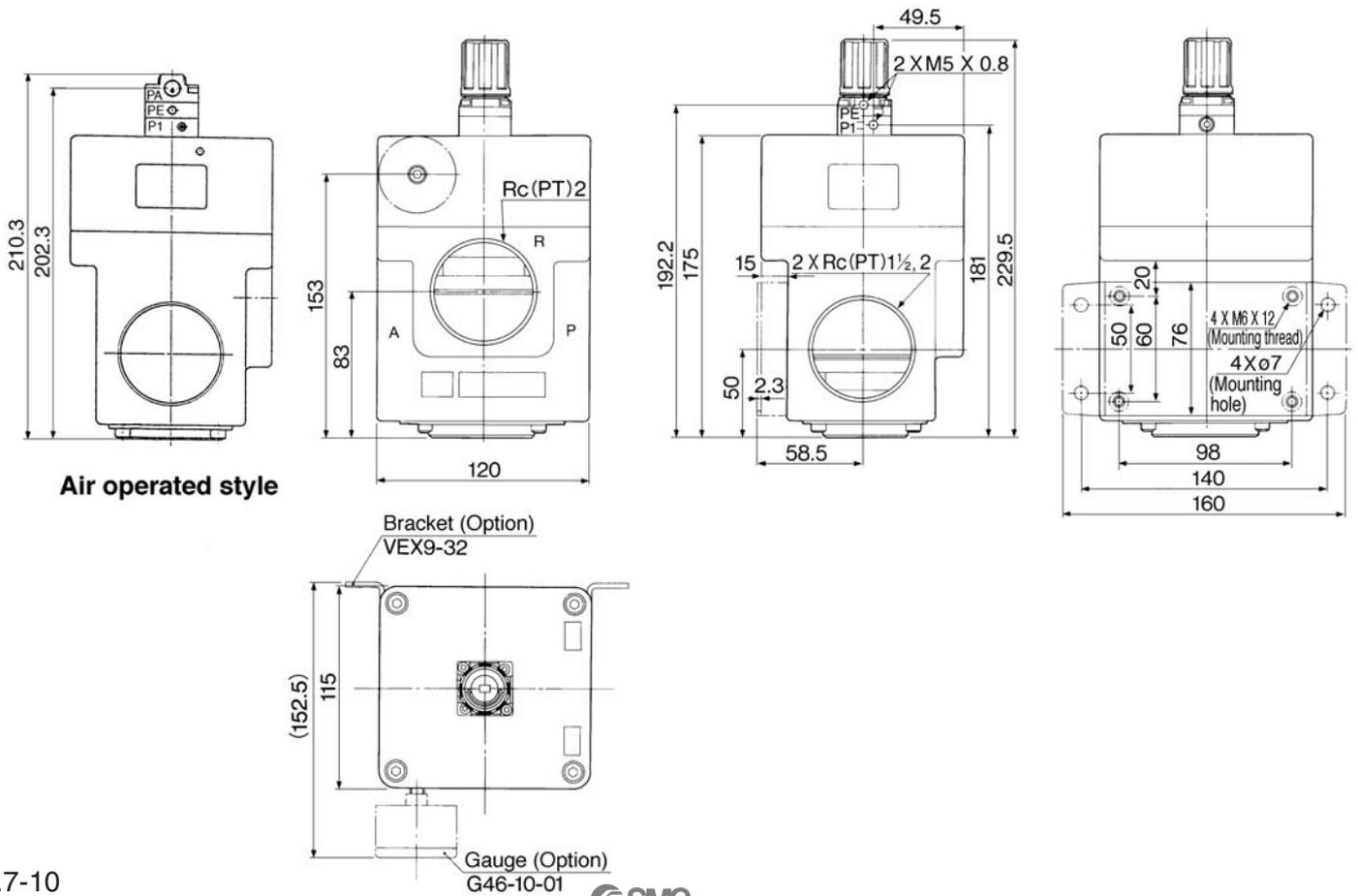


Body Ported Style

VEX173⁰₃-10/12



VEX193⁰₃-14/20

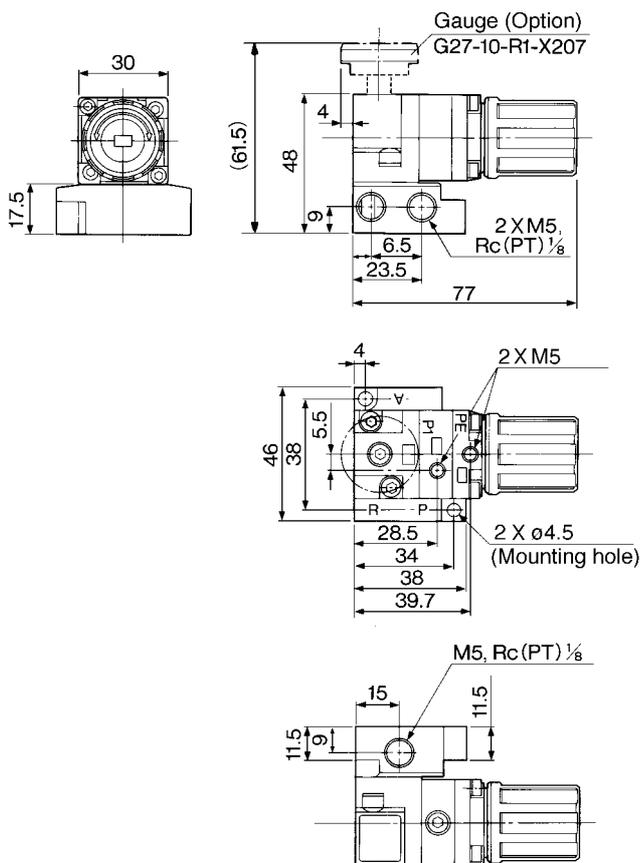


Precision Regulator Series VEX1□3₃⁰

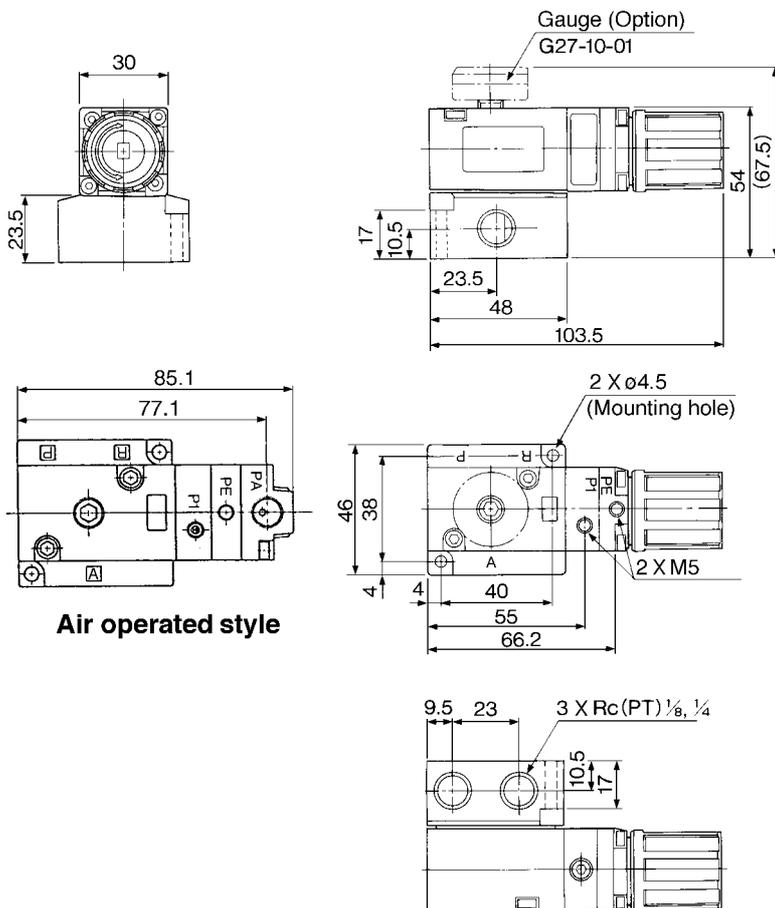


Base Mounted Style

VEX1B33-M5/01



VEX123₃⁰-01/02



Air operated style

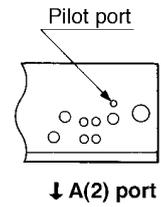
Series VEX1□3₃⁰



Manifold: VVEXB-□-□-01

Applicable valve: VEX1B33

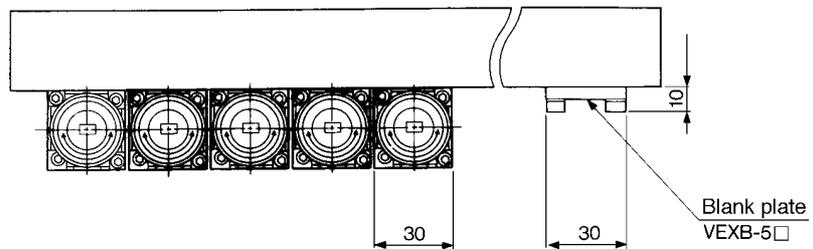
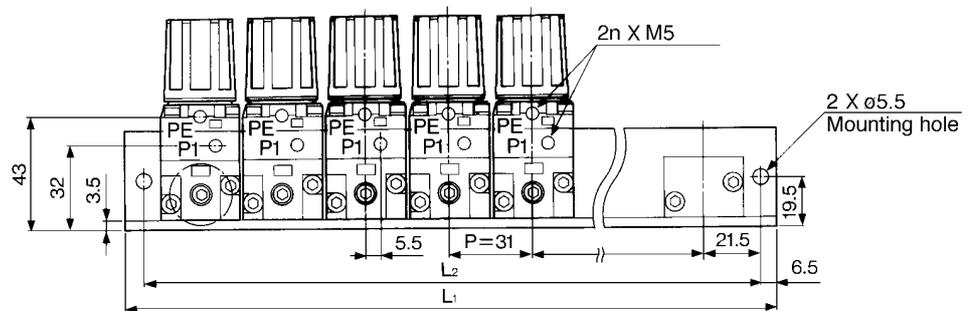
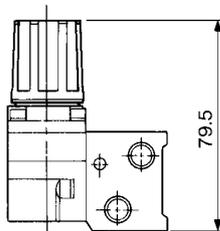
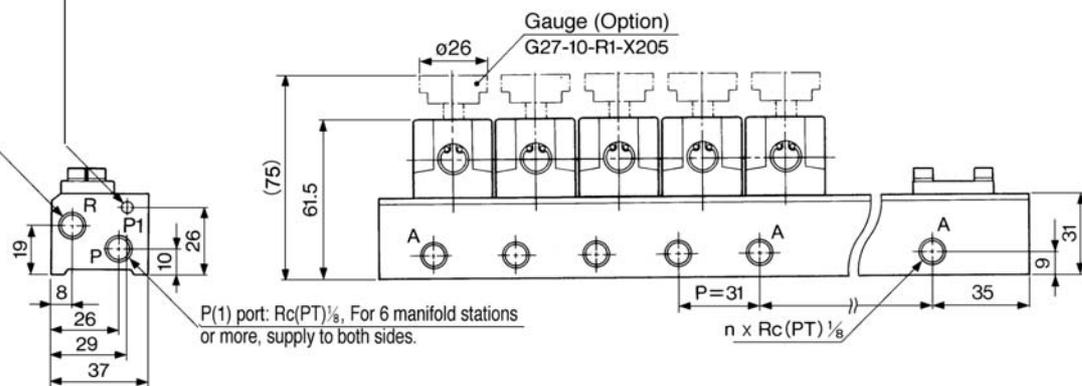
Valve mounting side



R(3) port: Rc(PT) 1/8, For 6 manifold stations or more, exhaust from the both sides.

External pilot port

Without M5 thread: Internal pilot VVEXB-1
With M5 thread: Common external pilot VVEXB-2



L dimensions L₁ = 31n + 25, L₂ = 31n + 12

Symbol ⁿ	2	3	4	5	6	7	8	9	10
L ₁	87	118	149	180	211	242	273	304	335
L ₂	74	105	136	167	198	229	260	291	322

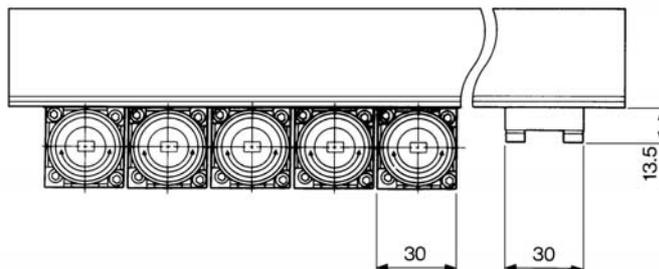
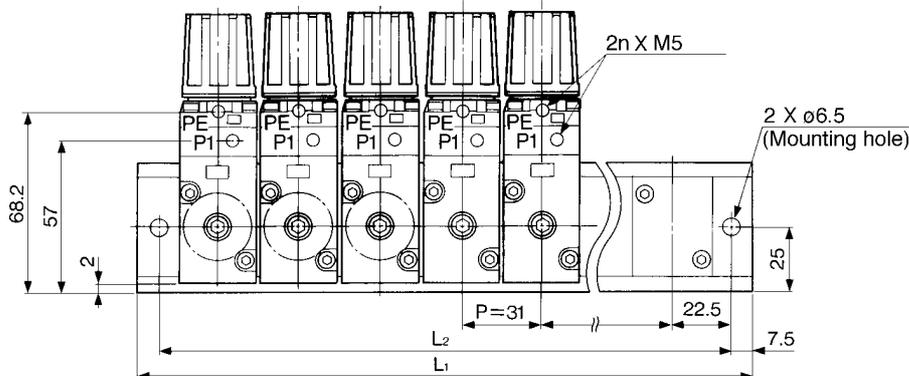
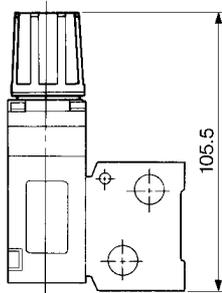
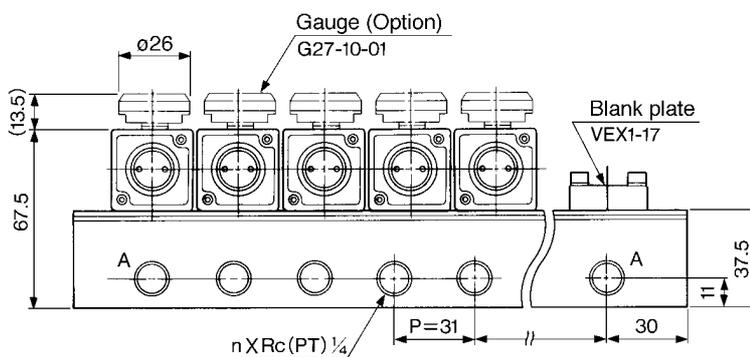
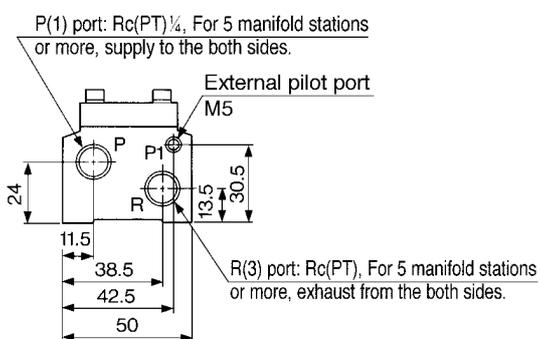
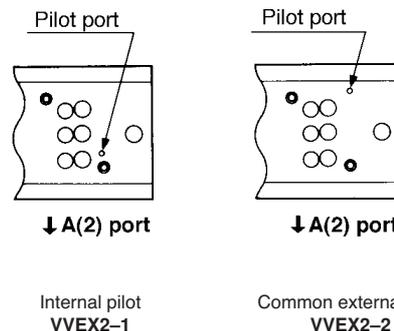
Precision Regulator Series VEX1□3⁰₃



Manifold: VVEX2-□-□-02

Applicable valve: VEX123⁰₃

Valve mounting side



L dimensions Equation $L_1 = 31n + 29$, $L_2 = 31n + 14$ n: Station

Symbol	n	2	3	4	5	6	7	8
L ₁		91	122	153	184	215	246	277
L ₂		76	107	138	169	200	231	262

⚠️ Precautions

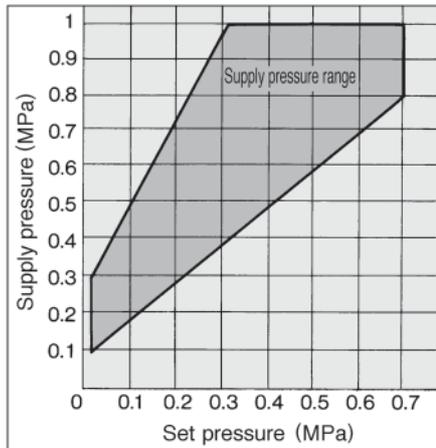
Be sure to read before handling.
Refer to p.0-26 and 0-27 for Safety Instructions and common precautions on the products mentioned in this catalogue.

Regarding the operating fluid

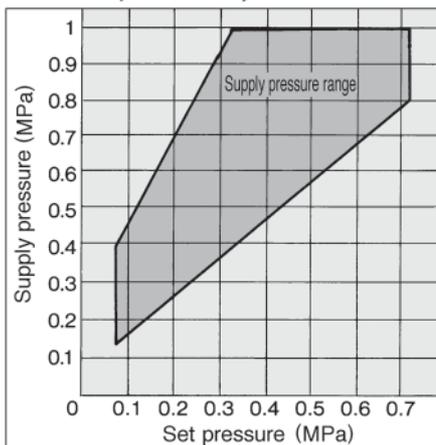
⚠️ Caution

- If drainage or debris is present in the supply pressure line, the fixed throttle becomes clogged, causing a malfunction. Therefore, in addition to the air filter (SMC's AF series), make sure to use a mist separator (SMC's AM series). Concerning the quality of the operating air, refer to SMC's Compressed Air Cleaning Systems on p.4.0-1.
- Make sure to perform periodic maintenance on the air filter and the mist separator (by discharging the drainage and cleaning or replacing the filter element).
- 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.
- 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.
- Use a supply pressure in the recommended range (the range indicated in the diagram below).

VEX1A33, VEX1B33



VEX1133, VEX1233, VEX1333, VEX1533, VEX1733, VEX1933



Regarding the piping

⚠️ Warning

- 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

- Tightening the fittings and strictly observing their tightening torque.

Tightening torque when piping

Connecting thread	Proper torque Nm
M5 X 0.8	Approx. 1/6 rotation after manual tightening
Rc(PT) 1/8	7 to 9
Rc(PT) 1/4	12 to 14
Rc(PT) 3/8	22 to 24
Rc(PT) 1/2	28 to 30
Rc(PT) 3/4	28 to 30
Rc(PT) 1	36 to 38
Rc(PT) 1 1/4	40 to 42
Rc(PT) 1 1/2	48 to 50
Rc(PT) 2	48 to 50

- 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 reducing valve.
- Under operating conditions in which the supply pressure is relatively high (approximately 0.5MPa minimum) the set pressure is low (approximately 0.1 MPa maximum) and the output side is open to the atmosphere, pulsations could be created in the flow of the set pressure side. In such a case, decrease the supply pressure as much as possible or slightly increase the set pressure and restrict the output line (such as by adding a throttle valve to adjust the pressure).

Regarding the regulator for signals (Air operated style only)

⚠️ Caution

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

Regarding the 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.

Related Products

Silencer (Series AN)

- Noise reduction capability of over 30dB.
- Provides a sufficient effective area.



Model	Connection R(PT)	Effective area (mm ²)
AN120	M5	5
AN110	1/8	35
AN200	1/4	35
AN300	3/8	60
AN400	1/2	90
AN500	3/4	160
AN600	1	270
AN700	1 1/4	440
AN800	1 1/2	590
AN900	2	960

Refer to "Best Pneumatics No.1" for further information.

Exhaust cleaner (Series AMC)

- Provides noise reduction and oil mist recovery functions.
- Can also be used in an intensive piping system.



Model	Connection R(PT)	Effective area (mm ²)	Max. flow (l/min(ANR))
AMC310	3/8	16	300
AMC510	3/4	55	1,000
AMC610	1	165	3,000
AMC810	1 1/2	330	6,000
AMC910	2	550	10,000

- Oil mist removal of 99.9%
- Noise reduction of over 35dB.

For details, refer to "Best Pneumatics 1".