

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 Cv value that is similar to the supply Cv value, this regulator responds quickly in order to set a precise outlet pressure even when the outlet 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 1/8—Up to 10 stations
VVEX2/Rc 1/4—Up to 8 stations

Rich line-up

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

Minimum size VEX1^A_B33

- Non-grease
- Seal materials (NBR, FKM) only for VEX1^A_B33



Manual handle type

Air operated type

F.R.L.

AV

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AF

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VEX

AMR

ITV

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VBA

VE□

VY1

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PPA

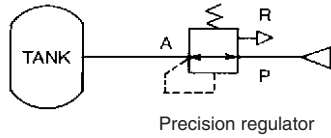
AL

Series VEX1□3⁰

Application Example

Relief Type Regulator

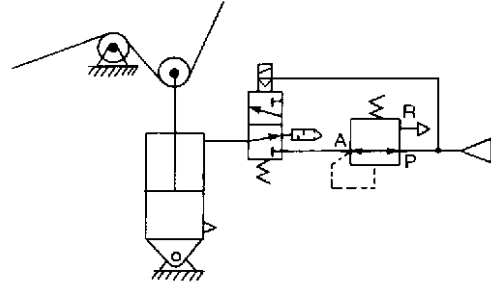
Rapid tank internal pressure adjustment and precise pressure setting



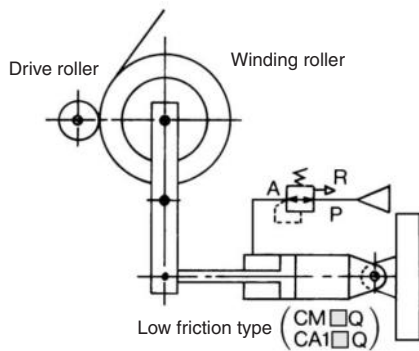
- Large effective areas of both supply and exhaust sides make it possible to set internal tank pressure rapidly.

Accurate Pressure Setting

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

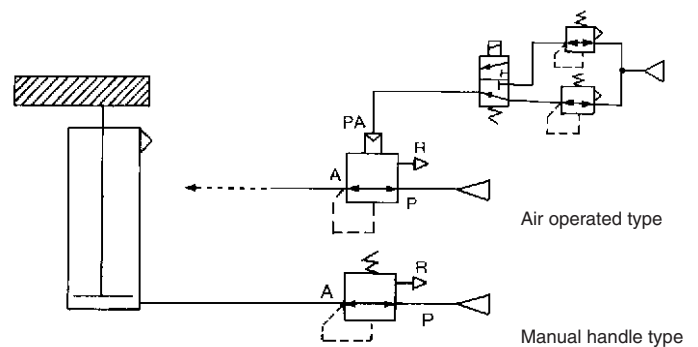


Contact Pressure Control



Balance and Drive

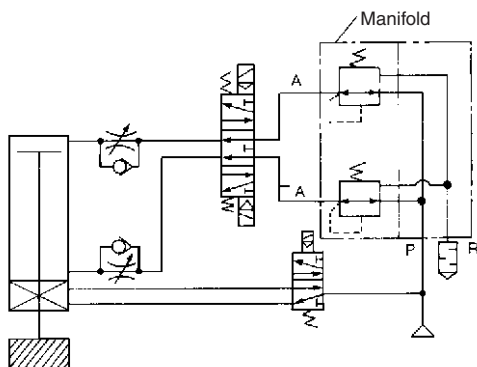
Accurate balance pressure setting



- 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)



- Accurate 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.

Precision Regulator Series VEX1□3⁰

Specifications

Model		VEX1A33- ^{M5} ₀₁	VEX1B33- ^{M5} ₀₁	VEX113 ⁰ ₃₋₀₂	VEX123 ⁰ ₃₋₀₂	VEX133 ⁰ ₃₋₀₂ ⁰³ ₀₄	VEX153 ⁰ ₃₋₀₄ ⁰⁶ ₁₀	VEX173 ⁰ ₃₋₁₀ ¹²	VEX193 ⁰ ₃₋₁₄ ²⁰									
Operation		Manual (Push locking slotted type)			Manual handle (Push locking slotted type) and Air operated type													
Pilot		Internal pilot  (External pilot can be switched. * Refer to "How to Switch to External Pilot" on page 14-6-4.)																
Fluid		Refer to Applicable Fluids.			Air													
Proof pressure		1.5 MPa																
Supply pressure		(Set pressure + 0.1 MPa) to Max. 1 MPa ⚠ Caution * Refer to "Precautions".																
Setting pressure range		0.01 to 0.7 MPa			0.05 to 0.7 MPa													
Ambient temperature ⁽¹⁾		0 to 60°C																
Fluid temperature ⁽¹⁾		0 to 60°C (VEX1 ^A _B 33) 0 to 99°C (VEX1 ^A _B 33B)			0 to 60°C													
Repeatability		Within ±0.5% F.S. (Full span)																
Sensitivity		Within 0.2% F.S. (Full span)																
Air consumption ⁽²⁾		6 ℓ/min (ANR) (at supply pressure 0.9 MPa)																
Mounting		Free																
Linearity ⁽³⁾		—			Within ±1% F.S. (Full span)													
Signal pressure ⁽³⁾		—			0.05 to 0.7 MPa													
Signal port PA ⁽³⁾		—			Rc 1/8													
Port size Rc	Port	M5	01	M5	01	01	02	01	02	02	03	04	06	10	10	12	14	20
	P														1	1 1/4	1 1/2	
	A	M5	1/8 ⁽⁴⁾	M5	1/8 ⁽⁴⁾	1/8	1/4	1/8	1/4	1/4	3/8	1/2	3/4	1	1 1/4	2		
	R																	2
Weight (kg)		0.15		0.18 ⁽⁵⁾		0.2		0.3 ⁽⁵⁾		0.5		1.4		2		4		

F.R.L.

AV

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VEX

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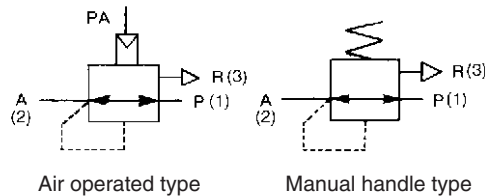
 Note 1) No condensation.
 Note 2) Large amount of air is exhausted all the time.
 Note 3) Applicable only to air operated type.
 Note 4) Indicates mm² and Cv of ($\frac{P \rightarrow A}{\text{Supply side}}$ / $\frac{A \rightarrow R}{\text{Exhaust side}}$).
 Note 5) With sub-plate.



Applicable Fluids

Model	VEX1 ^A _B 33 (Valve construction: NBR seals)	VEX1 ^A _B 33B (Valve construction: FPM seals)
Fluid	Air (Normal, Dry) Carbon dioxide (0.7 MPa) Nitrogen gas (N ₂) Freon 11, 113, 114	Argon Helium High temp. air (Max. 99°C)

JIS Symbol



Series VEX1□3₃

How to Order

VEX1 A 3 3 B M5 [] G

Regulator valve

Type Precision regulator

Operation Manual handle

Body size

Port size

Valve seal

Nil	NBR seals
B	FKM seals

* Refer to "Applicable Fluids"

Option

B	Bracket
F	Foot
G	Pressure gauge
N	Silencer for bleed hole

Threads (1/8 only)

Nil	Rc
F	G
N	NPT
T	NPTF

Body size		Port size		
		Port	P, A, R port	
Body ported	A	M5	M5	
		01	1/8	
Base mounted	B	Nil	Without sub-plate	
		M5	M5	
		01	1/8	

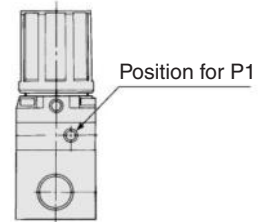
⚠ Caution

Using the External Pilot

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.

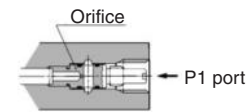
How to Switch to External Pilot

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

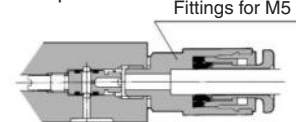


Dimensions of P1 port

<Internal pilot>



<External pilot>



VEX1 5 3 3 10 [] G

Regulator valve

Type Precision regulator

Operation

0	Air operated type
3	Manual handle

Body size

Port size

Option

B	Bracket
F	Foot
G	Pressure gauge
N	Silencer for bleed hole

Thread type

Nil	Rc
F	G
N	NPT
T	NPTF

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	1 1/4	
		12	1 1/4		
14		1 1/2			
20		2			
Base mounted	2	Nil	Without sub-plate		
		01	1/8		
		02	1/4		

Option *

Description		Part no.							
		VEX1A33	VEX1B33	VEX113 ₃	VEX123 ₃	VEX133 ₃	VEX153 ₃	VEX173 ₃	VEX193 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 **	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 to be used, also enter the part number of the pressure gauge. For details, refer to the pressure gauge guide on page 14-11-1.

Example: VEX1333-03
G36-4-01

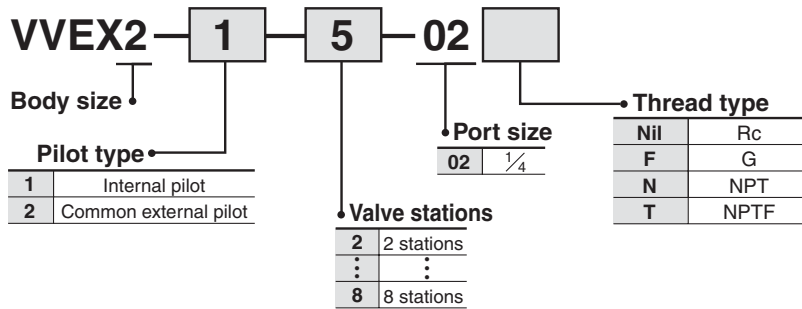
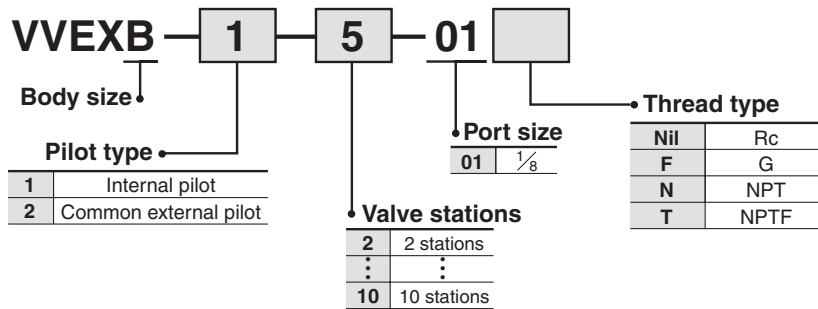
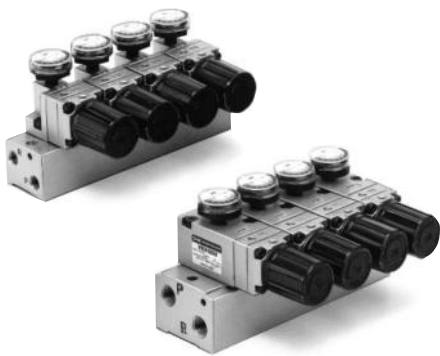
Series VEX1□3⁰₃ Manifold Specifications

Specifications

Applicable valve	VEX1B33		VEX123 ⁰ ₃				
Valve stations	2 to 10 stations (Note)		2 to 8 stations (Note)				
Air passage	Common supply/exhaust						
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				
Blanking plate	VEXB-5 (With gasket and mounting bolt)		VEX1-17 (With gasket and mounting bolt)				
	Gasket material <table border="1"> <tr> <td>Nil</td> <td>NBR seals</td> </tr> <tr> <td>B</td> <td>FKM seals</td> </tr> </table>		Nil	NBR seals	B	FKM seals	
Nil	NBR seals						
B	FKM seals						

Note) 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".

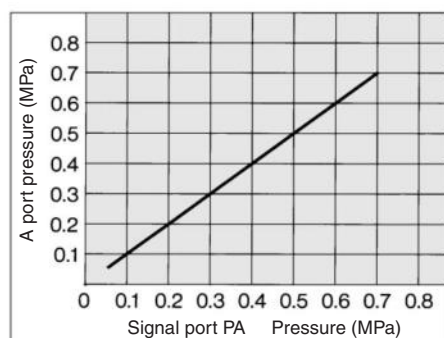
How to Order



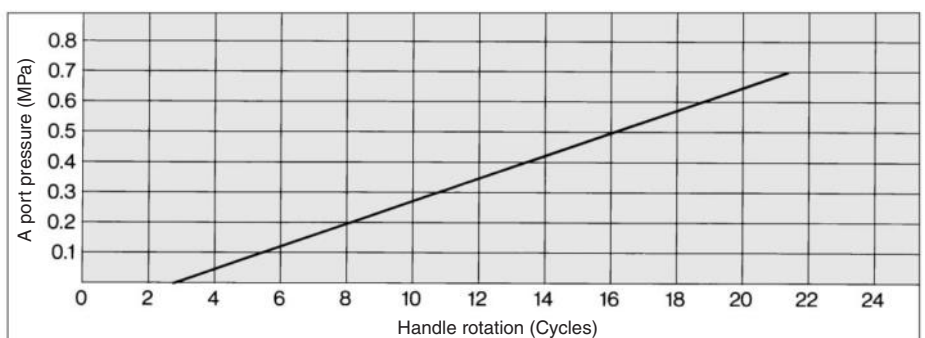
List symbols in the order of valves and blank plates for manifolds from the lefthand side (A port faces this side) of the manifold base.

Ex.) **VVEX2-2-5-02**
 *VEX1233-G — 4 pieces
 *VEX1-17 — 1 piece

Set Pressure Characteristics (Air operated type)



Set Pressure Characteristics (Manual handle type)



- F.R.L.
- AV
- AU
- AF
- AR
- IR
- VEX
- AMR
- ITV
- IC
- VBA
- VE□
- VY1
- G
- PPA
- AL

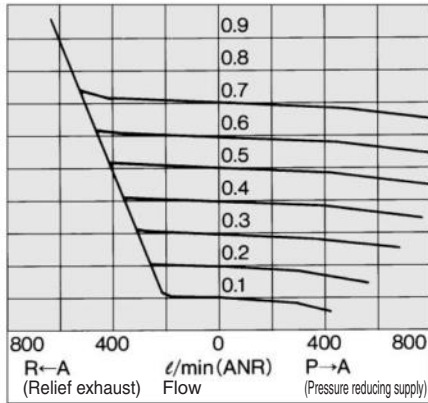
Series VEX1□3₃

Flow Characteristics

P port pressure: 1 MPa

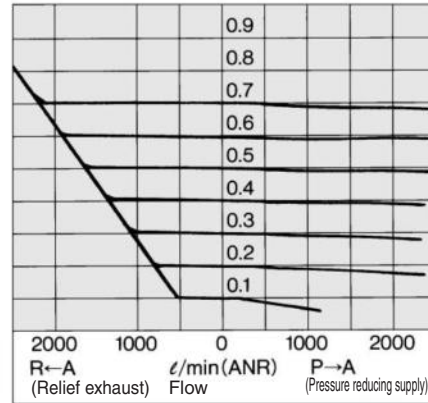
VEX1A33, VEX1B33-01

A port pressure (MPa)



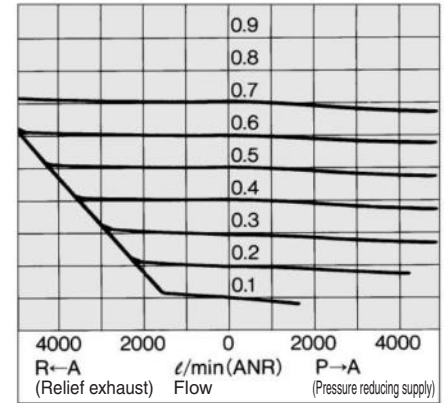
VEX113₃⁰, VEX123₃⁰⁻⁰²

A port pressure (MPa)

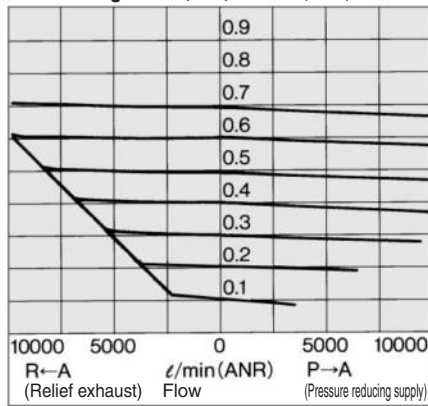


VEX133₃⁰⁻⁰³

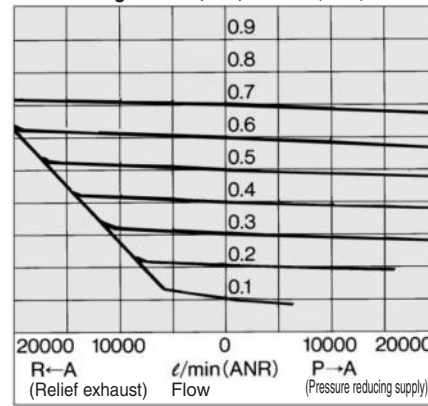
A port pressure (MPa)



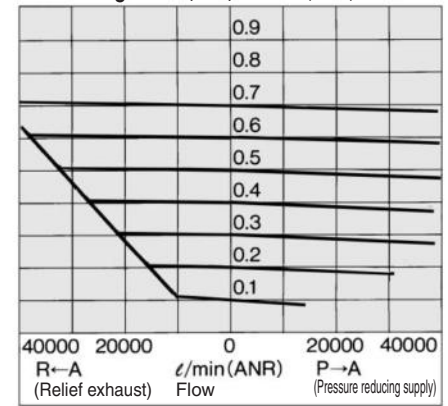
VEX153₃⁰⁻⁰⁶ A port pressure (MPa)



VEX173₃⁰⁻¹² A port pressure (MPa)



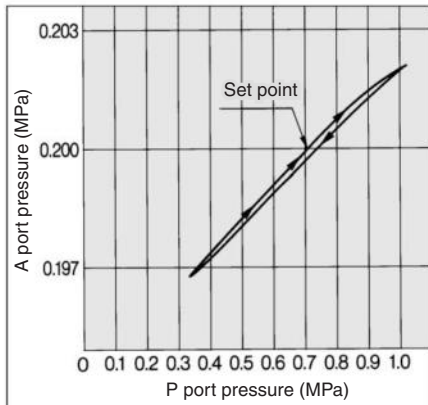
VEX193₃⁰⁻²⁰ A port pressure (MPa)



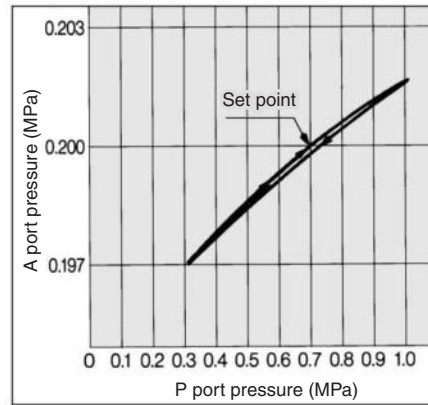
Pressure Characteristics

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

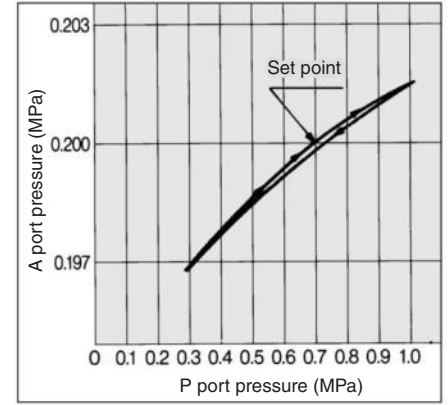
VEX1A33, VEX1B33



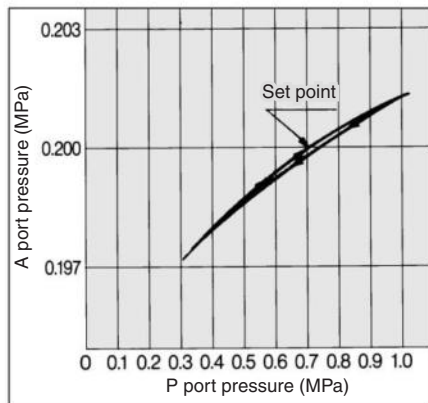
VEX113₃⁰, VEX123₃⁰



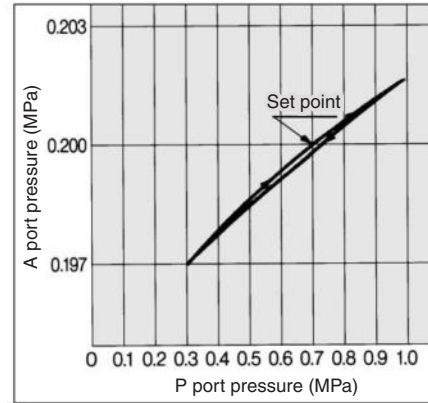
VEX133₃⁰



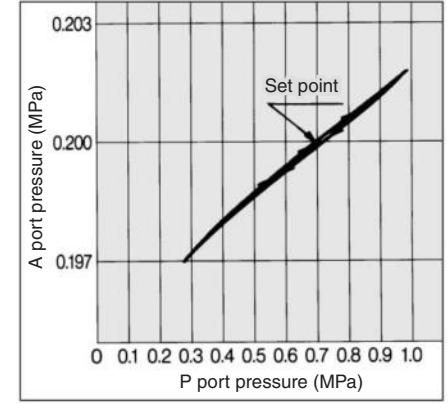
VEX153₃⁰



VEX173₃⁰



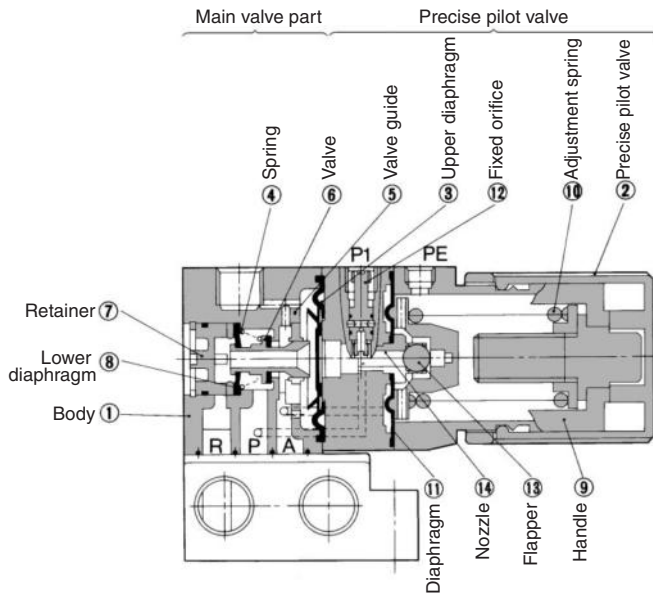
VEX193₃⁰



Precision Regulator Series VEX1□3₃

Construction/Working Principle

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.

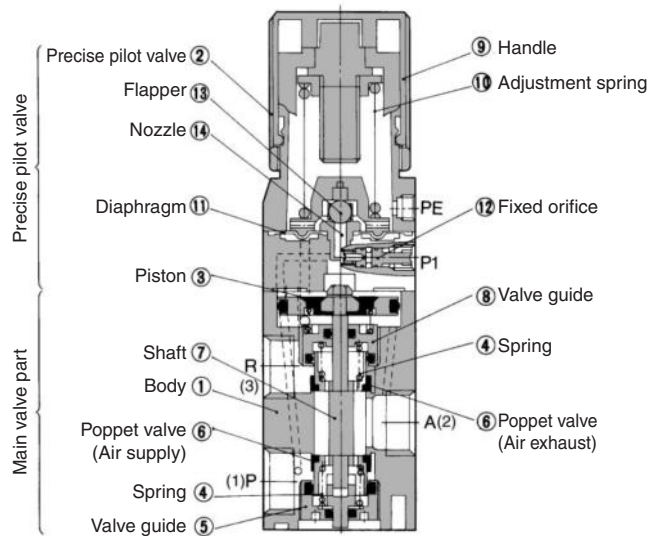
When the outlet pressure increases higher than the set pressure, it pushes diaphragm ⑪ towards the right, and the pressure at the right side of top diaphragm ③ decreases, causing top diaphragm ③ to move to the right. Then, valve ⑥ moves away from the left surface of top diaphragm ③, the outlet pressure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

Component Parts

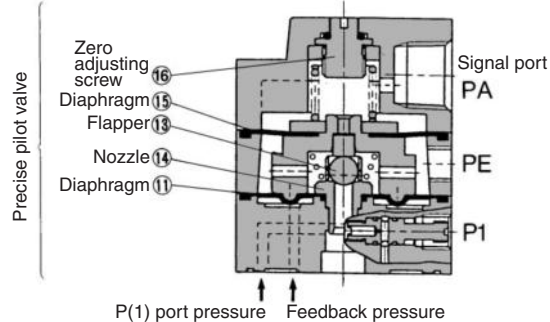
No.	Description	Material
①	Body	Zinc alloy die-casted
②	Precise pilot valve	Aluminum alloy die-casted
③	Upper diaphragm	NBR/FKM
④	Spring	Stainless steel
⑤	Valve guide	Stainless steel
⑥	Valve	NBR/FKM
⑦	Retainer	Polycetal
⑧	Lower diaphragm	NBR/FKM

VEX113₃⁰, VEX123₃⁰, VEX133₃⁰, VEX153₃⁰ VEX173₃⁰, VEX193₃⁰

Manual handle type



Air operated type



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 the 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 type.

Component Parts

No.	Description	Material
①	Body	Aluminum alloy die-casted
②	Precise pilot valve	Aluminum alloy die-casted
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

F.R.L.

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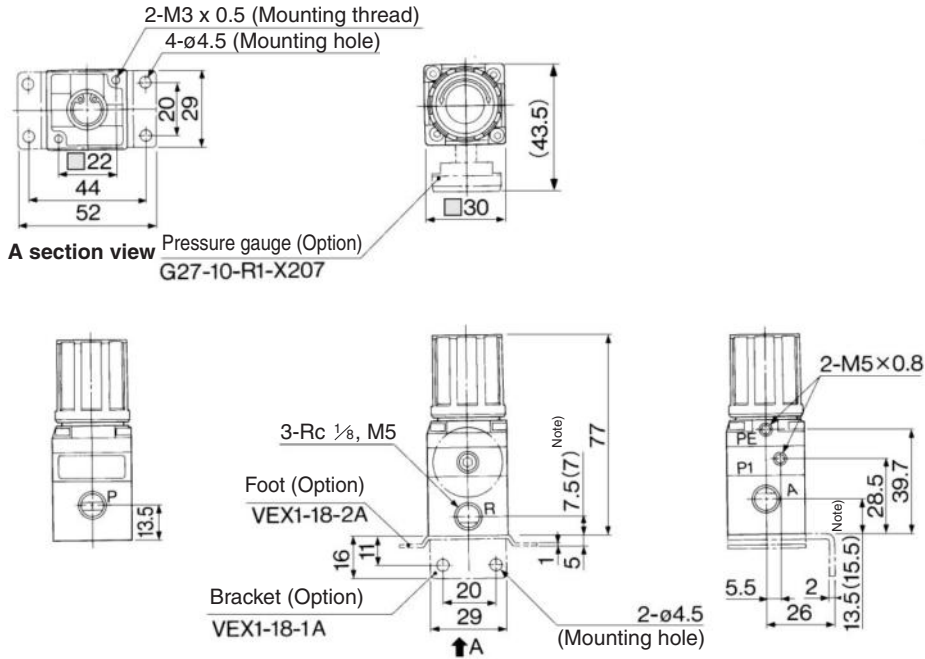
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Series VEX1□3₃⁰



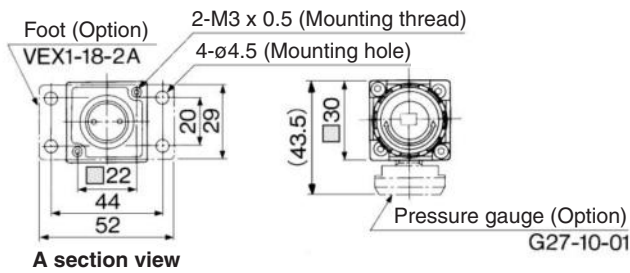
Body Ported

VEX1A33-M5, 01

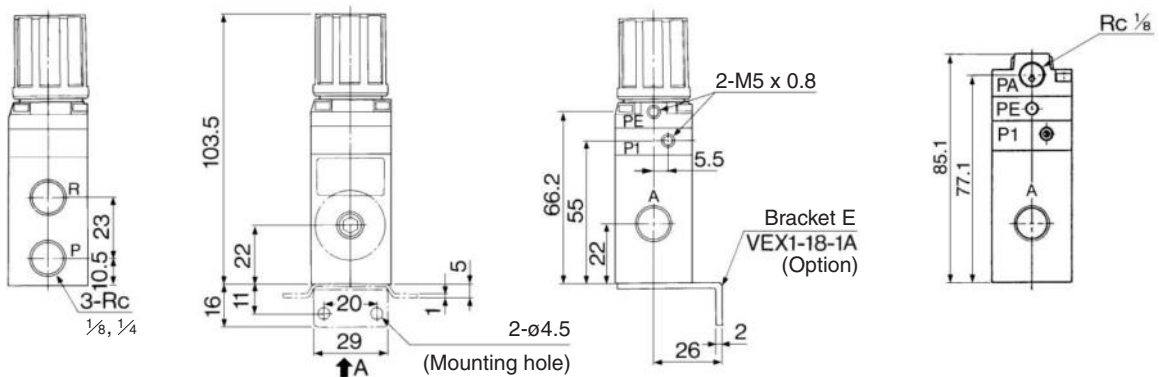


Note () are the dimensions of "M5".

VEX113₃⁰-01, 02



Air operated type

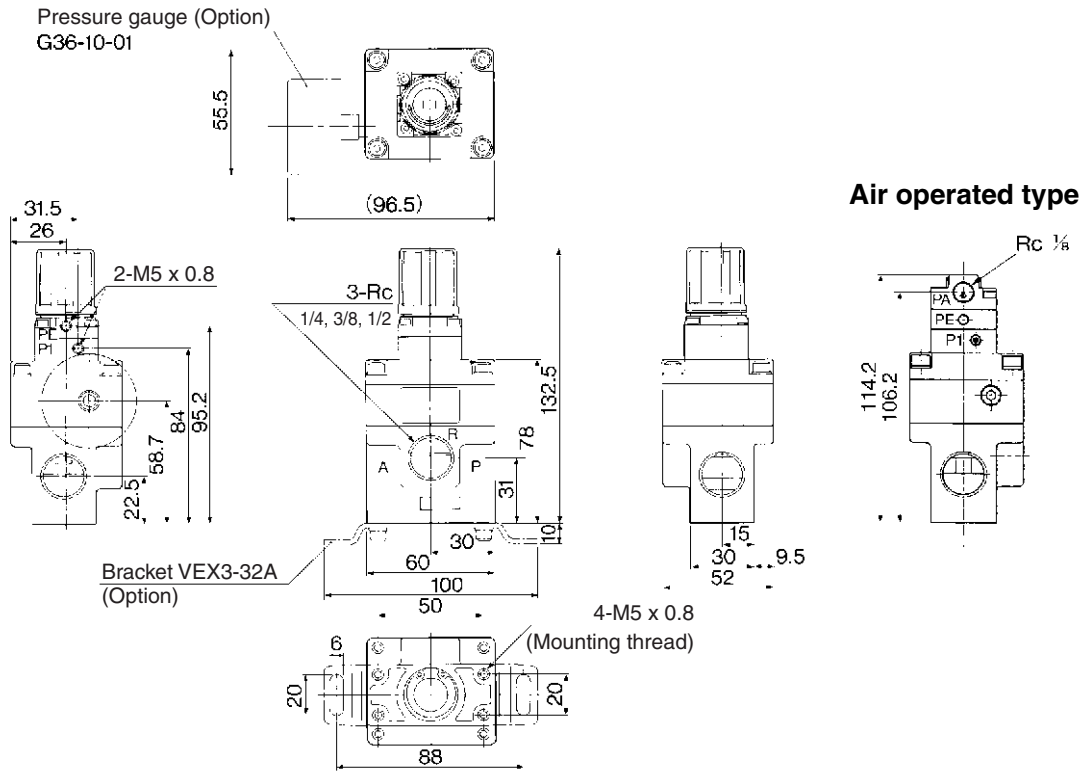


Precision Regulator Series VEX1□3⁰₃

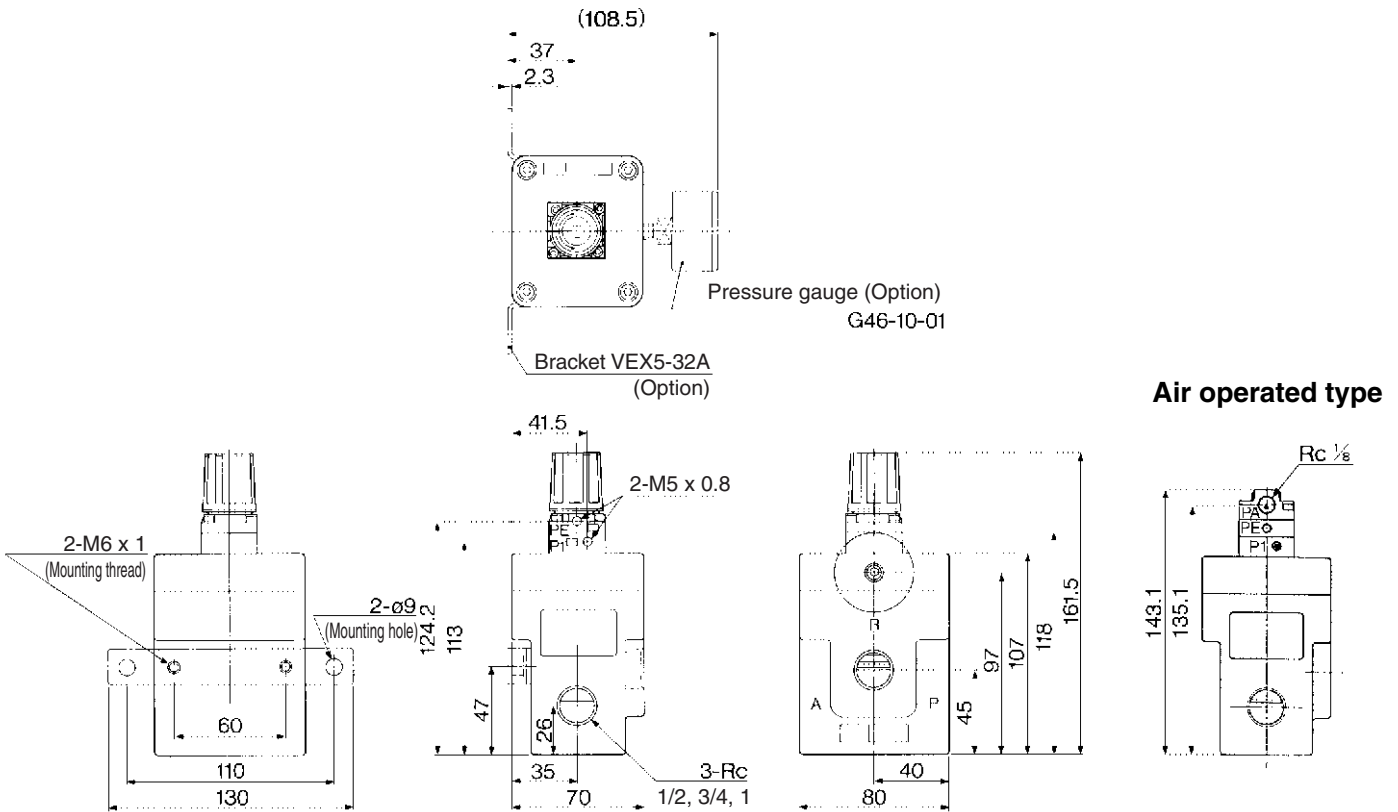


Body Ported

VEX133⁰-02, 03, 04



VEX153⁰-04, 06, 10



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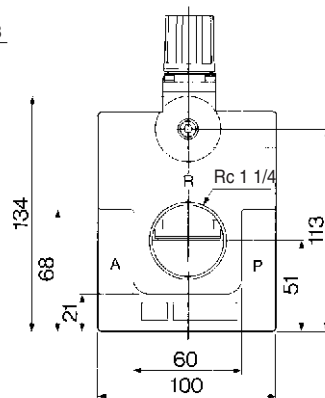
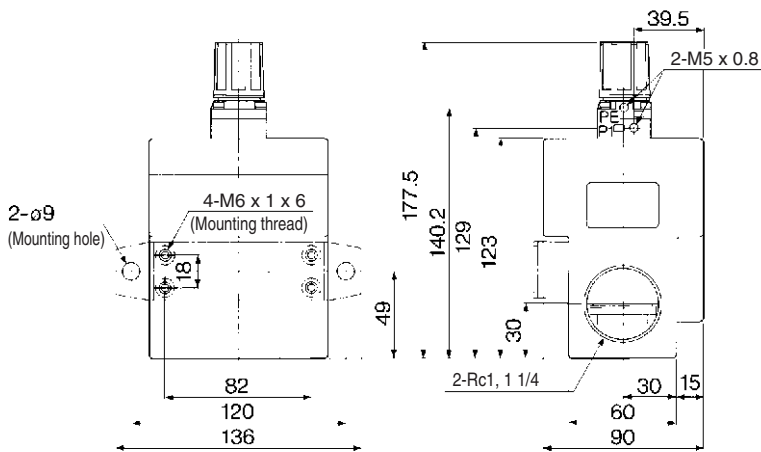
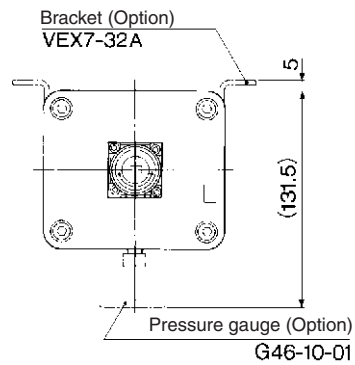
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Series VEX1□3₃⁰

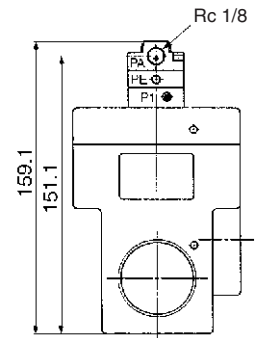


Body Ported

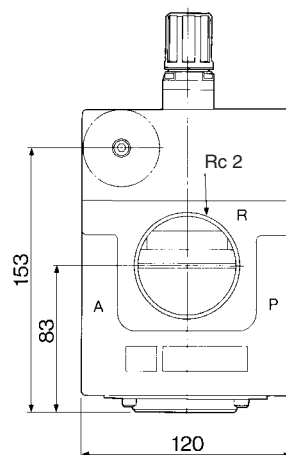
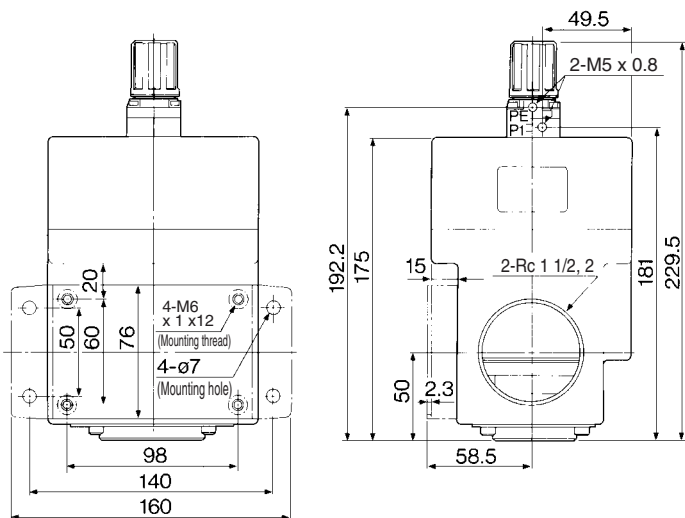
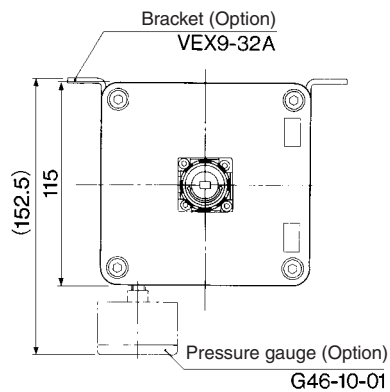
VEX173₃⁰-10, 12



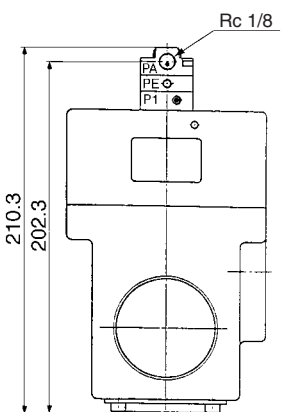
Air operated type



VEX193₃⁰-14, 20



Air operated type

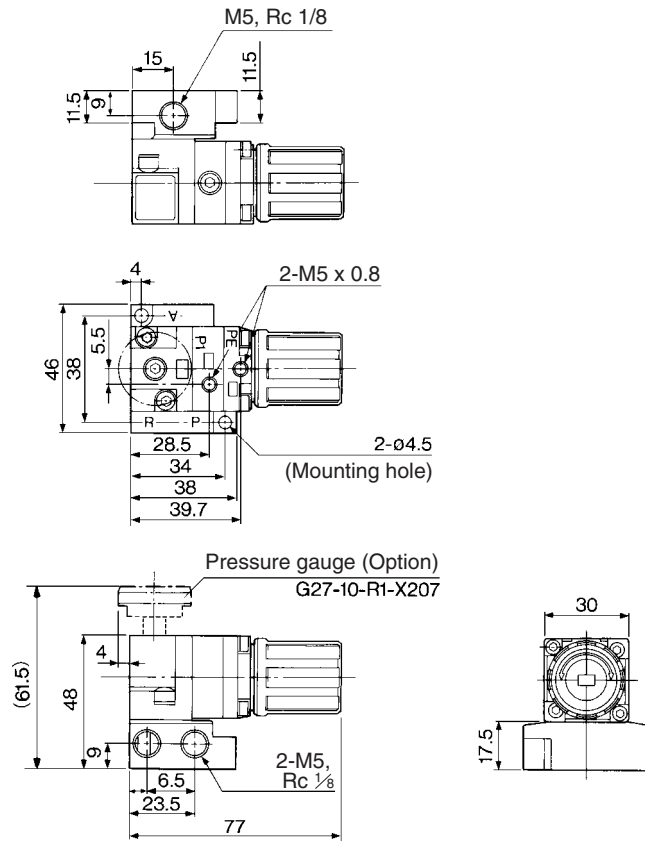


Precision Regulator Series VEX1□3₃⁰

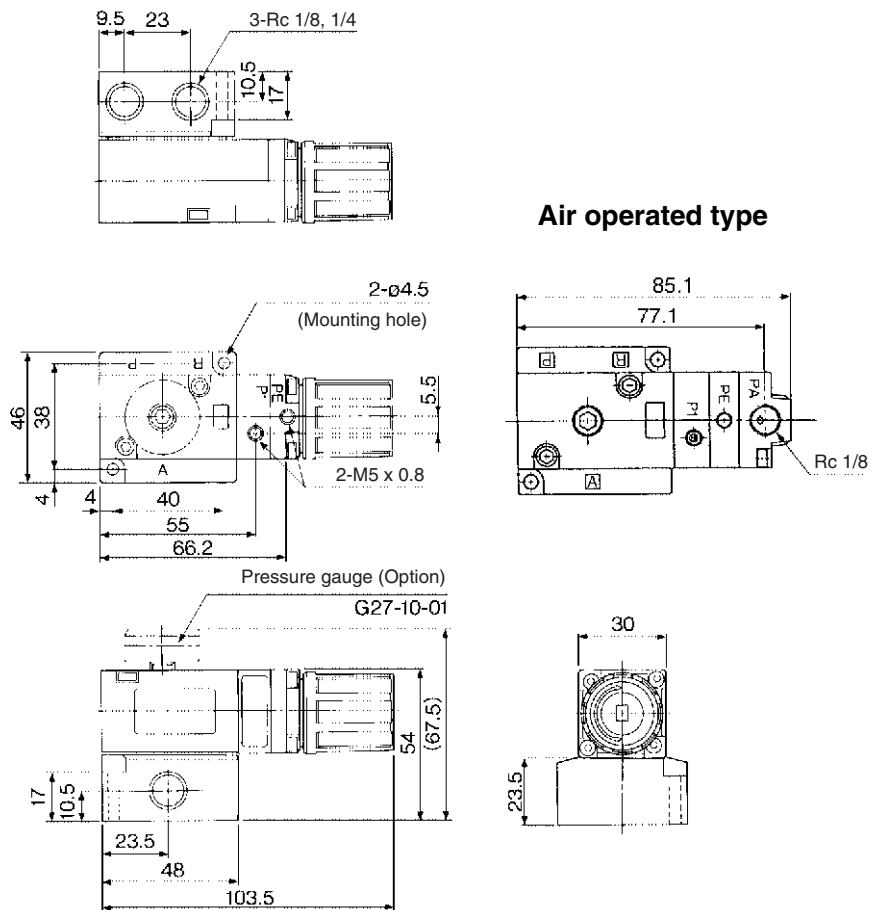


Base Mounted

VEX1B33-M5, 01



VEX123₃⁰-01, 02



Air operated type

- F.R.L.
- AV
- AU
- AF
- AR
- IR
- VEX**
- AMR
- ITV
- IC
- VBA
- VE□
- VY1
- G
- PPA
- AL

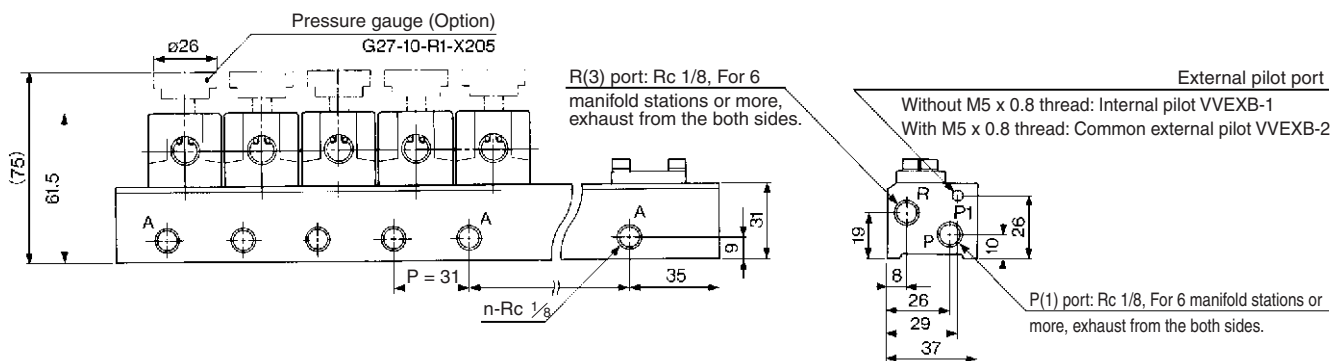
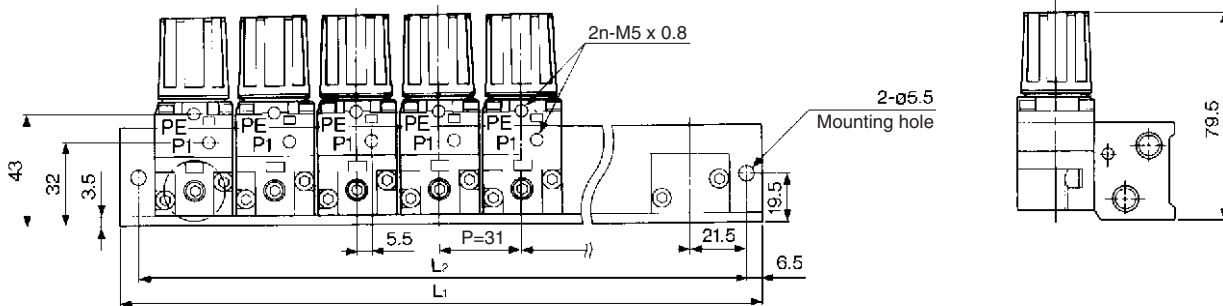
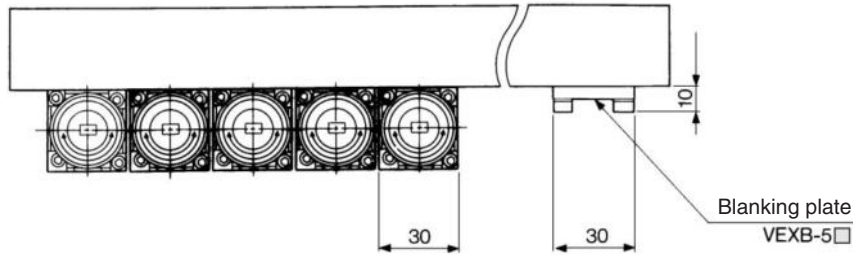
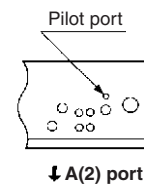
Series VEX1□3₃⁰



Manifold: VVEXB-□-□-01

Applicable valve: VEX1B33

Valve mounting side



L Dimension

L₁ = 31n + 25, L₂ = 31n + 12 n: Station

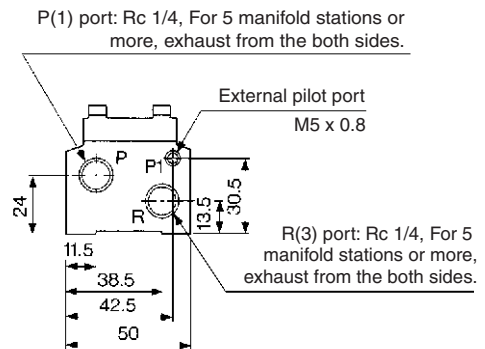
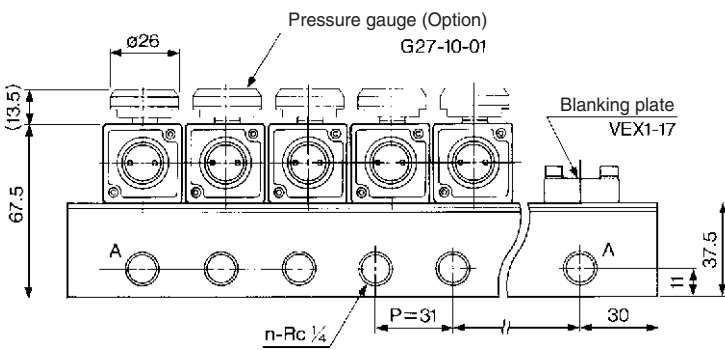
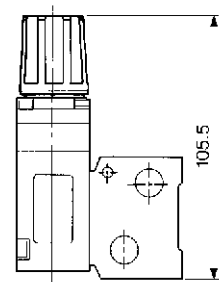
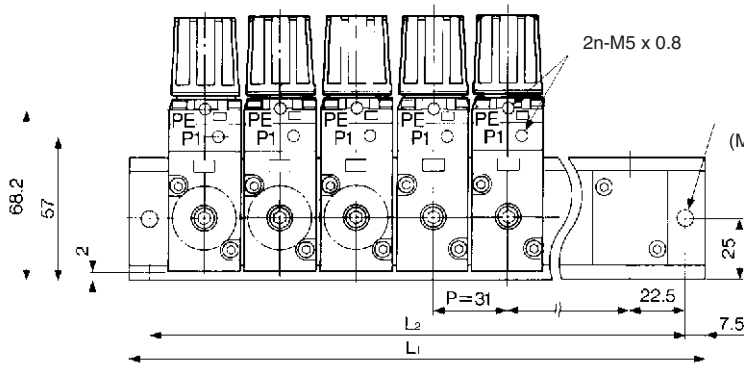
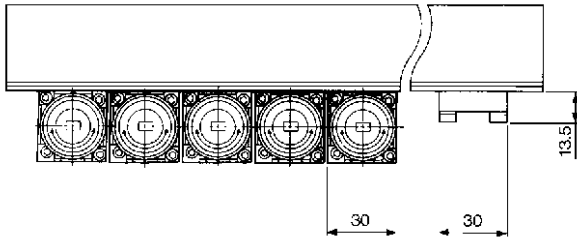
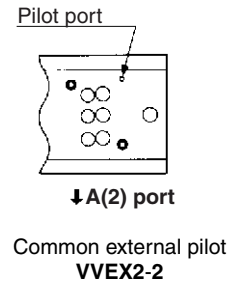
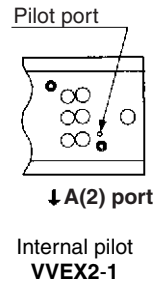
Symbol	n	2	3	4	5	6	7	8	9	10
L ₁		87	118	149	180	211	242	273	304	335
L ₂		74	105	136	167	198	229	260	291	322



Manifold: VVEX2-□-□-02

Applicable valve: VEX123₃⁰

Valve mounting side



L Dimension Equation L₁ = 31n + 29, L₂ = 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

F.R.L.

AV

AU

AF

AR

IR

VEX

AMR

ITV

IC

VBA

VE□

VY1

G

PPA

AL

Series VEX1□3₀³

⚠ Precautions

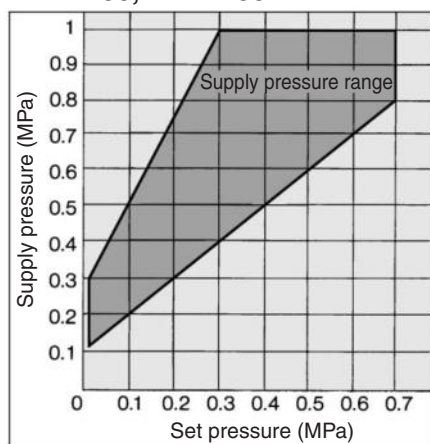
Be sure to read before handling. Refer to pages 14-21-3 to 14-21-4 for Safety Instructions and Common Precautions.

Operating Fluid

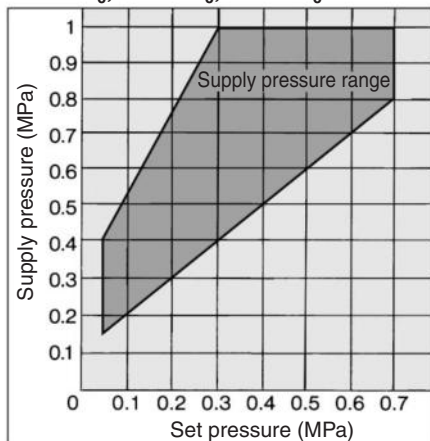
⚠ Caution

- 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.
- 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).
- 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



VEX113₀³, VEX123₀³, VEX133₀³ VEX153₀³, VEX173₀³, VEX193₀³



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

Tightening Torque when Piping

Connection thread	Applicable torque (N·m)
M5 x 0.8	Approx. 1/6 rotation after manual tightening
Rc 1/8	7 to 9
Rc 1/4	12 to 14
Rc 3/8	22 to 24
Rc 1/2	28 to 30
Rc 3/4	28 to 30
Rc 1	36 to 38
Rc 1 1/4	40 to 42
Rc 1 1/2	48 to 50
Rc 2	48 to 50

- Ordinarily, air is discharged from the bleed hole (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 0.5 MPa 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. When this is the 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).

Regulator for Signals

(Air operated type only)

⚠ Caution

- Applicable model
Regulator Series IR2000
Series VEX1_AB33
- 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.

Related Products:

Silencer (Series AN)

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



Model	Connection R	Effective area (mm ²)
AN120	M5 x 0.8	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

For details, refer to Best Pneumatics Vol. 5.

Exhaust cleaner (Series AMC)

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



Model	Connection R	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 35 dB.

For details, refer to Best Pneumatics Vol. 5.