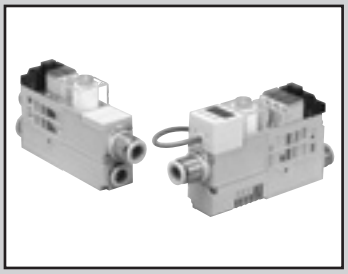


Vacuum ejector unit ideal for controlling large flow rates

VSQ Series

● Nozzle diameter: ø0.7, ø1.0, ø1.2, ø1.5, ø2.0

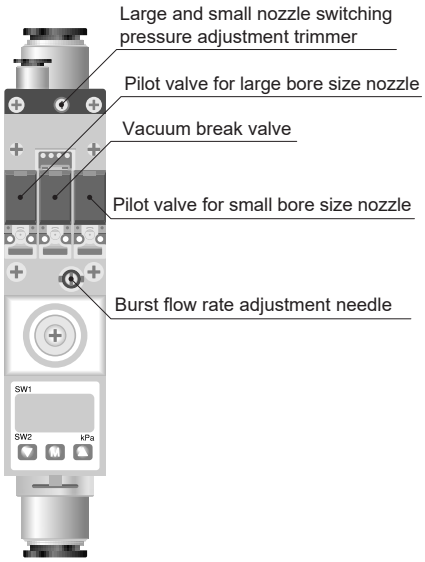
RoHS

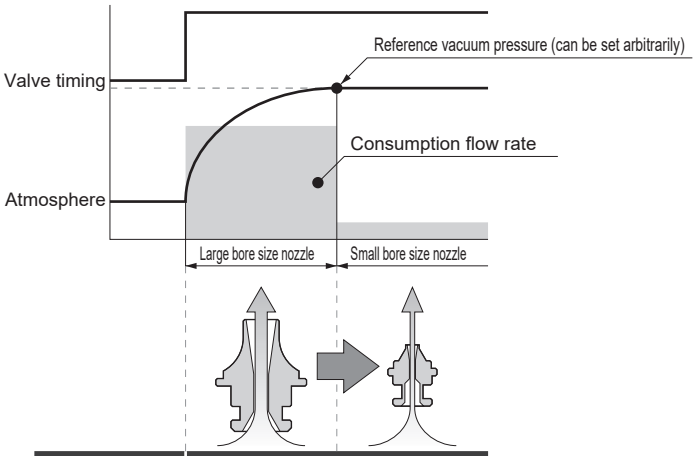
Features

■31.5mm width vacuum unit ideal for large flow rate control.

■Three types of vacuum ejector unit have been standardized: single nozzle, 2-stage nozzle, twin nozzle.

■The twin nozzle is ideal for use with long suction time and transportation time.
- ●Since large bore size rise is controlled up to the reference vacuum pressure by the vacuum nozzle and above the reference vacuum pressure by the small bore size nozzle, consumption flow rate can be significantly reduced. (Patent pending)
- ●The signal for vacuum generation can be controlled with one signal.





Nozzle	Consumption flow rate	
T15	100	23
T20	200	46

■The suction flow rate of the 2-stage nozzle has been increased by about 40% compared to the conventional single type.

■The single nozzle is an orthodox integrated large flow rate vacuum ejector.

■Wide variety of vacuum generating valves.
- ●Single nozzle: normally open, normally closed, self-hold
- ●2-stage nozzle: normally open, normally closed
- ●Twin nozzle: normally closed

■An easy-to-read 2-screen digital display pressure sensor is available for the pressure sensor.

■The minus common specification can be selected when the minus side of the power supply is used as a common reference potential.

Specifications

Descriptions	VSQ
Working fluid	Air
Working pressure MPa	0.3 to 0.7
Ambient/fluid temperatures °C	5 to 50

Ejector characteristics

Nozzle		Nozzle diameter (mm)		Rated supply pressure (MPa)	Achieved vacuum pressure (-kPa)	Intake flow rate (ℓ/min(ANR))	Air consumption rate (ℓ/min(ANR))
Single nozzle	H15	1.5	-	0.5	93	63	100
	L15				66	95	
	E15			0.35	92	42	70
	H20	2.0	-	0.5	93	110	200
	L20				66	180	
	E20			0.35	92	84	150
Twin nozzle	T15	0.7 (Small bore size)	1.5 (Large bore size)	0.5	93(93)	40(24)	100(23)
	T20	1.0 (Small bore size)	2.0 (Large bore size)			70(36)	200(46)
2-stage nozzle	D07	0.7	-	0.5	93	52	23
	D10	1.0	-			75	46
	D12	1.2	-			85	70

*1 : Values in ( ) for twin nozzle ( ) are the values of small bore size nozzles.
*2 : Values in table are representative values. Suction flow rate differs with the vacuum piping conditions (vacuum port size, pipe length).

Valve specifications

● Pilot valve

Descriptions	Pilot valve	
Valve and operation	Direct acting poppet valve	
Rated voltage V	24 DC	100 AC
Voltage fluctuation range V	24 DC ±10%	100 AC ±10%
Surge suppressor	Varistor	Bridge diode
Power consumption	0.55 W	1 VA
Manual override	Push locking	
Operation display	At coil excitation operation: Red LED lights	

● Switching valve

· Twin nozzle

Descriptions	Small bore size valve	Large bore size valve	Vacuum break valve
Valve and operation	Pilot operated poppet valve		
Valve	Normally closed	Normally closed	Normally closed
Lubrication	Not required		
Effective cross-sectional area mm^2 (Cv)	3.5 (0.19)	16.5 (0.89)	3.5 (0.19)

· 2-stage nozzle

Descriptions	Vacuum generating valve	Vacuum break valve
Valve and operation	Pilot operated poppet valve	
Valve	Normally closed, normally open	Normally closed
Lubrication	Not required	
Effective cross-sectional area mm^2 (Cv)	3.5 (0.19)	3.5 (0.19)

· Single nozzle

Descriptions	Vacuum generating valve	Vacuum break valve
Valve and operation	Pilot operated poppet valve	
Valve	Normally closed, normally open, self-hold	Normally closed
Lubrication	Not required	
Effective cross-sectional area mm^2 (Cv)	16.5 (0.89)	3.5 (0.19)
Min. excitation time ms	50 or more	

Vacuum pressure switch specifications

Descriptions		Vacuum pressure switch	
		NPN output (R)	PNP output (RP)
Working pressure kPa		-100 to 100	
Proof pressure kPa		500	
Environmental resistance	Ambient temperature (in storage) ℃	-10 to 60 (no condensation or freezing)	
	Ambient temperature (in use) ℃	0 to 50 (no condensation or freezing)	
	Ambient humidity (in storage/in use)	35 to 85% RH (no condensation)	
	Degree of protection	IEC standards IP40 or equivalent	
Power supply voltage V		12 to 24 DC±10% ripple (P-P) ±10% or less	
Current consumption mA		40 or less (no load)	
Pressure display	Display frequency	5 cycles/second	
	Display accuracy	±2%F.S. ±1digit	
	Digital display	Main display: 2 colors (red, sub-display: orange)	
Switch output	No. of output points	2 points	
	Output method	NPN open collector	PNP open collector
	Switch rating	30 VDC, 125 mA or less	
	Internal voltage drop	1.5 V or less	
Temperature characteristics		±2%F.S. or less (0~50°C, at25°C)	
Repeatability		±0.2%F.S. ±1digit	
Hysteresis		Adjustment is possible	
Responsivity		Selectable (50/250/500/1000/2000/3000 ms)	

Vacuum filter specifications

Descriptions	Vacuum filter
Element material	PVF (Polyvinyl formal)
Filtration rating μm	10
Filtration area mm^2	1507
Replacement filter element model No.	VSQ-E

Vacuum burst function

Descriptions	Vacuum burst function
Break air flow rate ℓ/min (ANR)	0 to 50 (at supply pressure 0.5 MPa)

Valve lead wire color

● 24 VDC plus common specifications

Nozzle	Black	Gray	Blue	Brown
Twin nozzle	Vacuum generation (-)	Vacuum burst (-)	Minus (-)	24 VDC(+common)
2-stage nozzle	Vacuum generation (-)	Vacuum burst (-)	- (*1)	24 VDC(+common)
Single nozzle	Vacuum generation (-)	Vacuum burst (-)	- (*1)	24 VDC(+common)

● 24 VDC minus common specifications

Nozzle	Black	Gray	Blue	Brown
2-stage nozzle	Vacuum generation (+)	Vacuum burst (+)	- (*1)	0V(-common)
Single nozzle	Vacuum generation (+)	Vacuum burst (+)	- (*1)	0V(-common)

● 100 VAC specifications

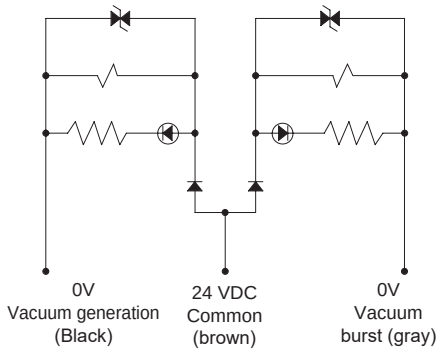
Nozzle	Black	Gray	Blue	Brown
2-stage nozzle	Vacuum generation (-)	Vacuum burst (-)	- (*1)	common
Single nozzle	Vacuum generation (-)	Vacuum burst (-)	- (*1)	common

*1: Blue lead wires are not used for 2-stage nozzles and single nozzles.

Electric circuit (solenoid valve)

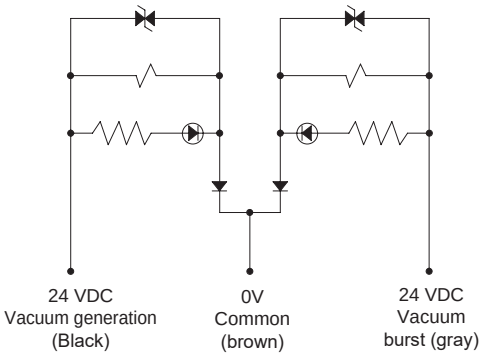
●24 VDC

・Single nozzle
・2-stage nozzle



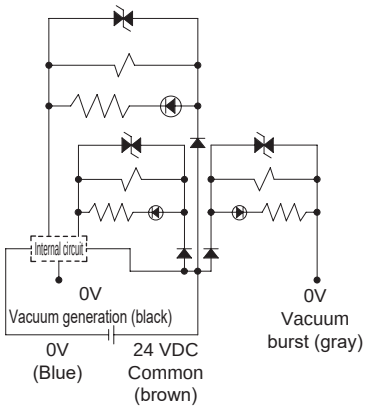
Plus common specifications

・Single nozzle
・2-stage nozzle



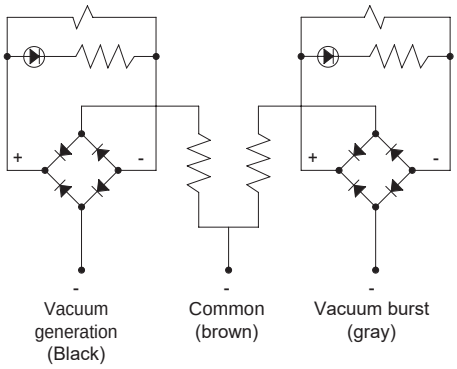
Minus common specifications

・Twin nozzle



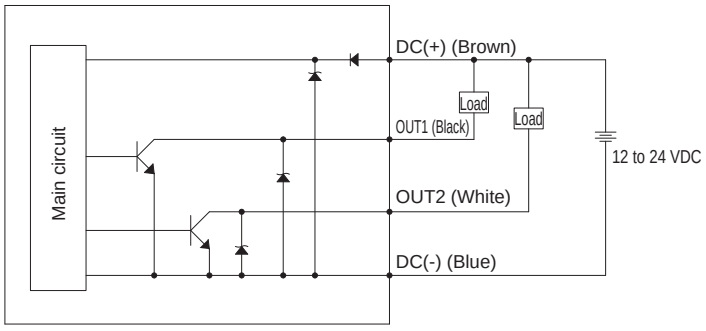
●100 VAC

・Single nozzle
・2-stage nozzle

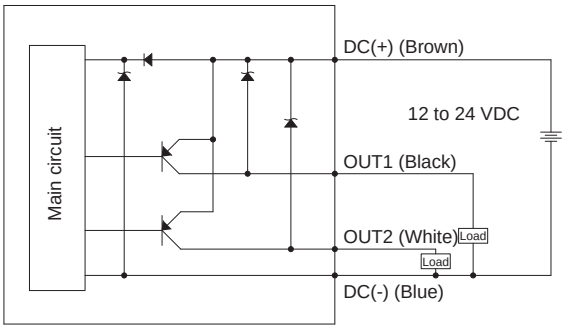


Vacuum pressure switch electric circuit diagram

● NPN open collector output

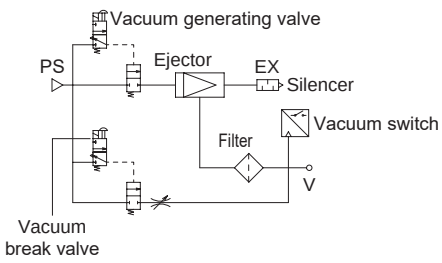


● PNP open collector output

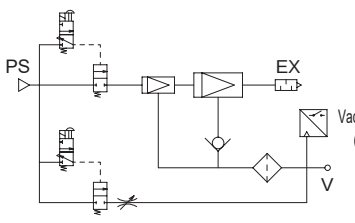


Circuit diagram

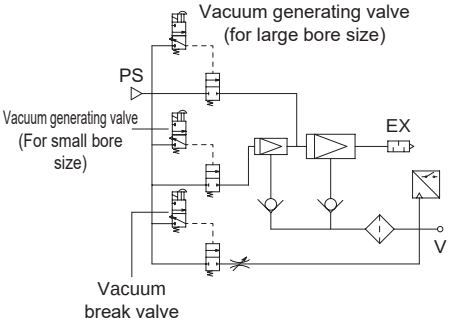
● Single nozzle



● 2-stage nozzle



● Twin nozzle



How to order

● 31.5 mm width single unit dedicated vacuum ejector unit

VSQ - T15 B - 10 10 J - 3 - R

Ⓐ Vacuum characteristics, nozzle diameter

Code	ContentVolume	
Ⓐ Vacuum characteristics, nozzle diameter *1, *2, *3, *4		
	Vacuum characteristics	Nozzle diameter
H15	High vacuum/medium flow rate	ø1.5
L15	Medium vacuum/large flow rate	ø1.5
E15	High vacuum/low flow rate	ø1.5
H20	High vacuum/medium flow rate	ø2.0
L20	Medium vacuum/large flow rate	ø2.0
E20	High vacuum/low flow rate	ø2.0
T15	Twin nozzle	ø1.5 (ø0.7)
T20	Twin nozzle	ø2.0 (ø1.0)
D07	2-stage nozzle	ø0.7
D10	2-stage nozzle	ø1.0
D12	2-stage nozzle	ø1.2

Ⓑ Valve

Ⓑ Valve *1, 2	
A	Normally open (NO)
B	Normally closed
D	Self-hold

Ⓒ Vacuum port (V)

Ⓒ Vacuum port (V)	
8	ø8 push-in fitting
10	ø10 push-in fitting

Ⓓ Air supply port (PS)

Ⓓ Air supply port (PS) *3	
6	ø6 push-in fitting
8	ø8 push-in fitting
10	ø10 push-in fitting

Ⓔ Exhaust port (EX)

Ⓔ Exhaust port (EX)	
S	Atmospheric release with silencer
J	ø12 push-in fitting common exhaust

Ⓕ Solenoid valve voltage

Ⓕ Solenoid valve voltage *4	
1	100 VAC
3	24 VDC (plus common specifications)
3MC	24 VDC (minus common specifications)

Ⓖ Vacuum pressure switch specifications

Ⓖ Vacuum pressure switch specifications	
Blank	Without vacuum pressure switch
R	With digital display, NPN output 2 points
RP	With digital display, PNP output 2 points

⚠ Precautions for model No. selection

*1: Ⓐ For "T15" and "T20", Ⓑ "A" and "D" cannot be selected.
*2: Ⓐ For "D07", "D10", and "D12", Ⓑ "D" cannot be selected.
*3: Ⓓ "6" indicates that Ⓐ Can be selected only for "D07", "D10" and "D12".
*4: Ⓐ For "T15" and "T20", Ⓕ "1" and "3MC" cannot be selected.

● Maintenance part model No.

・Filter element
VSQ-E

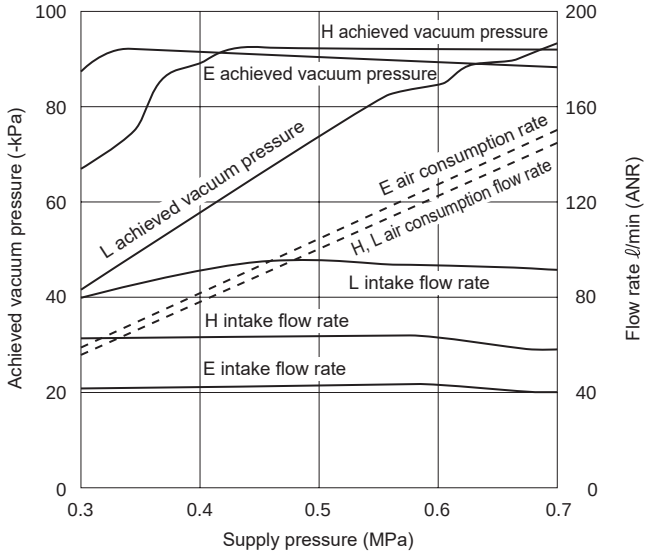
・Silencer element A
VSQ-SEZA

・Silencer element B
VSQ-SEZB

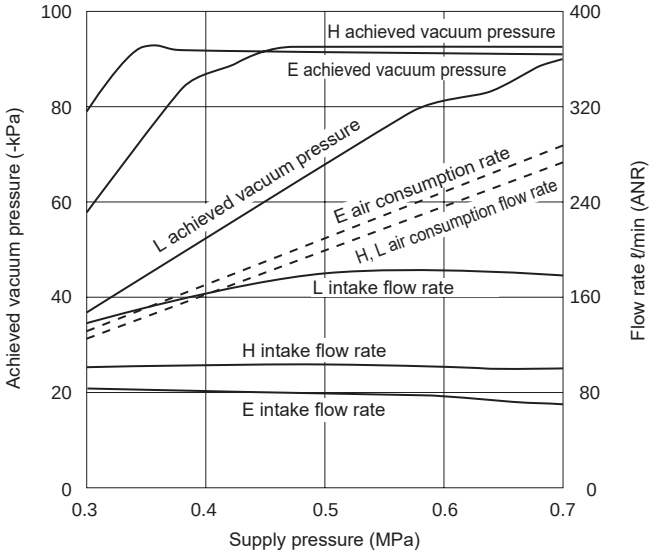
Vacuum characteristics

● Single nozzle

· VSQ-H15 □-□□□-□-□
· VSQ-L15 □-□□□-□-□
· VSQ-E15 □-□□□-□-□ Vacuum characteristics diagram

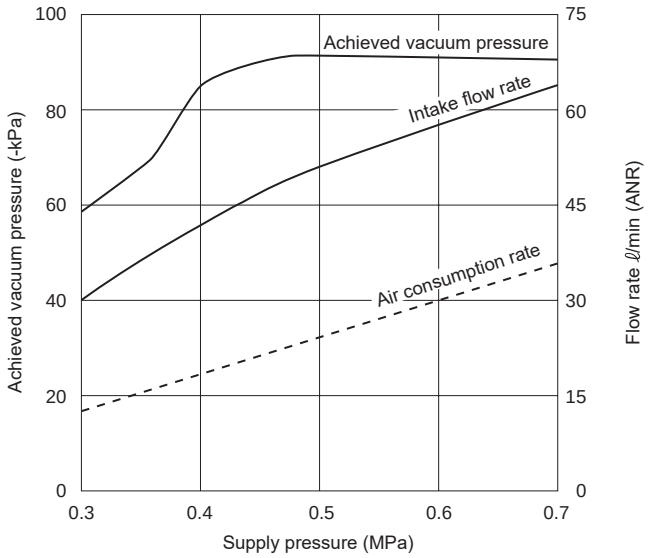


· VSQ-H20 □-□□□-□-□
· VSQ-L20 □-□□□-□-□
· VSQ-E20 □-□□□-□-□ Vacuum characteristics diagram

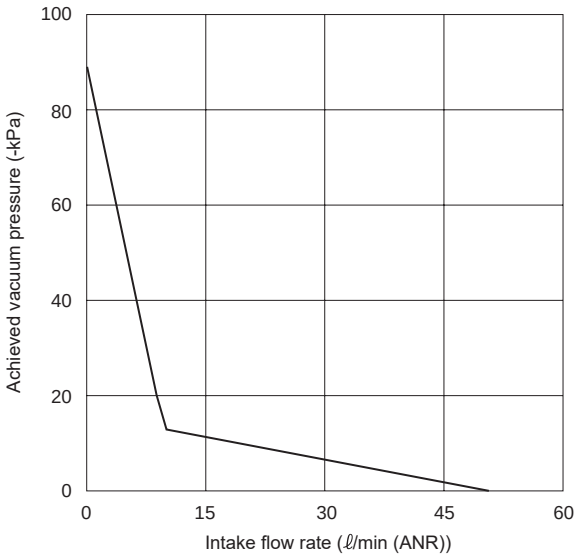


● 2-stage nozzle

· VSQ-D07□-□□□-□-□ Vacuum characteristics diagram



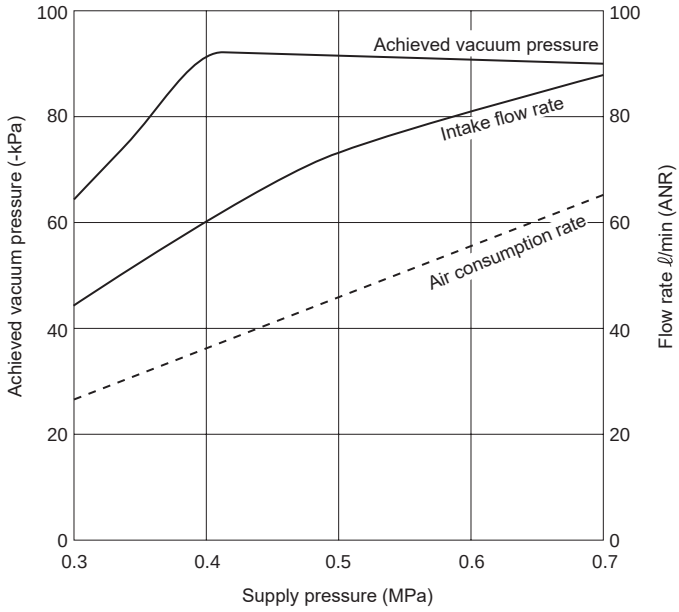
· VSQ-D07 □-□□□-□-□ Flow characteristics diagram



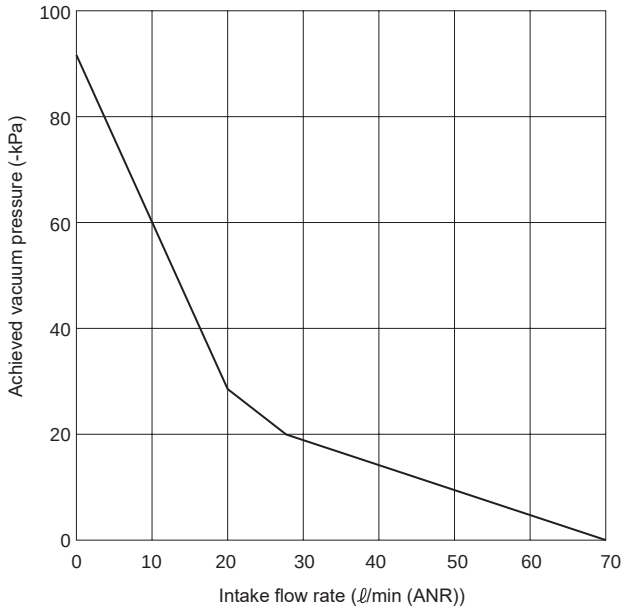
Vacuum characteristics

● 2-stage nozzle

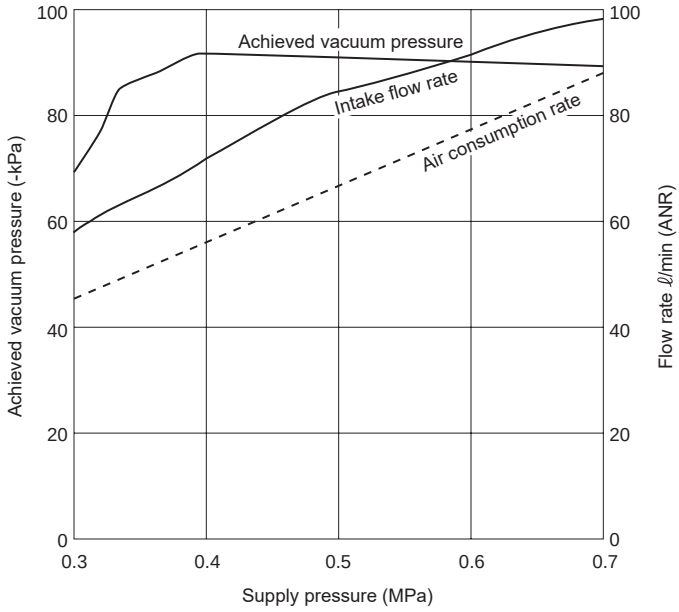
· VSQ-D10□-□□□-□-□ Vacuum characteristics diagram



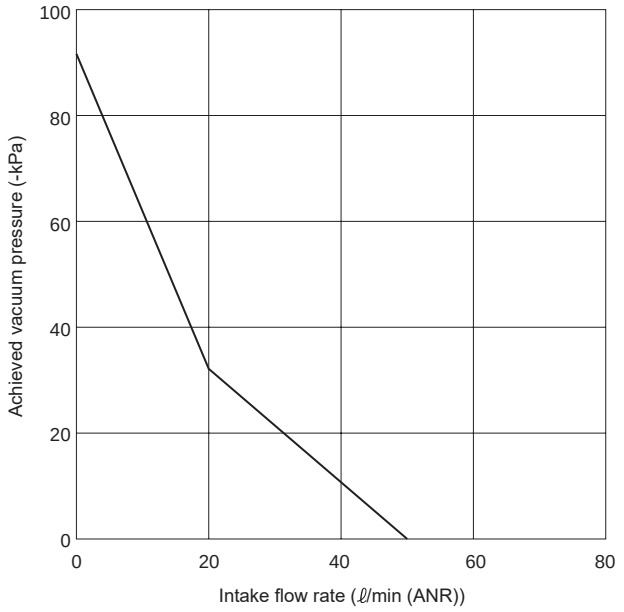
· VSQ-D10□-□□□-□-□ Flow characteristics diagram



· VSQ-D12□-□□□-□-□ Vacuum characteristics diagram



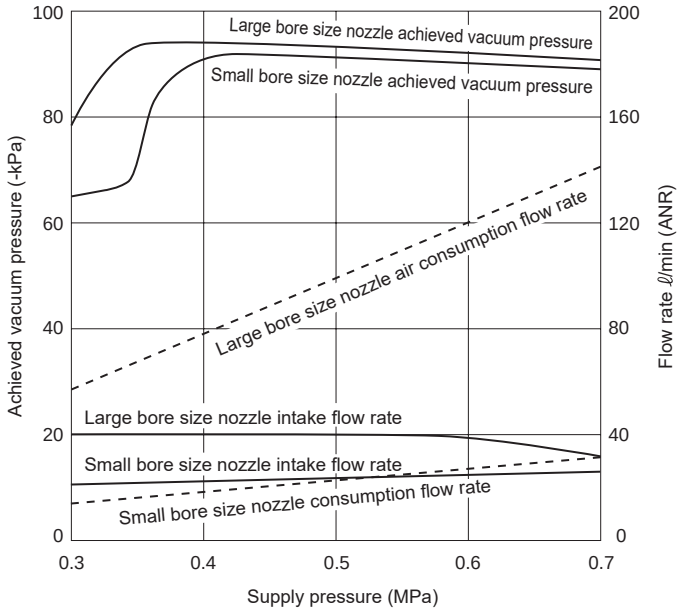
· VSQ-D12□-□□□-□-□ Flow characteristics diagram



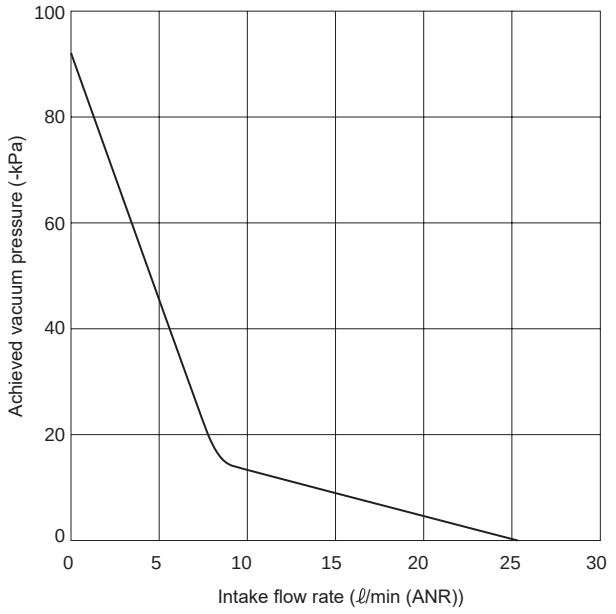
Vacuum characteristics

● Twin nozzle

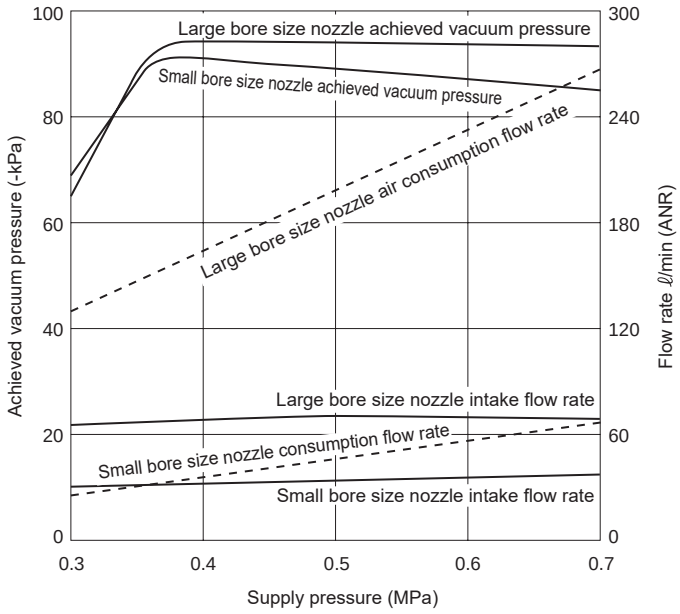
· VSQ-T15B-□□□-□-□ Vacuum characteristics diagram



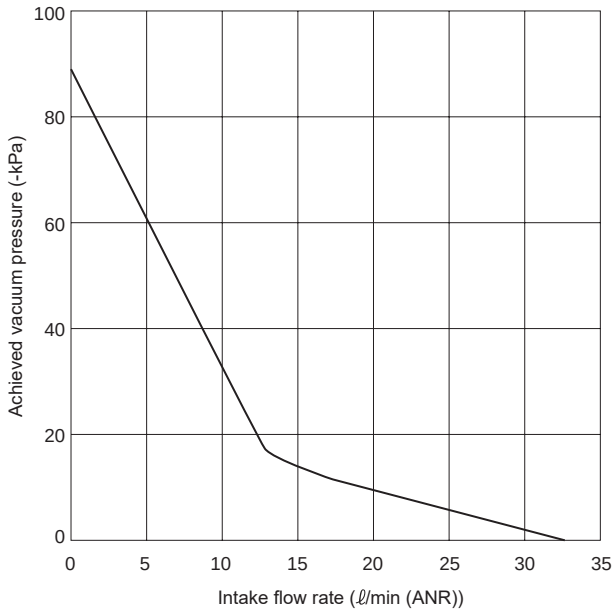
· VSQ-T15B-□□□-□-□ Vacuum characteristics diagram (small bore size nozzle)



· VSQ-T20B-□□□-□-□ Vacuum characteristics diagram



· VSQ-T20B-□□□-□-□ Vacuum characteristics diagram (small bore size nozzle)

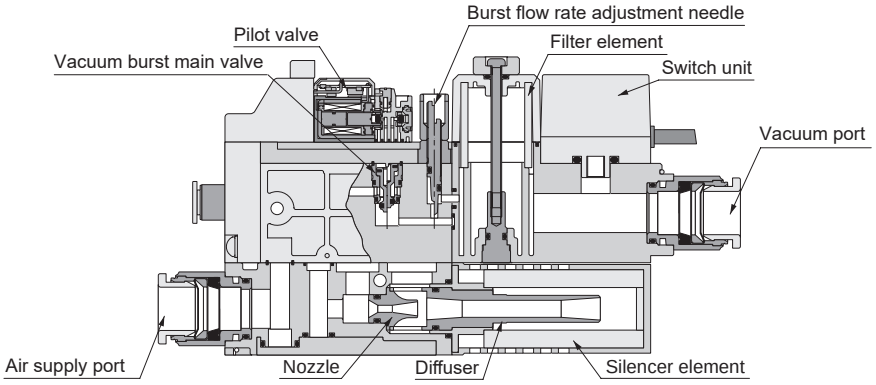


1. Supply pressure with the characteristics described above occurs at vacuum generation.
2. Achieved vacuum pressure with the characteristics described above produces abnormal noise (soft clicking sound) at supply pressure just before reaching the peak value. When this abnormal noise occurs, the characteristics become unstable and operation becomes louder. Reset the supply pressure, as it may affect the sensor, etc., and cause trouble.
   Ex. 1 : Source pressure is 0.5 MPa with the H vacuum ejector. During vacuum ejector operation, supply pressure drops to 0.43 MPa due to pressure drop, and abnormal noise is generated. → Reset supply pressure to 0.5 MPa during vacuum ejector operation.
3. Carry out piping or equipment selection with 3 times the effective cross-sectional area of the nozzle diameter cross-sectional area as a guideline. Satisfactory vacuum characteristics cannot be obtained if adequate supply air flow rate is not maintained.
   (A soft clicking sound occurs at set pressure. Insufficient intake flow rate, insufficient achievement of achieved vacuum pressure, etc.)
   Ex. 2 : Abnormal noise occurs even when pressure is 0.5 MPa with H vacuum ejector during vacuum ejector operation. → Insufficient supply air flow rate. (Supply air flow rate is restricted in front of the vacuum ejector by piping resistance, etc., and supply air flow rate satisfying the properties is not obtained. → Select piping components that can secure the required effective cross-sectional area.)
   Ex. 3 : For vacuum ejector with 1.0mm nozzle diameter, cross-sectional area is $0.5^2 \times \pi = 0.785\ mm^2 \times 3 = 2.35mm^2$. Therefore, carry out piping and equipment selection that ensures an effective cross-sectional area of $2.3mm^2$ or greater.

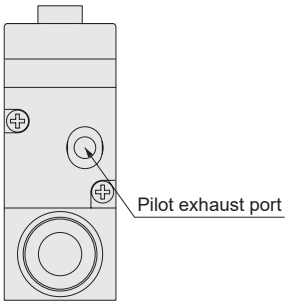
Internal structure

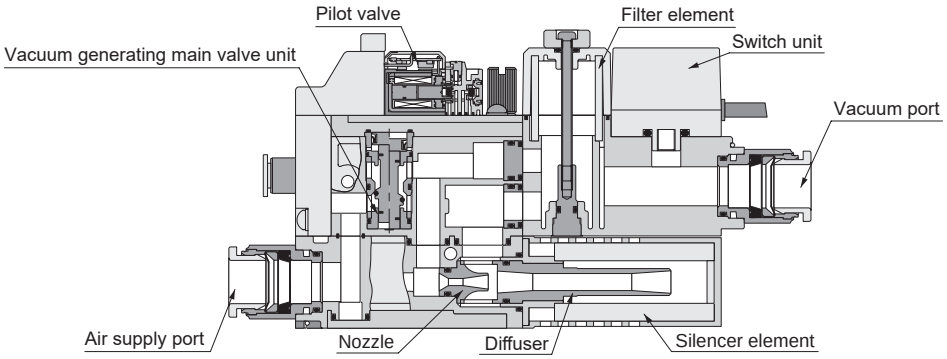
● Single nozzle

· Burst circuit



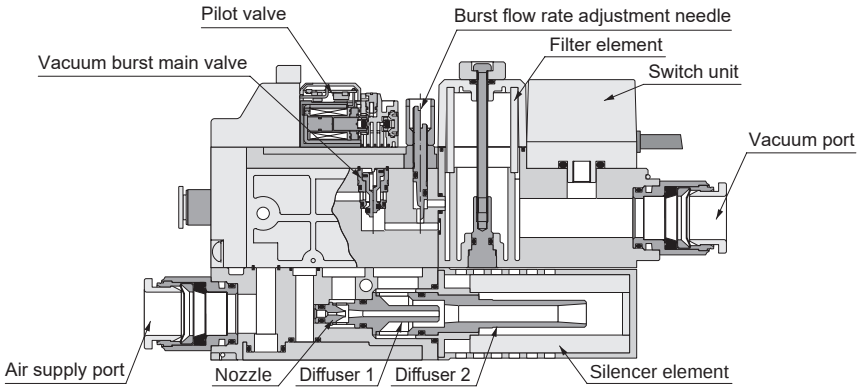
· Vacuum circuit



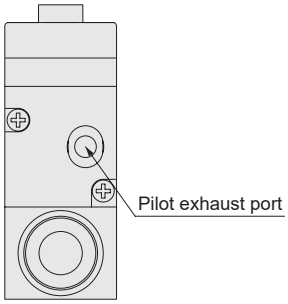


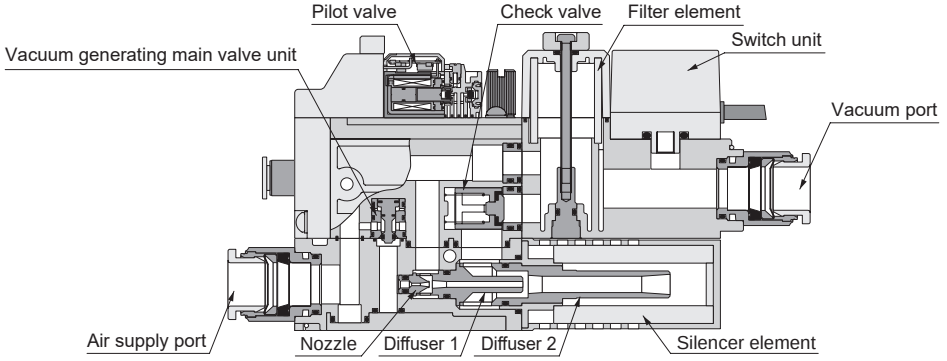
● 2-stage nozzle

· Burst circuit



· Vacuum circuit

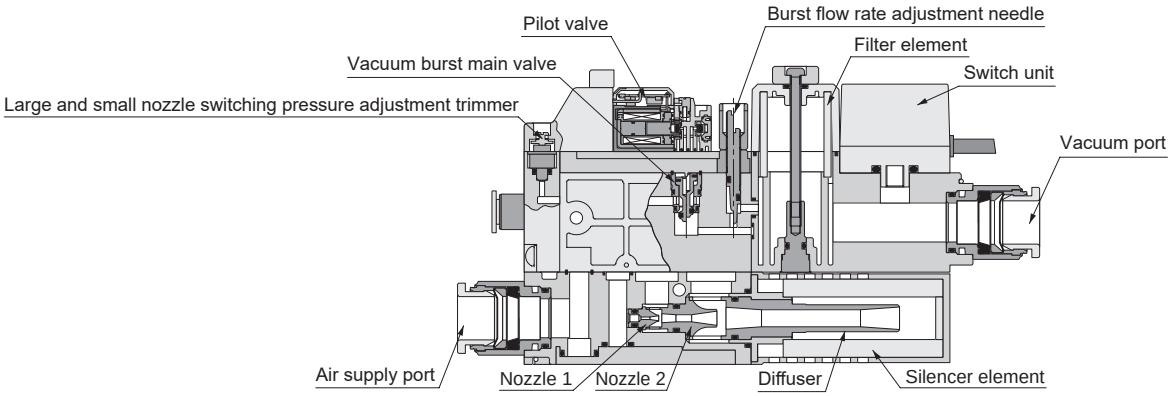




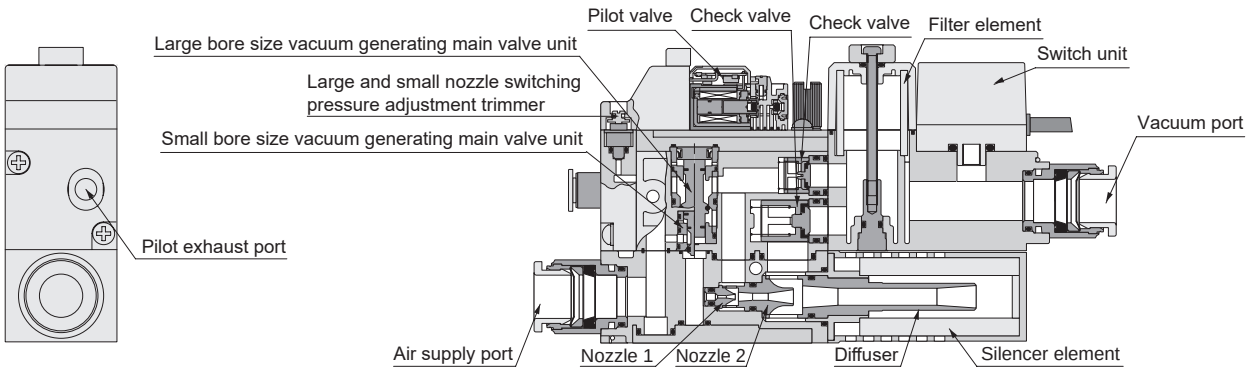
Internal structure

● Twin nozzle

· Burst circuit



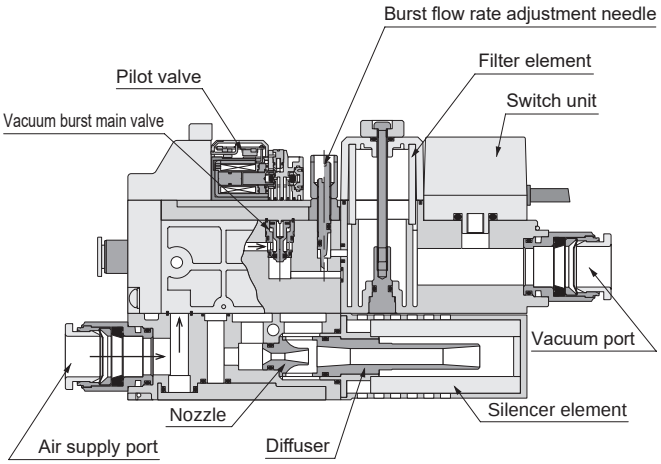
· Vacuum circuit



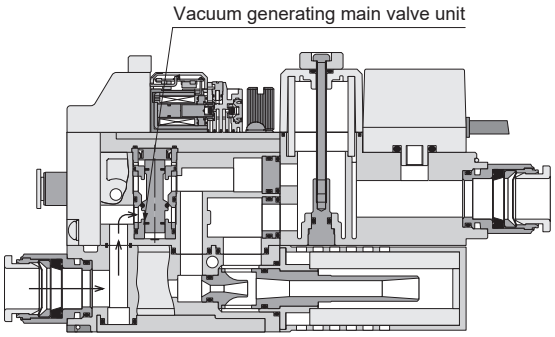
Operational explanation drawing (Single nozzle, normally closed)

● Vacuum generation stopped

· Burst circuit

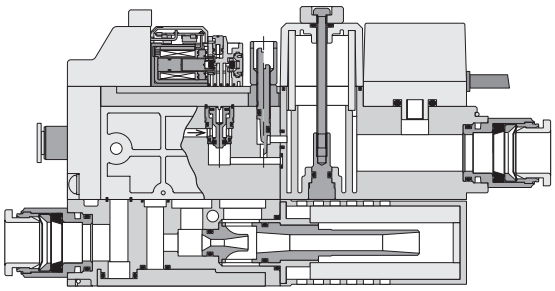


· Vacuum circuit

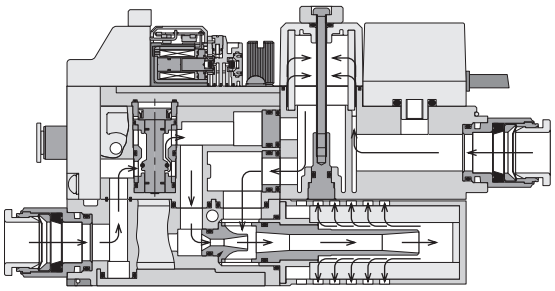


● Vacuum generation status

· Burst circuit

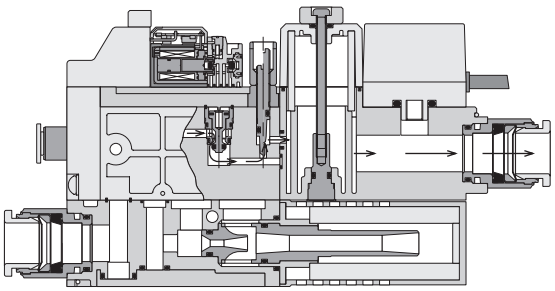


· Vacuum circuit

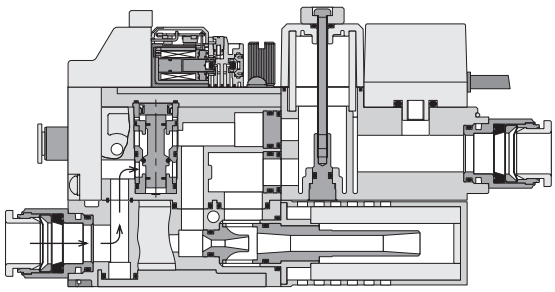


● Vacuum burst air supply

· Burst circuit



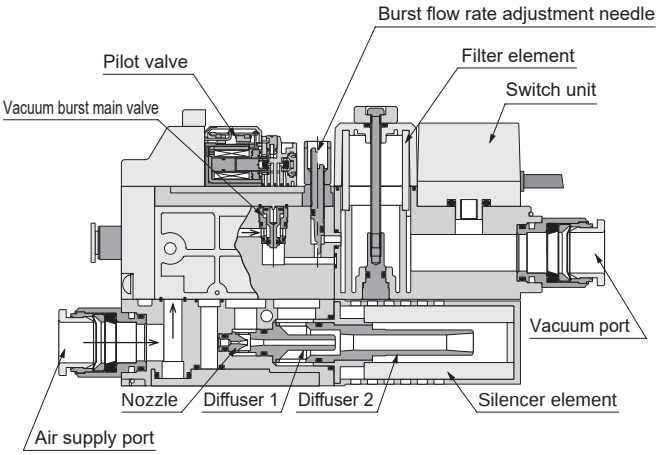
· Vacuum circuit



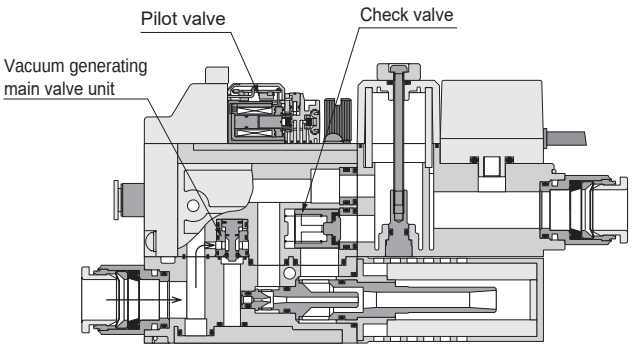
Operational explanation drawing (2-stage nozzle, normally closed)

● Vacuum generation stopped

· Burst circuit

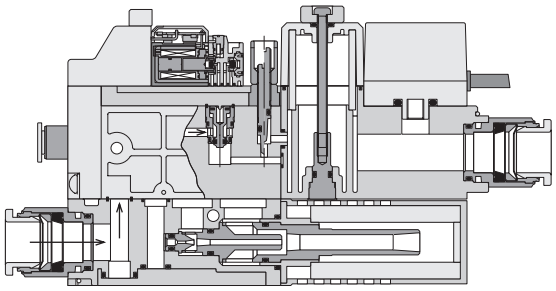


· Vacuum circuit

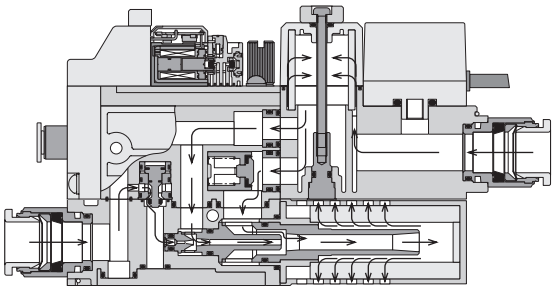


● Vacuum generation status

· Burst circuit

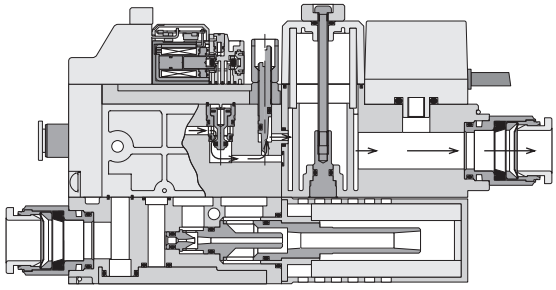


· Vacuum circuit

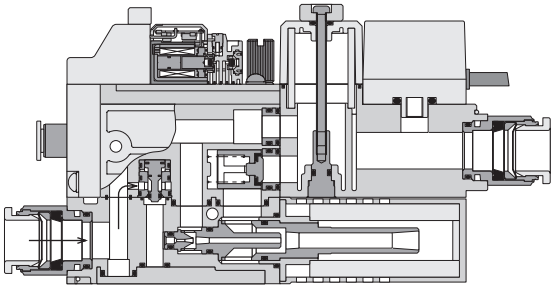


● Vacuum burst air supply

· Burst circuit



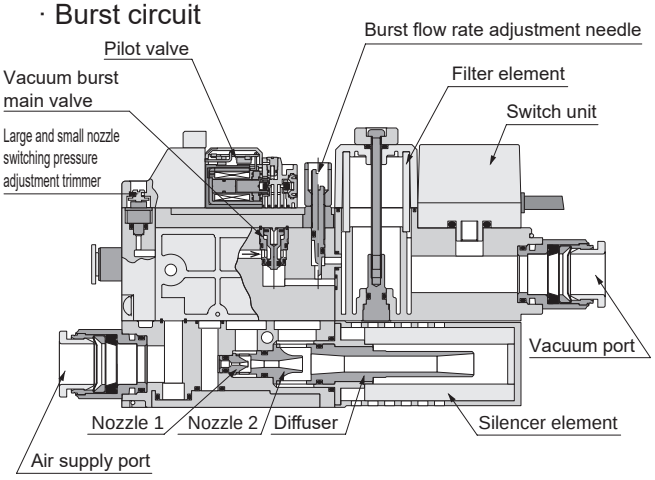
· Vacuum circuit



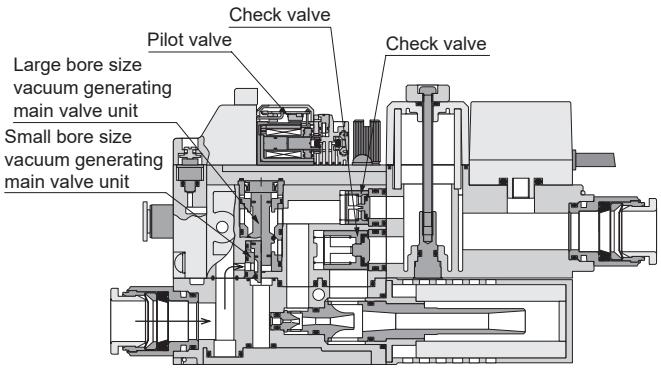
Operational explanation drawing (twin nozzle)

● Vacuum generation stopped

· Burst circuit

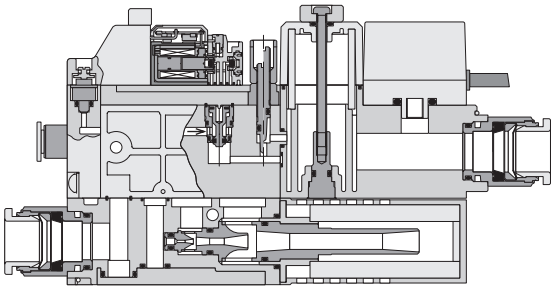


· Vacuum circuit

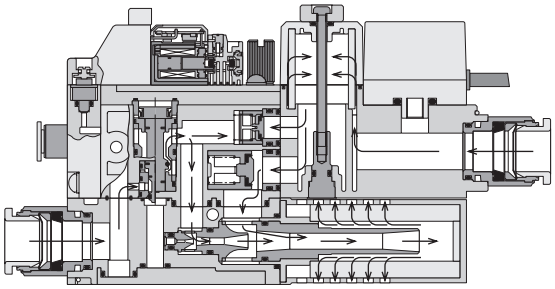


● Vacuum generation status (vacuum rise to reference vacuum pressure: large bore size nozzle)

· Burst circuit

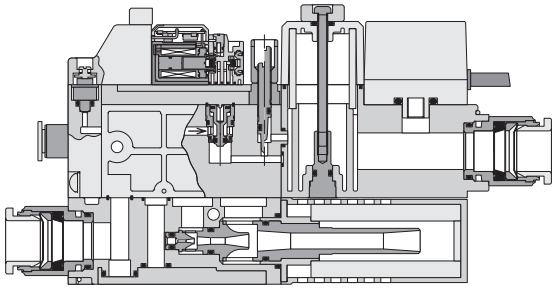


· Vacuum circuit

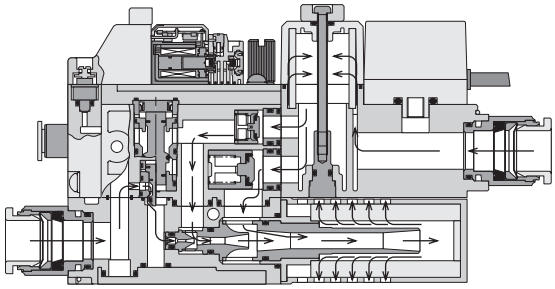


● Vacuum generation status (above reference vacuum pressure: small bore size nozzle)

· Burst circuit

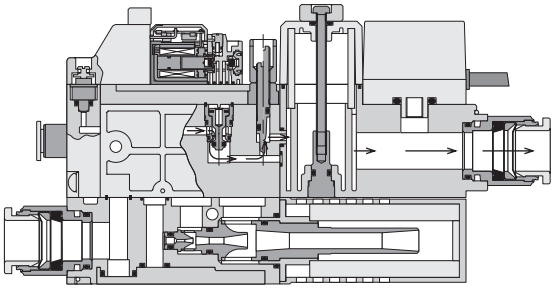


· Vacuum circuit

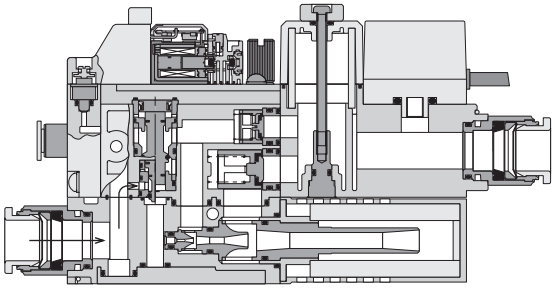


● Vacuum burst air supply

· Burst circuit



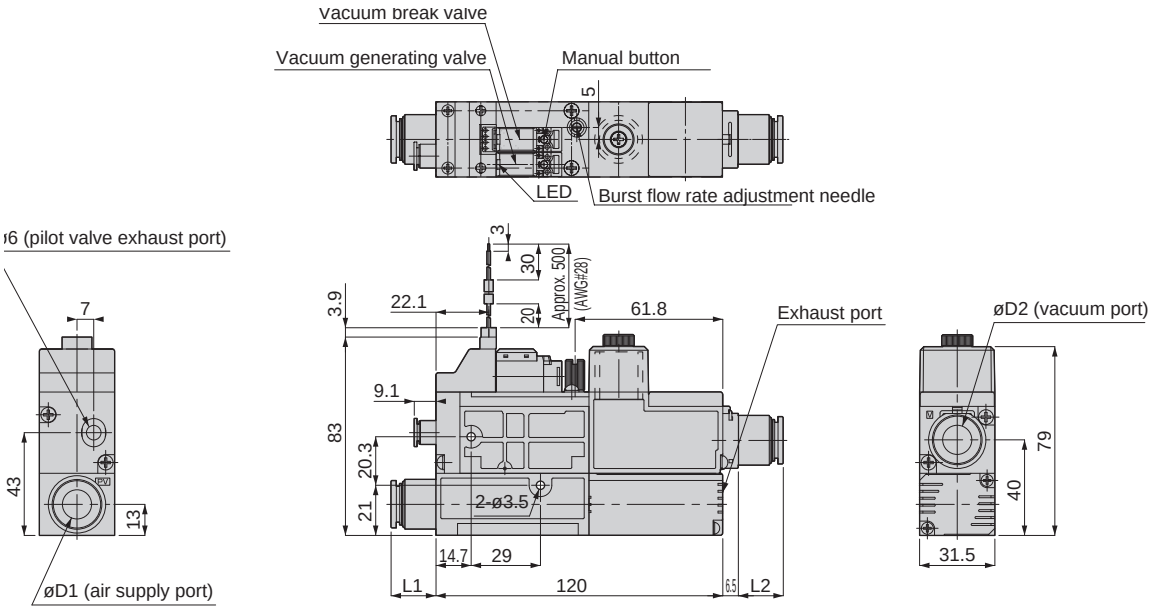
· Vacuum circuit



MEMO

Dimensions (single nozzle, atmospheric release)

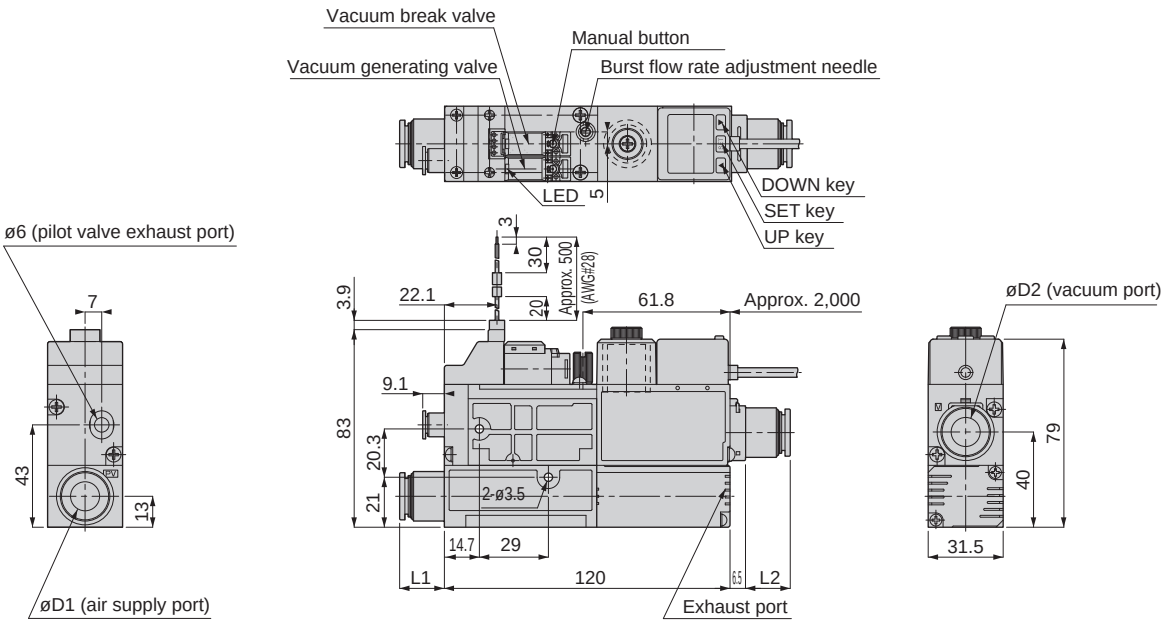
● Without vacuum pressure switch



Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

● With vacuum pressure switch and digital display

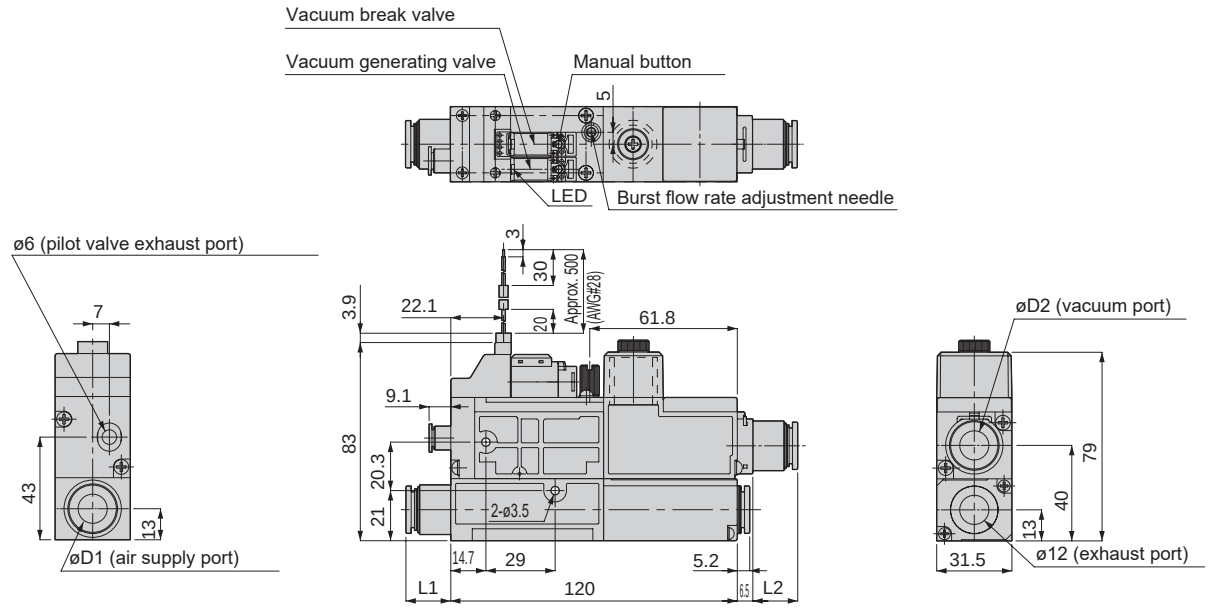


Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

Dimensions (single nozzle, common exhaust)

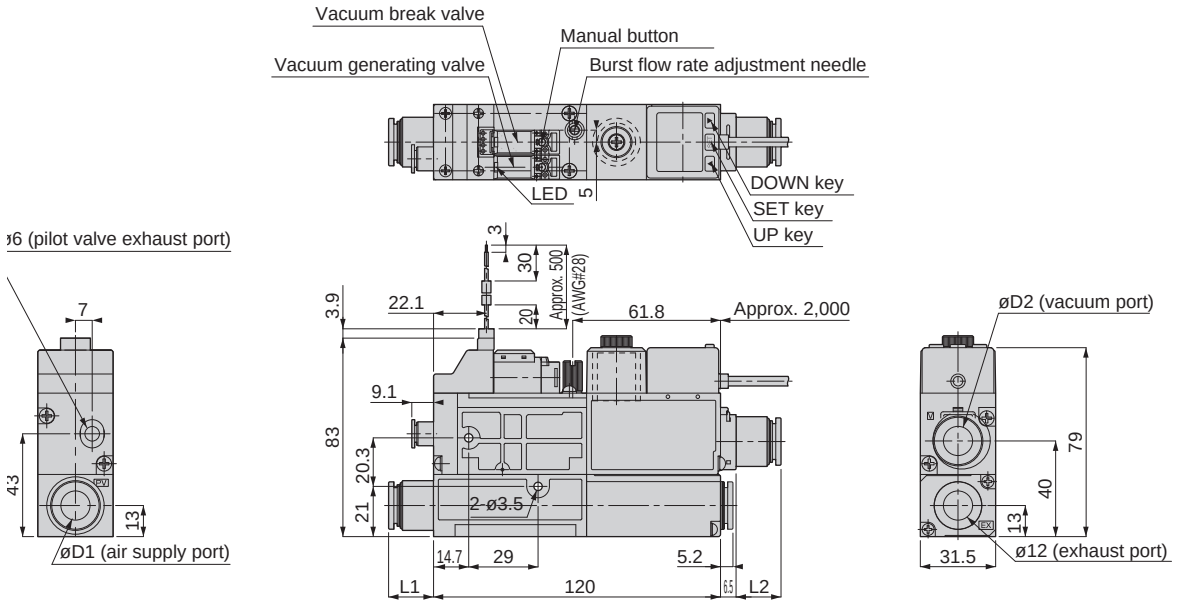
● Without vacuum pressure switch



Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

● With vacuum pressure switch and digital display

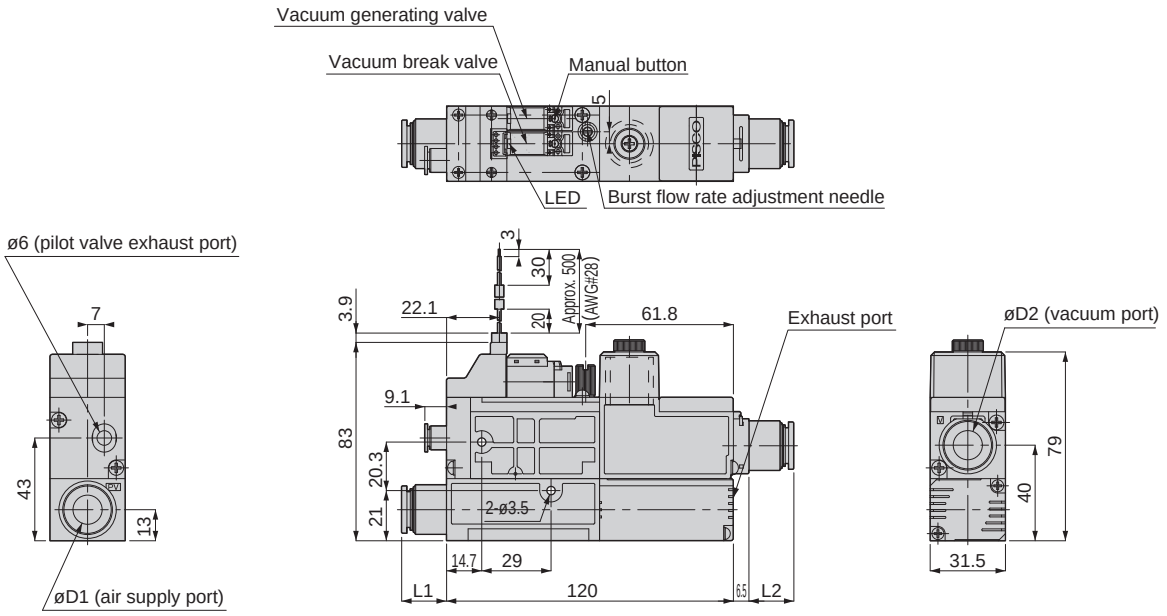


Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

Dimensions (2-stage nozzle, atmospheric release)

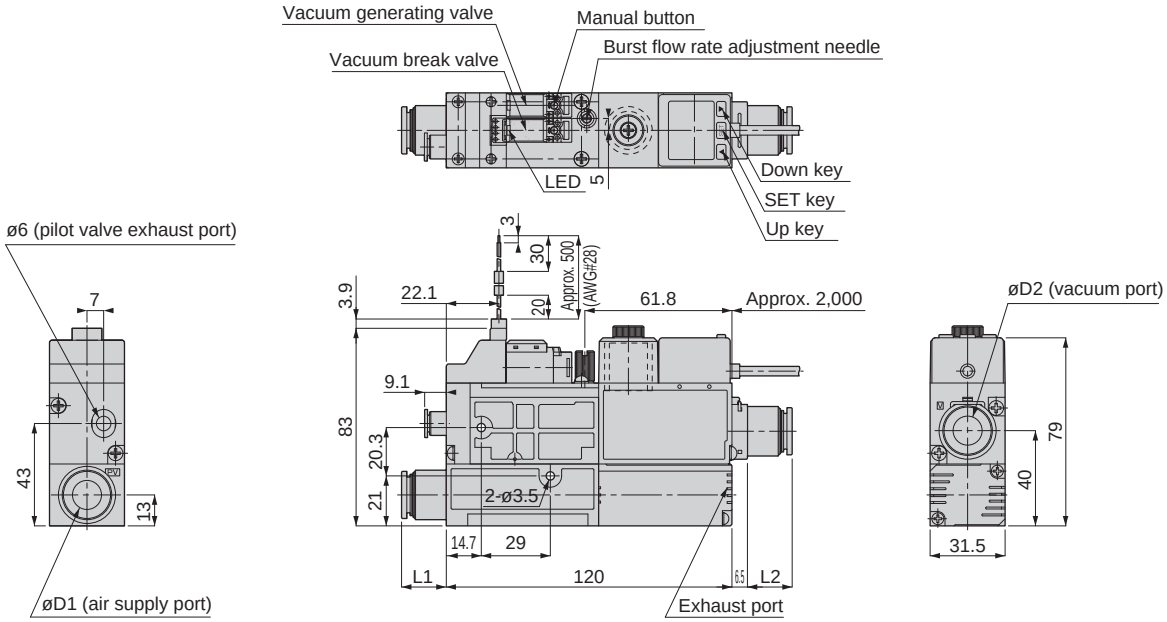
● Without vacuum pressure switch



Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	6	11.1	-	-
	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

● With vacuum pressure switch and digital display

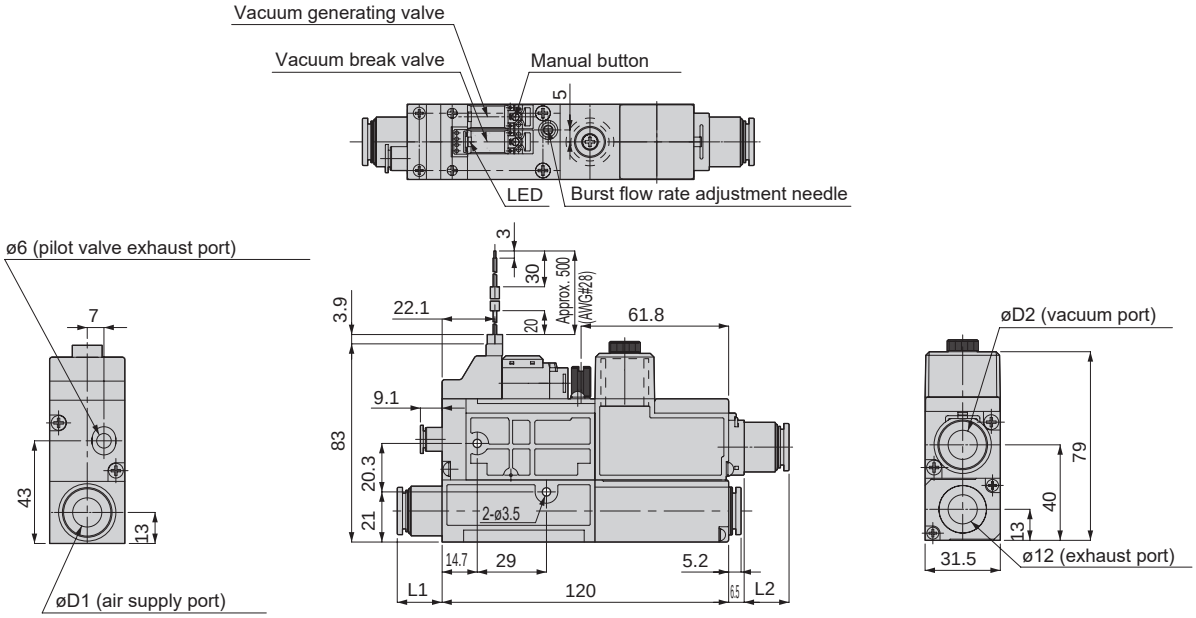


Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	6	11.1	-	-
	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

Dimensions (2-stage nozzle, common exhaust)

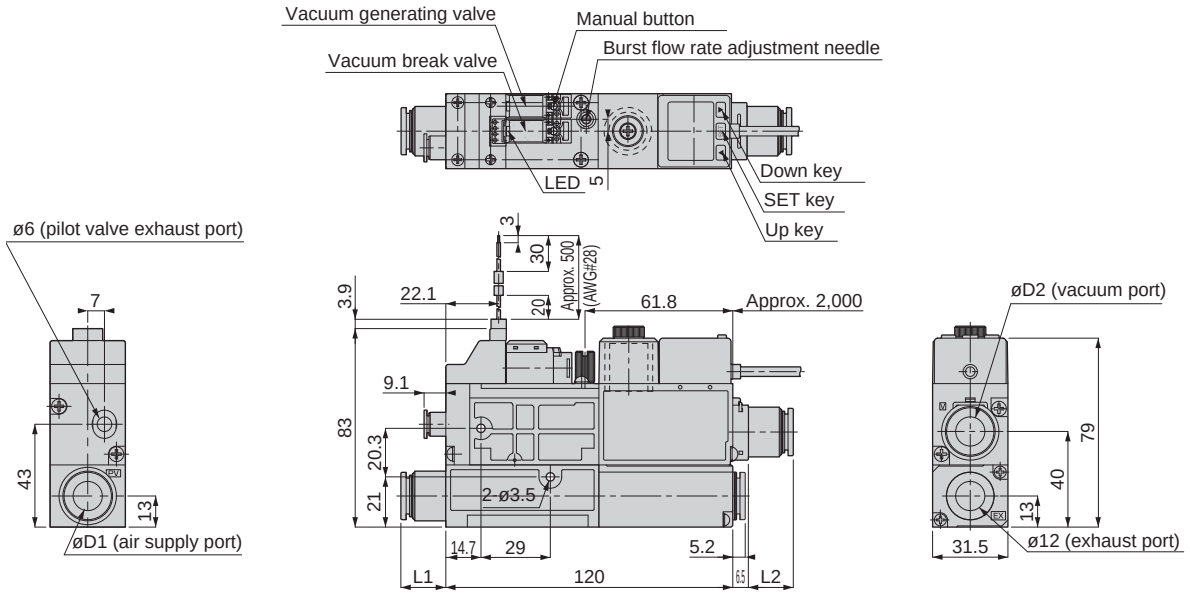
● Without vacuum pressure switch



Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	6	11.1	-	-
	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

● With vacuum pressure switch and digital display

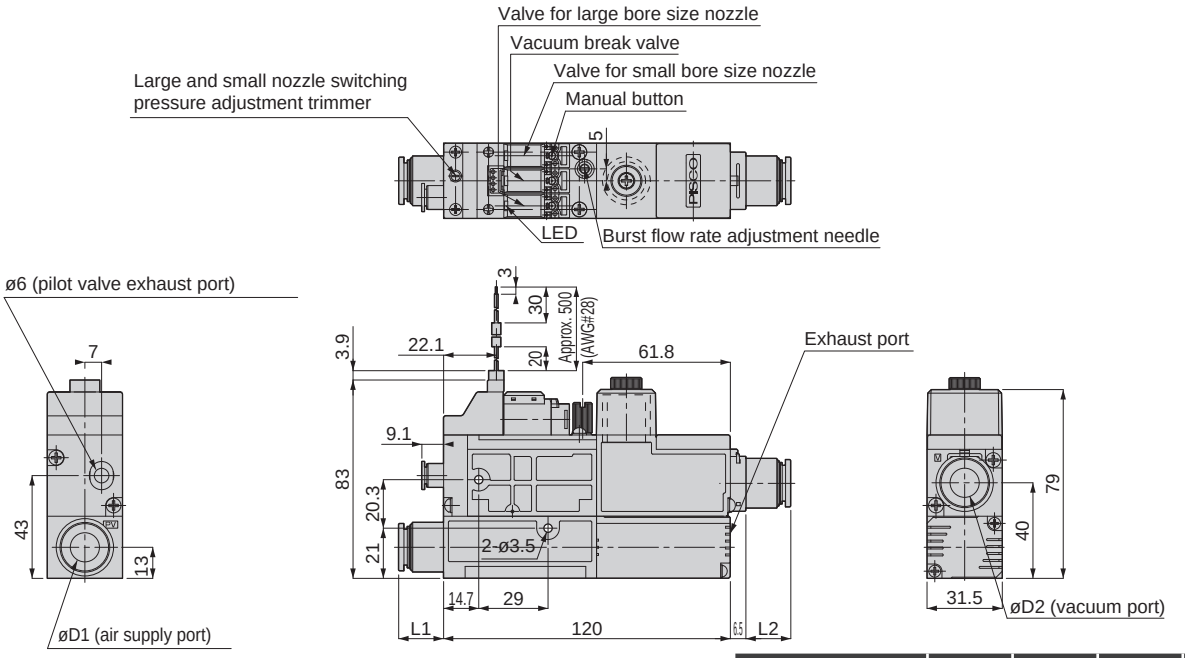


Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	6	11.1	-	-
	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

Dimensions (twin nozzle, atmospheric release)

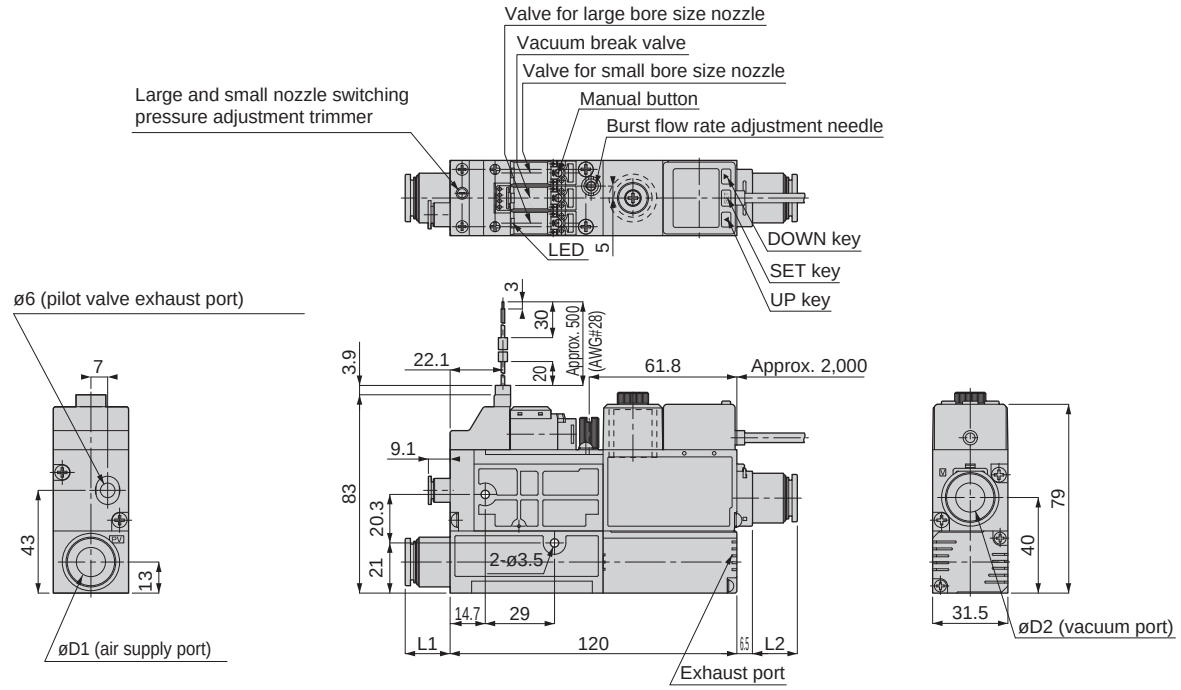
● Without vacuum pressure switch



Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

● With vacuum pressure switch and digital display

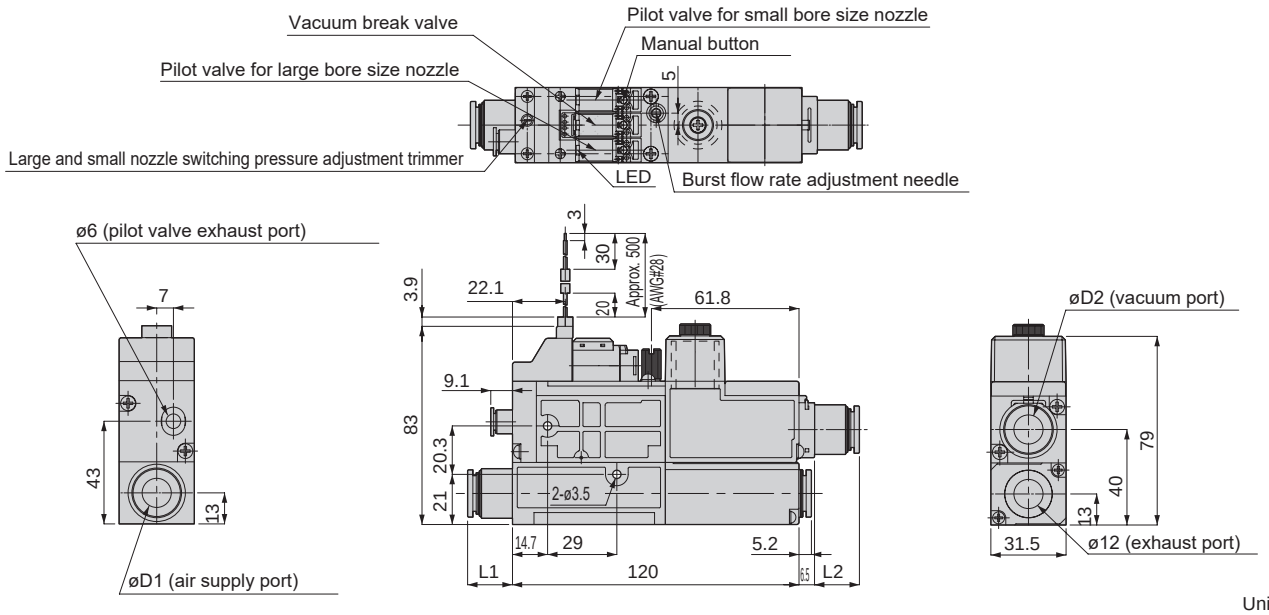


Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

Dimensions (single nozzle, common exhaust)

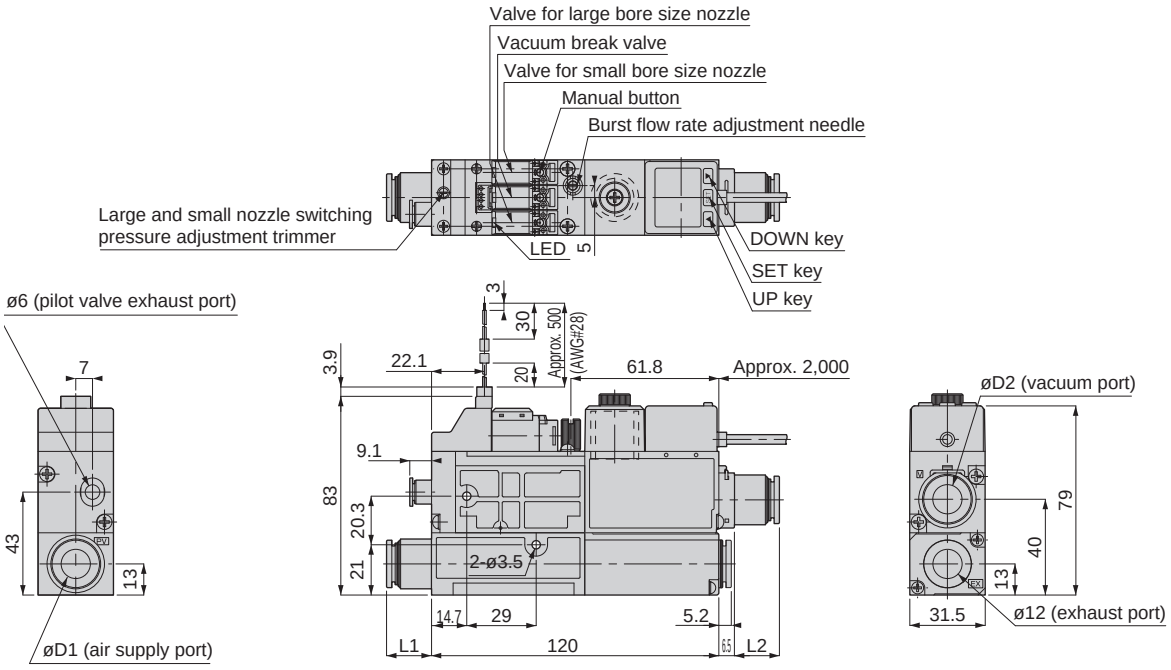
● Without vacuum pressure switch



Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7

● With vacuum pressure switch and digital display



Unit: mm

	Tube O.D. øD1	L1	Tube O.D. øD2	L2
Air supply port	8	12.2	-	-
	10	14.7	-	-
Vacuum port	-	-	8	12.2
	-	-	10	14.7