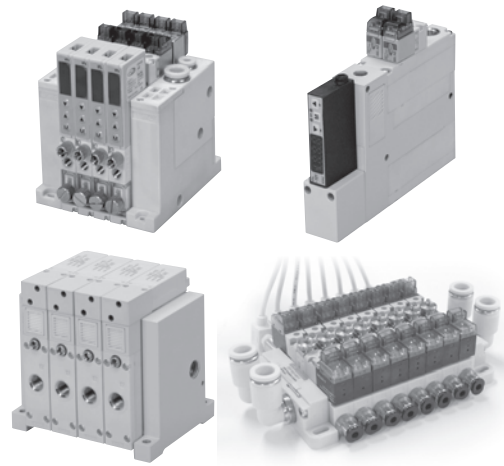


# Vacuum Equipment



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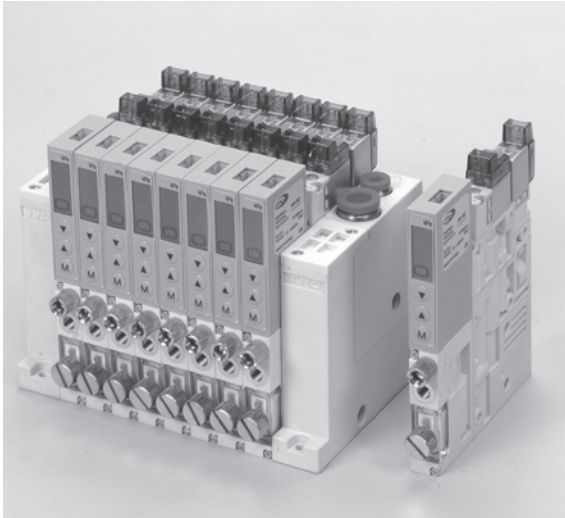
● Slim Vacuum Ejectors	
Series EP (Small) .....	948
Series EM/EL (Medium) .....	962
Series ES (Subminiature) .....	976

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※ Specifications in this catalogue may be changed for product performance upgrade without notice.  
So that please separately inquire to manufacturer when purchasing the product.

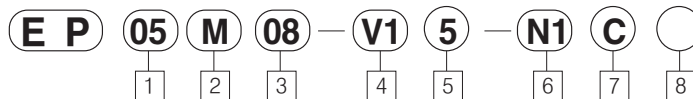
# Series EP

## EP Vacuum ejector



- COMPACT STRUCTURE—SLIM TYPE(10MM), LIGHT WEIGHT(88g).
- HIGH VACUUM VALUE (-600MMHG) AT LOW PRESSURE (3kg/cm<sup>2</sup>)
- LOW NOISE (BLOCKED IN TWO LAYERS)
- VARIOUS FUNCTIONS
  - LED 3 DIGIT VACUUM SWITCH
  - SOLENOID VALVE (VACUNM, BREAK)

### How to order



#### 1 Nozzle Diameter

- 05 : Ø0.5mm
- 07 : Ø0.7mm
- 10 : Ø1.0mm

#### 2 Body and Exhaust Type

Unit type	S	Silencer exhaustion
Manifold	M	Silencer collecting exhaustion at both sides
Type	MA	Silencer individual exhaustion

#### ■ Diameter of Connecting Pipe

Classification	Compressed Air Supplying Port	Vacuum Generating Port
Unit type	S	M5(individual)
Manifold	M	Ø8(both side) M5(individual)
Type	MA	M5(individual) M5(individual)

#### 3 Number of Station

Blank	for unit	*Manifold M Type only : maximum number of stations (depending on the nozzle diameter)
01	1station	· 0.5 : 8stations
02	2stations	· 0.7 : 6stations
⋮	⋮	· 1.0 : 4stations
08	8stations	

#### 4 Specification of Electronic Valve

Classification	for supplying air	for breaking vacuum
V1	N.C	N.C
V2	N.O	N.C
V3	N.O	-
V4	N.C	-

#### 5 Voltage

- 1 : AC110V
- 5 : DC24V (standard)

6 : DC12V

\* For non-standard type, please contact us.

#### 6 Vacuum Switch

- \* Voltage of power supply: DC24V
- Blank : No Switch
- N2 : NPN 2 points & analog output
- \* For PNP Type, please contact us.

#### 7 Electrical Entry

- \* Connector type
- Blank : 0.6M lead wire
- C : 2M lead wire

#### 8 Check Valve

- Blank : Without check valve
- H : With check valve

Specification

EP

EM/EL

ES

Type

Nozzle diameter (mm)	Type	Max. suction flow ℓ/min (ANR)	Air consumption ℓ/min (ANR)	Standard air pressure
0.5	EP 05	5	12	0.45MPa (64psi)
0.7	EP 07	11	22	
1.0	EP 10	22	46	

Ejector

Fluid	air
Max. operating pressure	0.6MPa(87psi)
Max. vacuum pressure	85KPa (-640mmHg) · (-12.3psi)
Supply pressure range	0.3 ~ 0.6MPa (43.5~87psi)
Operating temperature range · °C(°F)	0 ~ 60°C (32~140°F)
Suction filter	polyethylene crystalline (30 <sub>μ</sub> m)
Weight · g (ℓ b)	manifold block left and right 144g(0.317 ℓ b) unit type 88g(0.194 ℓ b)

Valve

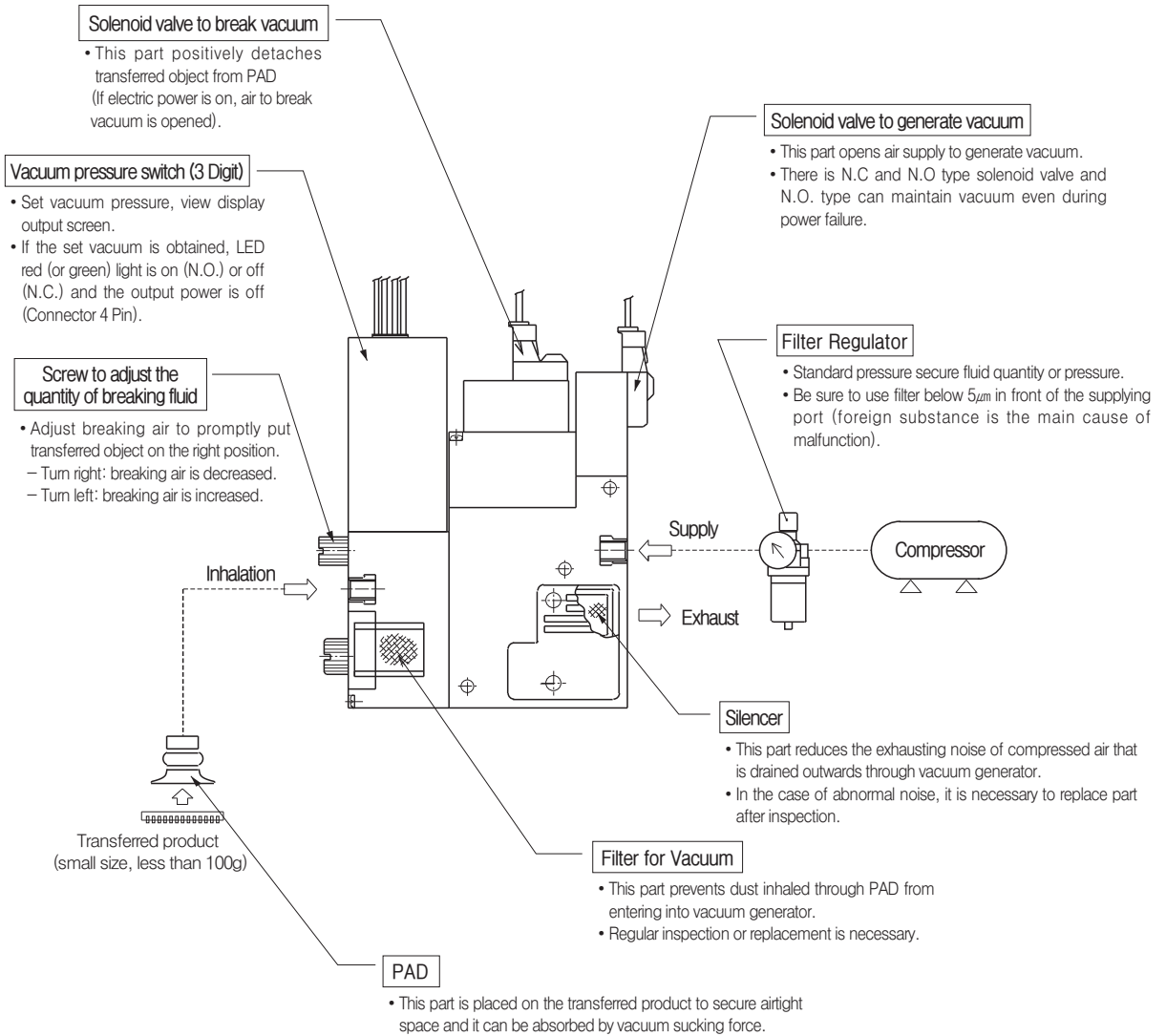
Operating method	N.C / N.O direct operation
Main valve	poppet
Effective orifice (CV value)	0.18mm <sup>2</sup> (Cv 0.01)
Operating pressure	0.3~0.6MPa(43.5~87psi)
Electrical entry	plug connector
Power consumption	below 0.6 (attaching lamp)
Regular voltage	DC12*, DC24V / AC110*, AC220V*

Vacuum switch

Power supply	voltage	12-DC24V±10%
	current consumption	50mA
Sensor switch output	setting point	2
	output method	NPN/PNP open collector
	setting pressure range	-101.2~110KPA
	control range	below 2% F.S. (fixed)
	indication of operation	LED(3digit red)
	precision	±0.25%F.S (0~50°C)
	responding time	below 2.5ms
	internal pressure	0.2 MPa(29.0psi)

Color of lead wire

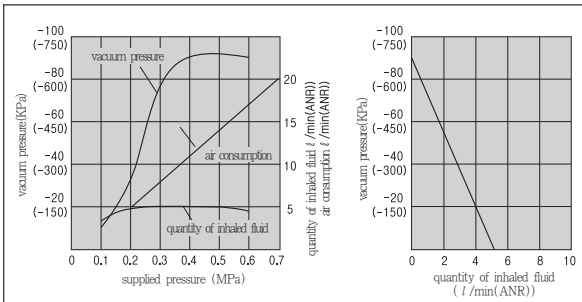
Brown	DC(+)
Black	switch output 1
White	switch output 2
Blue	DC(-)
Orange	analogue output



Performance / Property

EP05 exhaustion property

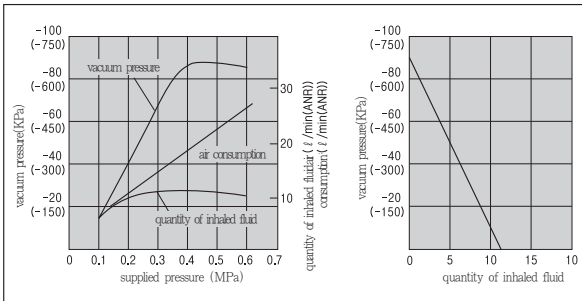
EP05 fluid quantity property



The unit of value in ( ) is mmHg.

EP07 exhaustion property

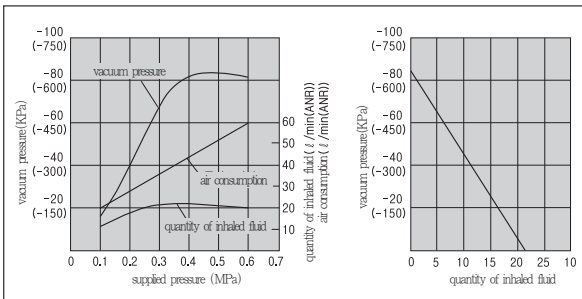
EP07 fluid quantity property



The unit of value in ( ) is mmHg.

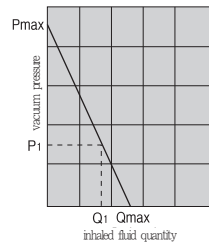
EP10 exhaustion property

EP10 fluid quantity property



The unit of value in ( ) is mmHg.

How to read the diagram of fluid quantity property



The relation between vacuum pressure and inhaled fluid quantity is generally indicated by the fluid property. The vacuum pressure change is also indicated if inhaled fluid quantity changes. The indication refers to a relation of standard pressure from now on. As shown in the diagram, Pmax and Qmax represent max vacuum pressure and max inhaled fluid quantity. The above values are indicated in the catalog.

Method to change the vacuum pressure

- 1) When the inhaling hole is closed, and it is air-tight, the inhaled fluid quantity could be zero and vacuum pressure reaches Pmax.
- 2) In the event that the inhaling hole is adjusted to gradually open so as to let air pass (air emission), resulting in the increase of the inhaled fluid quantity, and vacuum pressure drops (the state of P1 and Q1)
- 3) When opening all inhaling holes, inhaled fluid quantity becomes maximum(Qmax) and the vacuum pressure drops, almost 0 (atmospheric pressure). In similar method, in event that inhaled fluid quantity changes, the vacuum pressure also changes. Thus, in event that no leakage in the vacuum port (vacuum piping) occurs, the vacuum pressure is maximized, but as leakage quantity increases, it drops and in event that leakage quantity is same to maximum inhaled fluid quantity, the vacuum pressure gets almost 0.

When attaching ventilation to work with leakage, take care that vacuum pressure is not too high.

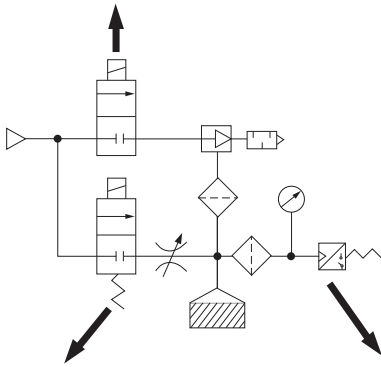
Cautions for use

For unsatisfactory performance or trouble, inspect the product as follows. In event that trouble still remains after this action, be sure to consult the manufacturer,

1. Low vacuum performance owing to insufficient supplying air quantity countermeasure :
  - a. Confirmation of supplying air quantity is needed.
  - b. Make the pipe length as short as possible.
  - c. Make the fitting size as large as possible.
  - d. In event that the supplied air port is one a sided type, it is necessary to use both sides.
2. Low performance owing to large piping resistance countermeasure :
  - a. Make the pipe length as short as possible.
  - b. Make the fitting size as large as possible.
  - c. Check whether exhaustion port is blocked by Internal and external influence.
  - d. Reduce the number of station in the manifold to use.
  - e. Use individual exhaust for each station.

## Cautions for selecting vacuum equipment

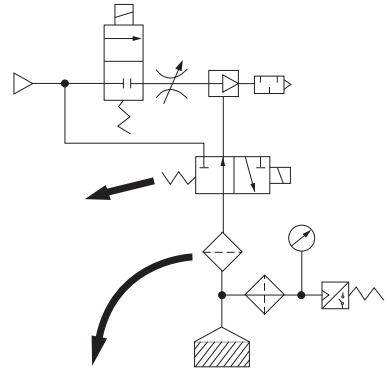
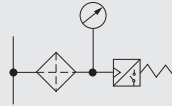
To cope with power failure, select normal open or magnet retention function for the supply valve.



For break valve, select 2/3 port valve of low vacuum specification. Use needle valve to adjust broken fluid quantity.

Use a valve with a synthetic effective cross section that is 3 times larger than that of the nozzle diameter for vacuum transfer valve.  
 Ex) In event of nozzle 1.0  
 Effective cross section  
 $0.52 \times 0.785\text{mm}^2 \times 3\text{times} = 2.35\text{mm}^2$

- Confirmation of the suction transference of work is needed by vacuum switch.
- For heavy substance or hazardous substance, confirm gauge as well.
- For unfavorable surrounding environment attach a filter before pressure switch.



Use vacuum filter to protect transfer valve and prevent mesh of ejector from being blocked. Blocking the mesh will occur faster. When only one filter is adapted for the product

## Cautions for vacuum circuit and assembled equipment

Number of ejector and pad		Number of vacuum pump and pad	
Ideal condition : one pad is provided for one ejector.	When attaching several pads to one ejector water leakage at one work allows vacuum pressure to drop all other works as well. Perform the following measures. <ul style="list-style-type: none"> <li>• Reduce the fluctuating pressure of suction and non suction by needle valve.</li> <li>• Install vacuum maintaining valve at each pad in order to eliminate the influence by other pad when erroneous attachment occurs.</li> </ul>	Ideal condition : one pad is provided for one line.	When attaching several pads to one vacuum line, perform the following measures <ul style="list-style-type: none"> <li>• Reduce the fluctuating pressure of suction and non suction by the needle valve.</li> <li>• Stabilize the setting by installing a tank and vacuum decreasing/increasing valve (vacuum control valve).</li> <li>• Install and attach vacuum maintaining valve at each pad.</li> </ul>

Unit type

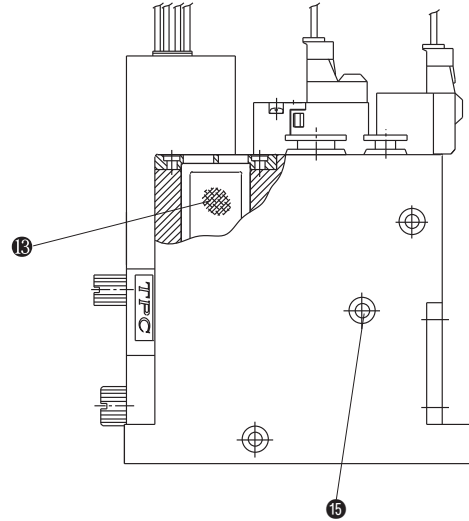
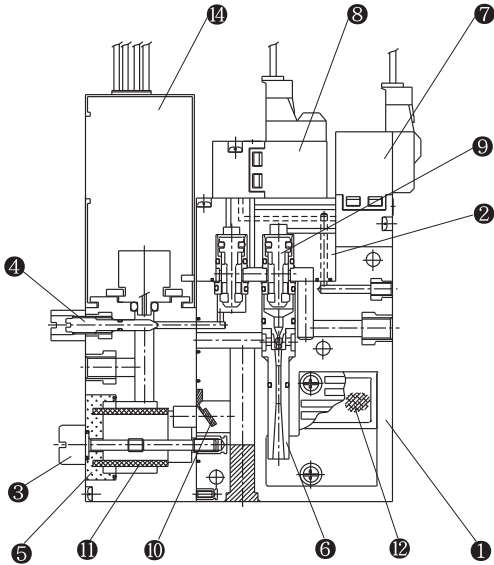
EP

Unit type

Manifold type

EM/EL

ES

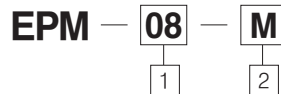


Components

No.	Description	Material	Note
1	ejector body	nylon	
2	operator body	nylon	
3	tension bolt	C3604	nickel plating
4	screw to adjust fluid quantity	AL	nickel plating
5	filter cover Ass'y	-	
6	diffuser Ass'y	AL	alumite
7	vacuum valve	-	
8	break valve	-	
9	poppet valve Ass'y	-	
10	check valve	NBR	

No.	Description	Material	Part number
11	suction filter (for unit)	polyethylene	EP-033-001
12	silencer (for unit)	polyethylene	EP-064-060 EP-064-080
13	silencer (for manifold)	polyethylene	EPM-064-002
14	vacuum pressure switch	-	VPS-C-N-P VPS-C-P-P
15	bolt (manifold type)	chrome steel	M3×0.5×*L

Manifold block only



Bolt size for mounting manifold

Number of station	M Type(M3×0.5)	MA Type(M3×0.5)
1stations	25L	18L
2stations	35L	30L
3stations	45L	40L
4stations	55L	50L
⋮	⋮	⋮
8stations	95L	95L

1 Manifold station 2 Body and exhaustion type

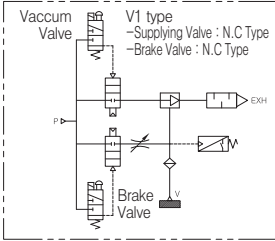
	Classification	Supply & Exhaust	*Type of Mounting
01 : 1station			
02 : 2station	M	common supply&exhaust	manifold block(R,L)
⋮			
⋮	MA	individual supply&exhaust	bracket(R,L)
08 : 8station			

## Dimensions / Unit type

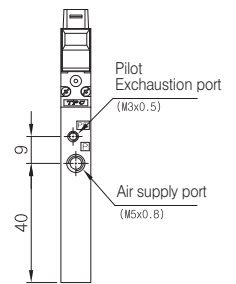
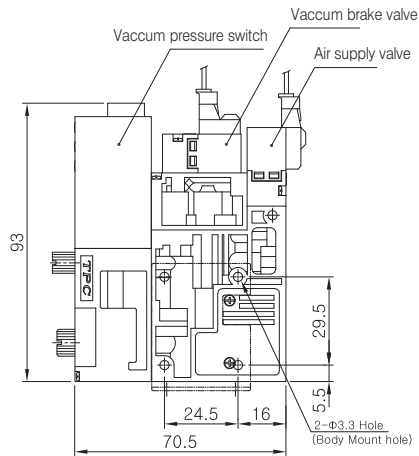
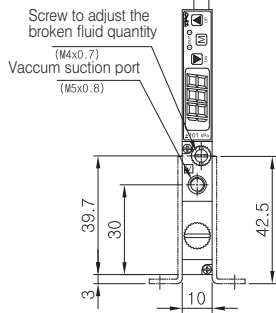
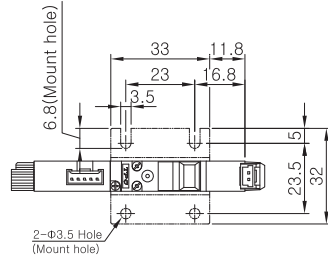
### Switch type

EP□□ - □□ - □□□

Circuit Diagram EX)



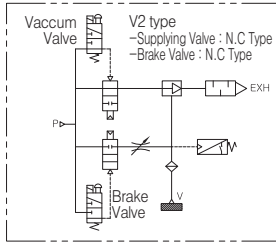
(Unit:mm)



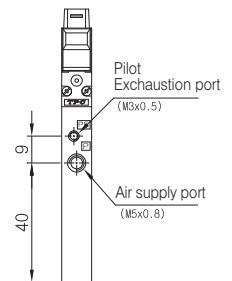
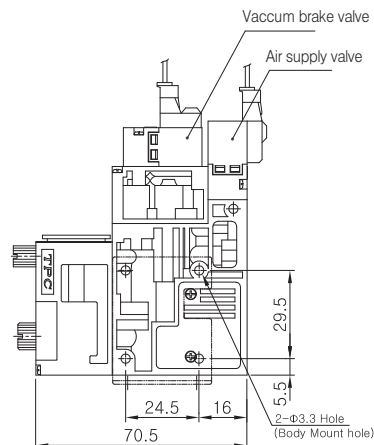
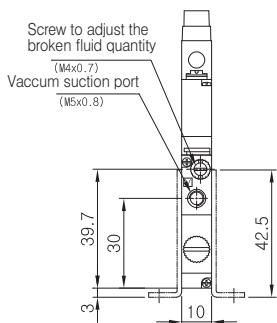
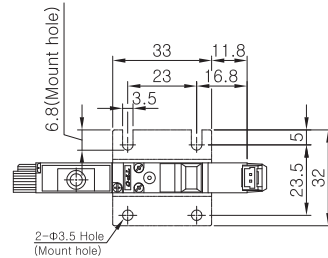
### Non-switch type

EP□□ - □□ - □□

Circuit Diagram EX)



(Unit:mm)





Dimensions / Manifold type

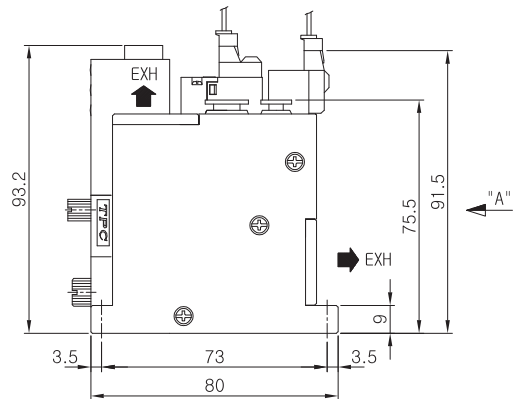
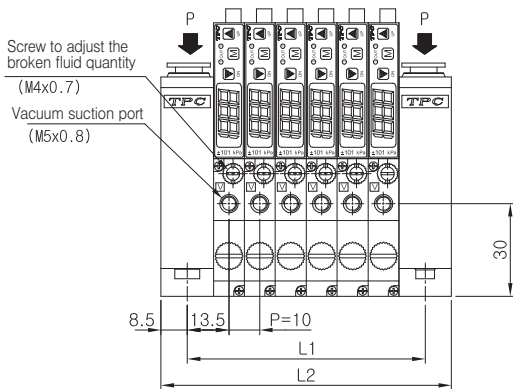
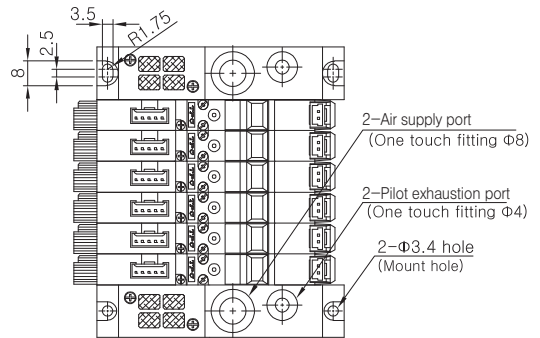
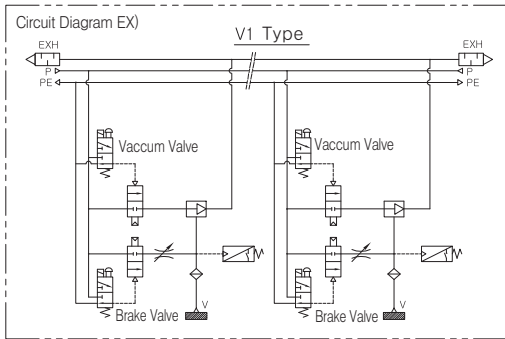
Collective exhaust (for silencer at both sides)

EP□M06 - □□ - □□□

EP

EM/EL

ES



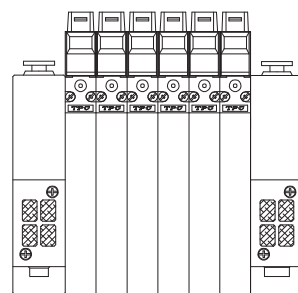
Dimensions

(Unit : mm)

Number of Station	1	2	3	4	5	6	7	8
L1	27	37	47	57	67	77	87	97
L2	44	54	64	74	84	94	104	114

Maximum Number of Station for Nozzle Diameter

Nozzle Diamete	Maximum Number of Station
Ø0.5	8 Station
Ø0.7	6 Station
Ø1.0	4 Station



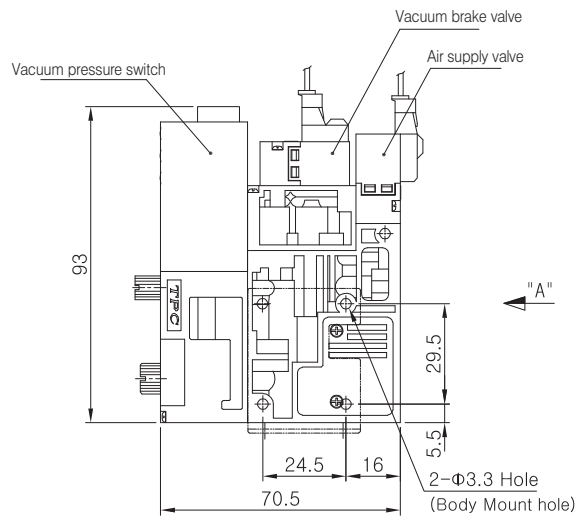
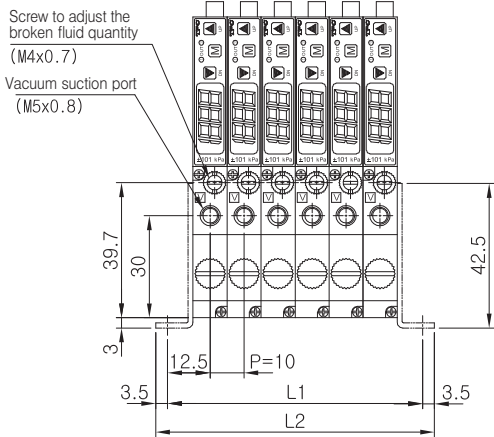
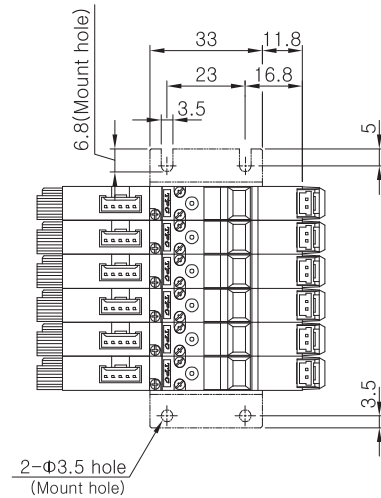
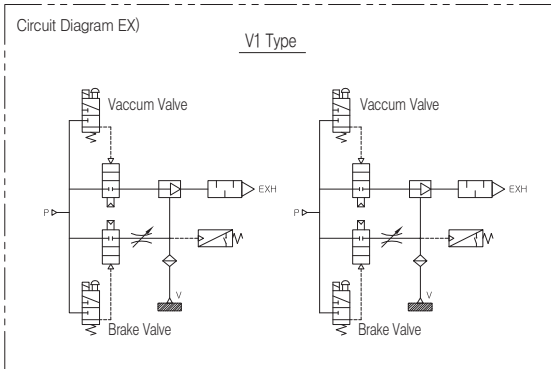
VIEW "A"

# Series EP

## Dimensions / Manifold type

### Individual exhaust (for Silencer)

EP □ MA06 - □ □ □ □ □ □

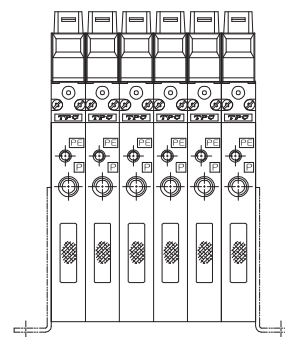


### Dimensions

(Unit : mm)

Number of Station	1	2	3	4	5	6	7	8
L1	25	35	45	55	65	75	85	95
L2	32	42	52	62	72	82	92	102

※ The number of station can be increased upon request.  
Your inquire is welcomed anytime.



VIEW "A"

## Vacuum Equipment

When the ejector and vacuum pumps are adapted, and work is sucked, during the suction procedure, the suction (exhaustion) responding time and vacuum pressure are changed based on the piping condition and kinds of work. In this case, it is preferred that the product could be used as vacuum system provided with high efficiency as appropriate vacuum equipment is selected.

### Order to select

1. To select pad :

- 1) Get the diameter of the pad
- 2) Get the theoretical Lift force.



2. To select the vacuum transfer valve of an ejector

- 1) Get the responding time
- 2) Quantity of water leakage in suction work
- 3) Size of vacuum supplying valve of ejector (with water leakage)
- 4) Size of vacuum supplying valve of ejector (without water leakage)

1. Pad selection

1) How to get the diameter of pad

Lift calculation of pad is adapted so as to obtain the diameter of pad.

Confirm by actual suction test if necessary.

The calculation value is just for reference.

Things which will be checked.

- What pad diameter is usable.
- It is preferred to select size less than pad diameter and terminal of work attaching surface by more than 10, so that air leakage during suction can be prevented.
- Is there air leakage caused by tolerance of work suction surface?
- To get the tolerance of suction surface or work, so that air passes, set the fluid quantity at the side of vacuum.
- What about the transference direction and attachment direction of work?
- Consider the following safety rate when calculating impellent force based on the horizontal and vertical attaching position.

Ex) Work mass 1kg 1 unit standard type

Horizontal movement can be performed with 5 Pads

If it is calculated by the diameter of pad (vacuum pressure? 60kpa)

※ Calculation expression-based method

$$\varnothing D = \sqrt{\frac{4}{\pi} \times \frac{1}{P} \times \frac{W}{n} \times s \times 1000}$$

$$\varnothing D = \sqrt{\frac{4}{\pi} \times \frac{760}{P' \times 1.033} \times \frac{W'}{n} \times s \times 1000}$$

$$\varnothing D = \sqrt{\frac{4}{\pi} \times \frac{1}{60} \times \frac{10}{5} \times 4 \times 1000} = 13\text{mm}$$

∅D: diameter of pad (mm)

W': lift power (kgf)

n: quantity of Pad for work

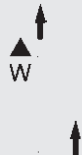
W: lift power (N)

P: vacuum pressure (kpa)

P': vacuum pressure (mmHg)

s: safety rate horizontal direction : over 4

vertical direction : over 8



② Method to get the theoretic lift force

(SI unit)

$$10 = -60 \times A \times 0.1 \times \frac{1}{4}$$

$$A = 6.7\text{cm}^2 \div 5 = 1.34$$

┘ vacuum pressure

$$\varnothing D = \sqrt{A \times \frac{4}{\pi}}$$

$$\frac{W}{S} = \frac{P \times A \times 0.1}{S}$$

┘ Lift force    ┘ Area    ┘ Safety rate

$$\varnothing D = \sqrt{1.34 \times \frac{4}{\pi}} = 1.3\text{cm}$$

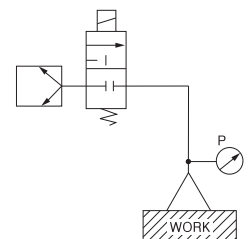
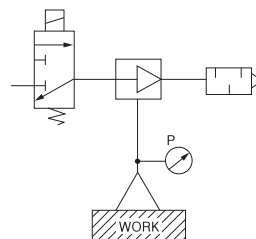
2. Selection of vacuum transfer valve of ejector

How to get the suction responding time for suction and transferring work by pad, getting the suction responding time is needed (after the operation of supplying valve, the time required for vacuum pressure in the pad to reach vacuum pressure necessary for suction)

### Vacuum System Circuit

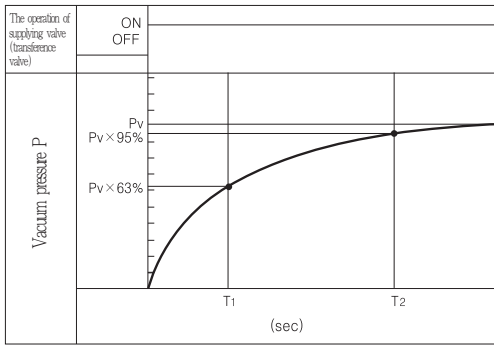
supplying valve

transfer valve



# Series EP

■ vacuum pressure and responding time after the operation of supplying valve (transference valve)



$P_v$  : final vacuum pressure  
 $T_1$  : time required to reach the 63% of final vacuum pressure  $P_v$   
 $T_2$  : time required to reach the 95% of final vacuum pressure  $P_v$

### Calculating by expression method

It is possible to obtain the suction response time  $T_1, T_2$  based on expression.

Suction response time  $T_1 = \frac{V \times 60}{Q}$

$T_1$  : Time required to reach the 63% of final vacuum pressure  $P_v$ (sec.)

Suction response time  $T_2 = 3 \times T_1$

$T_2$  : Time required to reach the 95% of final vacuum pressure  $P_v$ (sec.)

Pipe volume

$Q_1$  : How to get the average inhaled fluid quantity  $i/\text{min}$  (ANR)

● For ejector,  $Q_1 = (1 \sim 3) H$  maximum inhaled fluid quantity of ejector

$D$  : Inner diameter of pipe (mm)  
 $L$  : Length from ejector and transfer valve to Pad  
 $v$  : Pipe volume from ejector and transfer valve to Pad  
 $Q_2$  : Maximum fluid quantity by piping system from ejector and transfer valve to Pad.  
 Among  $Q, Q_1, Q_2$ , the least fluid quantity.

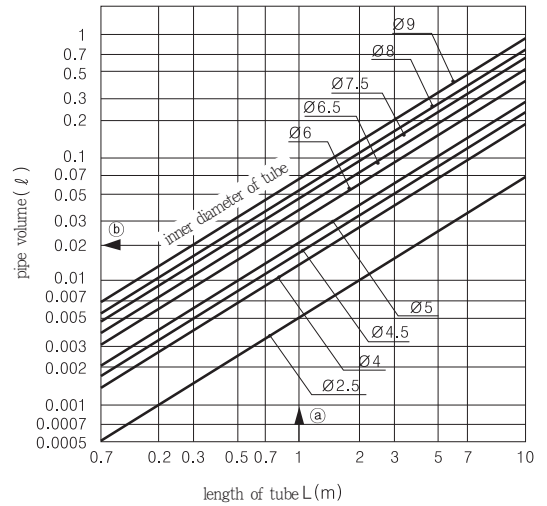
### Selective graph method

Ⓐ Get the pipe volume of tube.

Get the pipe volume from ejector, and transfer valve of vacuum pump to pad by selective graph.

### How to

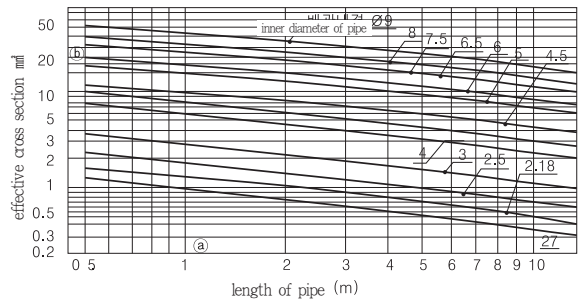
Ex) How to get the volume of the tube with a diameter of 4mm and a length of 1m.



### Select order

At the extended line of left axis, horizontal pipe volume of nearly  $0.015L$  is obtained based on the intersection of tube with vertical length of 1m and inner diameter of 4mm.

Ⓑ Get the effective cross section of pipe.



### Select order

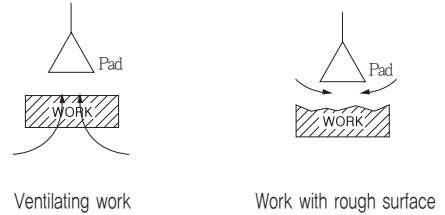
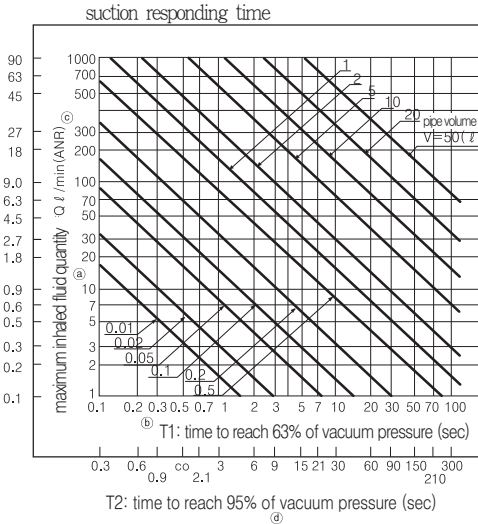
Ex) For the tube size  $\varnothing 4$ , 1m

### Select order

At the extended line of left axis, horizontal effective cross section of nearly  $6.1\text{mm}^2$  is obtained based on the intersection of the tube with a vertical length of 1m and an inner diameter of 4mm.

Ⓒ The suction responding time :

With a selective graph, obtain the suction responding time  $T_1, T_2$  which indicates the duration from operation of supplying valve (transfer valve) which controls the ejector to reach a designated vacuum pressure.



Quantity of water leakage  $QL = 11.1 \times SL$   
 $QL$ : Quantity of water leakage  $\text{l/min(ANR)}$   
 $SL$ : Gap between work and pad and effective cross section of open work entrance

**How to**

Maximum suction fluid quantity of vacuum elector 07 is  $12\text{L/min(ANR)}$ . Pipe volume of the pipe system is  $0.015\text{L}$ . Under this condition, getting the suction responding time required to drain the pressure in the pipe system up to 63% of final vacuum pressure ( $T_1$ ) is needed.

**Select order**

With the Intersection of maximum inhaling quantity of vacuum elector,  $12\text{L/min(ANR)}$  and pipe volume,  $0.015\text{L}$ , it is needed to obtain the suction responding time  $T_1$  required to reach 63% of maximum vacuum pressure. (① in the selected graph  $\rightarrow$ ) ②  $T_1$ , approximately 0.23 second)

Ex) By using valve with effective cross section of  $18\text{mm}^2$  and intersection of  $3\text{L}$ , it is possible to obtain the exhaustion responding time  $T_2$  required to reach 95% of final vacuum pressure,

③ In the selected graph  $\rightarrow$  ④

**Select order**

By using valve with effective cross section of  $6.1\text{mm}^2$  and intersection of pipe volume  $3\text{L}$ , it is possible to obtain the exhaustion responding time  $T_2$  required to reach 95% of final vacuum pressure. ( $T_2$ , approximately 22 seconds)

**Quantity of water leakage when the suction of work is performed**

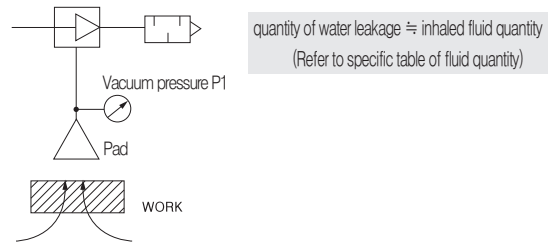
Get the quantity of water leakage :

For a sucking elector, because pad sucks work and inhales atmosphere based on varying kinds of work, it is impossible to obtain the vacuum pressure in the pad drops and pressure required for suction.

To suck work in this specification, considering the quantity of water leakage from work and selecting the size of vacuum transfer valve of the elector.

● How to set the quantity of water leakage :

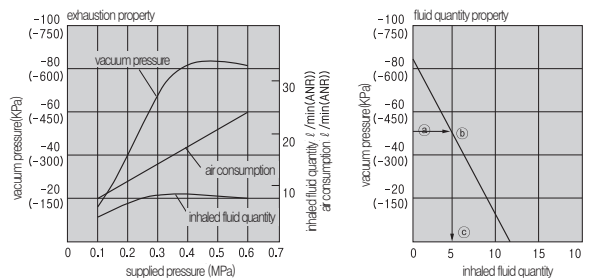
Use the ejector pad, vacuum gauge and suck ejector as seen in the following drawing. With the suction inhaled fluid quantity obtained by specific graph of fluid quantity of ejector from vacuum pressure  $P_1$ , the quantity of water leakage of work is obtained.

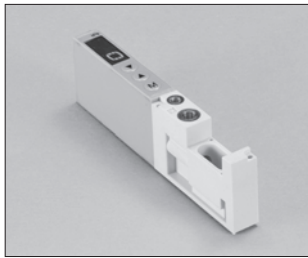


Ex) The pressure of vacuum gauge indicates  $-53\text{kPa}(-400\text{mmHg})$  when supplied pressure is  $0.45\text{MPa}$  and work with water leakage of ejector is sucked. To get the quantity of water leakage, With the graph of fluid quantity property, the inhaled fluid quantity for  $-53\text{kPa}(-400\text{mmHg})$  is  $5\text{L/min(ANR)}$ .

Quantity of water leakage = inhaled fluid quantity ( $5\text{L/min}$ ) (ANR)

**Select order**



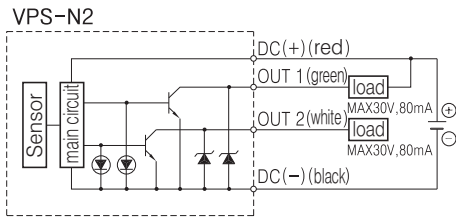


- Red LED (3 Digit)
- Automatic temperature compensation method
- High precision type of digital setting
- Super slim type (width 10 mm)
- Response in high speed (below 2mS)
- Indication of vacuum break pressure (~ 100kPa)(14.5psi)

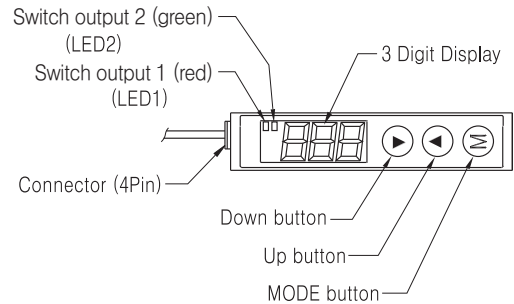
### Specification

Type	VPS-N2	
Fluid	Air	
Range of applied temperature · °C(°F)	-20 ~ 80°C (-4~176°F)(automatic temperature)	
Range of set pressure	0 ~ -100kPa(0~-14.5psi)	
Internal Pressure	0.2MPa(29psi)	
Voltage	DC 24V ± 10%	
Current Consumption	Below 17mA (DC24V ON)	
Output	set	Open Collector 30V, 80mA
	Signal	-
Width of control	Below 3% F.S. (fixed)	
number of set points	2point	
Operation indicating lamp	Lit when on (Out 1: red, 2: green)	
setting method	Variable type by push button	
precision	±0.5% F.S (based on 0~50°C(32~122°F), 25°C(77°F)standard)	
Display	LED (3Digit)	

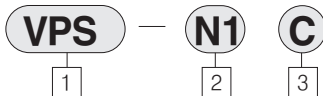
### Example of wiring in the internal circuit



### How to set pressure

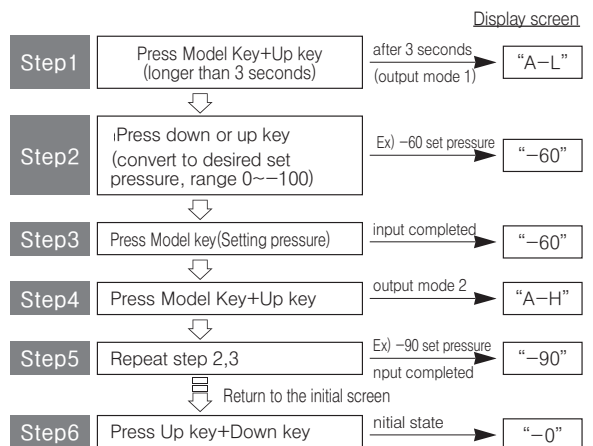
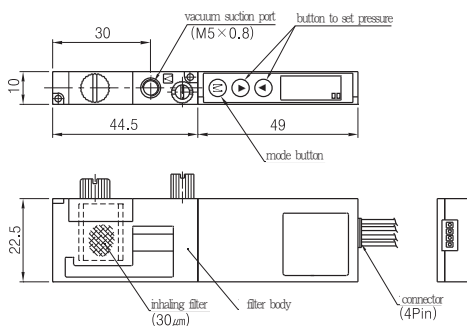


### How to Order



- 1 Switch of Vacuum Pressure
- 2 Output Method  
N2: NPN2 output & analog output
- 3 Method to Pull out Switch Lead Wire  
\* connector type  
C: Length of lead wire-2M

### Dimensions



- \* explanation on program mode function besides pressure setting mode (A-L, A-H)
- "drp" : setting control speed
  - "ddp" : setting display speed

※ Be sure to read the following instruction before use.

## ! Common cautions for installing vacuum equipment

### Design · Selection

#### ! Warning

1. Perform a safety check to prepare against a possible accident caused by a reduction of vacuum pressure due to power failure or trouble of air source. In event that vacuum pad loses suction force because of reduction of vacuum power, failure could result during transportation.
2. Vacuum specification is needed for vacuum transfer valve and vacuum break valves. Always use valve with vacuum specification.
3. Select ejector with appropriate inhaling quantity. (when water leakage occurs).  
Defective suction may occur due to insufficient inhaled fluid quantity.  
(long and large pip)  
In event that the pipe volume increases, retardation could occur in the suction.  
Select ejector with appropriate inhaled fluid quantity.
4. Difficulty could occur when setting vacuum switch when inhaled fluid quantity is larger than necessary. Select appropriate ejector.
5. When more than 2 pads are adapted and piped to one ejector, and in addition when one pad is separated from work, detach the other pad from work because vacuum pressure could decrease.
6. Make sure to pipe tube using enough effective cross section. In addition, for vacuum piping, select pipe with effective cross section through which maximum inhaled fluid quantity of ejector. Pay attention so as to prevent any unnecessary tube parts or water leakage in the piping.  
Provide piping design suitable for air consumption of each ejector for air supplying side.  
Reduce the pressure reinforcement of ejector to increase the effective cross section of tube, pipe nipple, valve and so on. In addition, design the air source based on maximum air consumption of ejector and air consumption of other air circuit.

### Design · Selection

#### ! Cautions

Move to for related equipments such as direction control equipment, driving equipment, etc., (refer to the cautions in each catalog).

### During attaching

#### ! Warning

Do not block the exhaustion hole of the ejector.

### While attaching

#### ! Cautions

1. Linear piping should be performed with shortest length at both vacuum side and supplying side.
2. A large size effective cross section of piping should be provided at the exhaustion of the ejector.  
When exhaustion decreases, deterioration may occur in the performance of ejector
3. No damage or loss by bending on the piping.

### Environment when in use

#### ! Warning

1. It is preferred that the product should not be adapted at place in which corrosive gas, chemical, sea water, water, vapor, etc. are provided.
2. The use of the product in an explosive environment should be avoided.
3. The use of the product cohere with vibration or shock should be avoided. It is needed to check the specification of each series.
4. It is needed to protect the product with protective cover in environment of light input.
5. When heat source is nearby, it is needed to block the radiant heat.
6. When water, oil, welding spectrum are supposed to be attached, it is needed to provide protective measure for the place.
7. When it takes long time to change, it is needed to protect against heat. With the above protection, installing the environment of vacuum unit could stay within the temperature range of vacuum unit specification.

### Repair and inspection

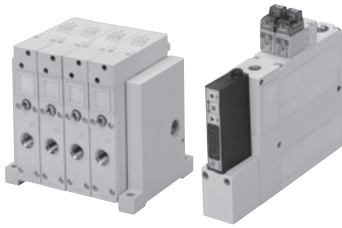
#### ! Warning

1. Regular removal should be performed so that the foreign substance is not inputted into suction filter, silencer and pad. If not, blocking the mesh of filter, silencer and pad could result. In particular, it is preferred to select filter with large capacity of fluid quantity for a place with much dust.

EP

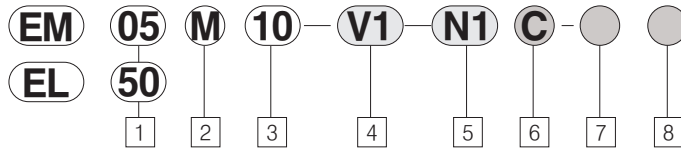
EM/EL

ES

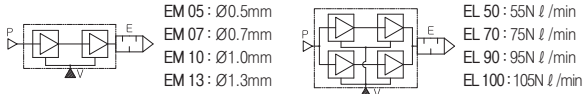


- COMPACT LARGE FLUX (2 STEP NOZZLE)
  - FLAT TYPE AND MANIFOLD (CONCENTRATED AND INDIVIDUAL SUPPLY & EXHAUST)
  - DIGITAL EJECTOR (VACUUM GENERATION, ELECTRIC EXHAUST VALVE AND VACUUM SWITCH ATTACHED)
- VARIOUS VACUUM FLUX (OPTIMUM HIGH SPEED RESPONSE)
  - EM SERIES (MAX. VACUUM FLUX 70NL/MIN, 4 TYPES)
  - EL SERIES (MAX. VACUUM FLUX 100NL/MIN, 4 TYPES)
- VARIOUS EXHAUST METHODS
  - SINGLE PRODUCT: OPEN EXHAUST, PIPE PORT EXHAUST
  - MANIFOLD: INDIVIDUAL OPEN EXHAUST, CONCENTRATED EXHAUST

## How to Order



### 1 EM : Nozzle Diameter(mm) / EL : Vacuum Flux(N ℓ /min)



### 4 Electric Valve Specification

Index	for SUP	for Destroy	Electric Voltage
Blank	N.E	N.E	DC 24V
V1	N.C	N.C	
V2	N.O	N.C	
V3	N.O	N.E	
V4	N.C	N.E	

※ Contact separately for AC110V and DC 12V.

### 2 Body & Exhaust Type

Index	Indication Type	SUP/EXH Type	Remark
Single product	S	Individual SUP/Individual EXH	Air Open Type, Pipe Port EXH
	MA	Individual SUP/Individual EXH	Air Open Type, Pipe Port EXH
	M	Concentrated SUP/Individual EXH	Air Open Type, Pipe Port EXH
Manifold	MB	Concentrated SUP/Individual EXH	Both side port EXH
	MR	Concentrated SUP/Individual EXH	Right Side Port EXH (V-Port Front Base)
	ML	Concentrated SUP/Individual EXH	Right Side Port EXH (V-Port Front Base)

※ Please additionally fill S1, MA1 and M1 for ordering single product pipe port EXH type.  
 ※ Manifold concentrated EXH silencer (model name: SN500-06R 3/4) may be purchased separately

### ■ Diameter of Connecting Pipe

Index	Indication Type	Contact Pipe Diameter		
		SUP(P) Port	Vacuum(V) Port	EXH Port
Single product	S	Rc(PT)1/8(Individual)	PC(PT)1/8, Ø10 Pitting Selection	Rc(PT)1/8,
	MA	Rc(PT)1/8(Individual)		Air Open Type
Manifold	M	Rc(PT)1/4(Concentrated)		Rc(PT)3/4
	MB			
	MR			
	ML			

### 3 Manifold Number of Station

Blank	For Unit	In Case of Order for all Single Product Models
02	2 Station	In Case of Ordering Manifold Only
⋮	⋮	
10	10 Station	

### ■ Max. Utilizing Connection Number Along Nozzle Diameter

Model	MA	M, MB	MR, ML
EM05	10	10	10
EM07	10	10	8
EM10	10	8	5
EM13	10	6	4
EL50	5	5	4
EL70	5	3	3
EL90	5	3	3
EL100	5	2	2

### 5 Vacuum Switch Type

※ Electric Voltage: DC 24V

Model Name	Index	Contents
-	Blank	No Switch
VPS-*	NL	LED 3 Digit indicating, NPN 2-point+Analogue output, Grommet type
	NK	LED 3 Digit indicating, NPN 2-point+Analogue output, Connector type
VMS-*	N1	LED turned ON, NPN 1-point output + Differential setting (Analogue output), Connector type
	N2	LED turned ON, NPN 2-point output, Connector type

※ Inquire in advance for ordering PNP type.

### 6 Switch lead track specifications

Blank	LeadTrack Length 0.6M
C	LeadTrack Length 2M

※ Only 2M is produced for grommet type lead track.

### 7 Check Valve

Blank	No Check Valve
H	Check Valve

※ Vacuum exhaust time is delayed if attaching check valve.

### 8 Vacuum (V) Port Type

Blank	Rc(PT) 1/8
F	Ø10 Fitting



## Specifications

### Flux Features

Basic Type	EM05□	EM07□	EM10□	EM13□	EL50□	EL70□	EL90□	EL100□
Index								
Max. Vacuum Flux[N ℓ /min]	15	30	60	70	55	75	95	105
Air Consumption[N ℓ /min]	12	23	46	95	46	66	92	141
Target Vacuum Level	-84kPa[-630mmHg]							

### Ejector

Fluid	Air
Max. Pressure Applied	0.7MPa[7.1kgf/cm <sup>2</sup> ]
Rated Supply Pressure (Range)	0.5MPa[4.5kgf/cm <sup>2</sup> ~5.5kgf/cm <sup>2</sup> ]
Applied Temperature Range	5 ~ 50°C
Filter Opening Width	PE, 30μm
Contact Pipe	SUP Port Rc(PT) 1/8
Diameter	Absorbing Port Rc(PT) 1/8, Ø10 Fitting
Product Weight	350g
Attaching Direction	Free

### Electric Valve (Vacuum Generating, Vacuum Destroy)

Applied Pressure Range	0.25~0.7MPa[7.1kgf/cm <sup>2</sup> ]
Operating Method	N.C/N.O Direct Action Type
Rated Voltage	DC24V
Allowable Voltage	Within Rated Voltage +/- 10
Effective Sectional Area	0.18mm <sup>2</sup>
Lead track Extraction Method	Plug Connector
Power Consumption[W]	Less than DC 0.6W
Lead Track Color	Red (+), Black (-)
Lamp & surge voltage protecting circuit	LED & Protecting Circuit Built-in

### Vacuum Switch

Indication Type	VMS-□□-□□	VPS-□-□-□□□
Display Type	LED (Red, Green) ON	LED 3 Digit
Set vacuum Level in Delivery	-53.3kPa[-400mmHg]/1 Point	
Power Supplied	DC12~24V	
Output Method	NPN/PNP Open Collector 30V, 200mA	NPN/PNP Open Collector 30V, 80mA
Output Point	1 Point Output + Differential Setting (Analogue Output) or 2 Point Output	2 Point Output + Analogue Output
Power Consumption	30mA	Less than 50mA
Set Pressure Range	0kPa~-101kPa	
Guaranteed Pressure-Resistant	0.2MPa (Double of Rated Pressure)	
Gas Applied	Air and Non-Corrosive Air	
Applied Temperature Range	0~60°C	
Temperature Feature	±3% F.S or Less	
Differential Setting	Set Pressure 0.5~10% F.S	3% F.S (Fixed)
Response Term	2.5ms or Lower	2.0ms or Lower
Repeat Error	Within ±1% F.S	±0.2% F.S
Lead Tract Extraction Method	ConnectorType	Connector or Grommet Type
Function[VMS]	Differential Setting Trimmer(210°) Pressure Setting Trimmer(210°)	-

### Color of Lead Wire

VMS	Brown	DC(+)
	Black	Output 1
	White	Output 2(or Analogue Output)
	Blue	DC(-)

VPS	Brown	DC(+)
	Black	Output 1
	White	Output 2
	Blue	DC(-)
	Yellow	Analogue Output



Operation Principle Diagram

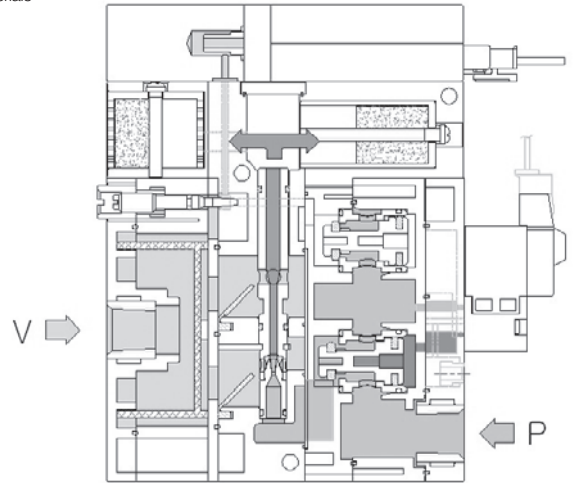
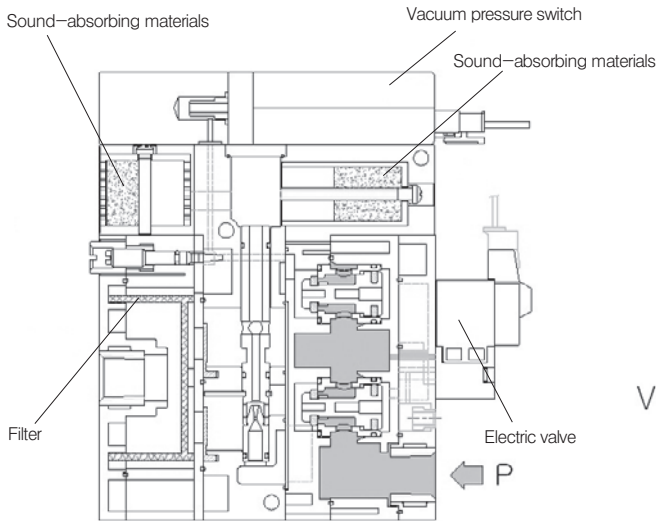
EP

EM/EL

ES

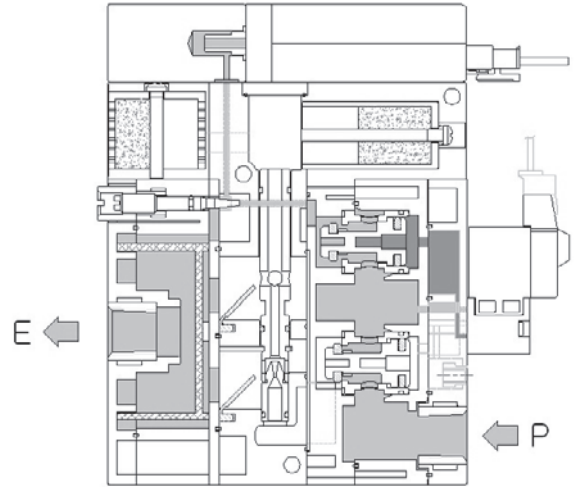
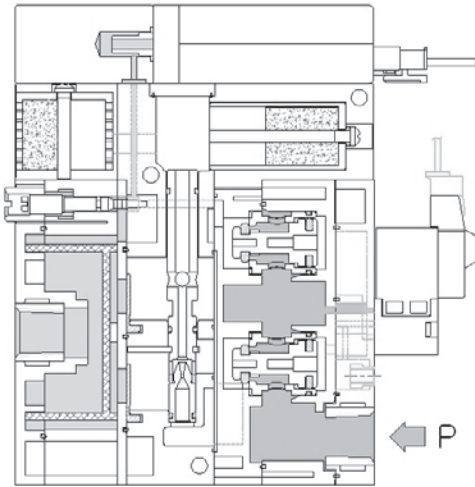
Waiting Status

Vacuum Generating Status



Vacuum Maintaining Status

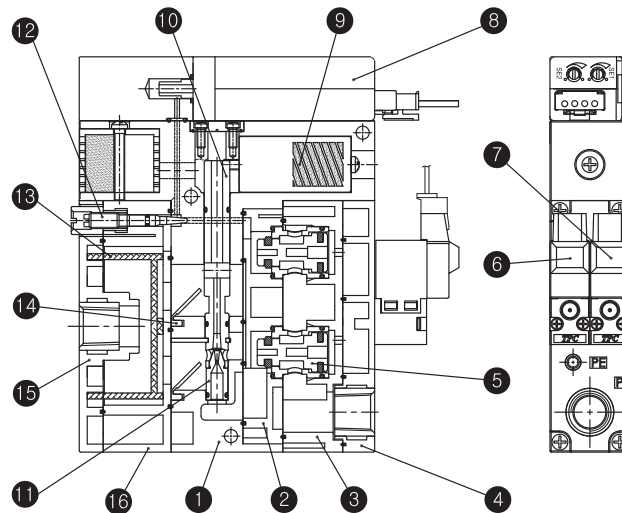
Vacuum Exhaust Status



Time for Vacuum Achieved (sec/ℓ)

Name of Model	Reached Vacuum Level kPa	53	60	67	73	80
	(mmHg)	(400)	(450)	(500)	(550)	(600)
EM05		8.3	9.9	12.4	15.1	20.1
EM07		3.1	4.2	5.5	6.9	9.3
EM10		1.6	2.1	2.7	3.5	5.4
EM13		1	1.3	1.7	2.3	3.5
EL50		1.7	2.2	3	3.8	5
EL70		1.2	1.6	2	2.6	4
EL90		0.9	1.2	1.5	1.9	3.2
EL100		0.7	0.9	1.2	1.5	2.5

Ejector Structure Map and Component Table



Components

Np.	Name of components	Material	Remark
1	Diffuser Body	Zn(Painting)	
2	Operator Body (Lower)	PA	
3	Operator Body (Upper)	PA	
4	Valve Unit Body	PA	
5	Poppet Valve Ass'y	-	
6	Electric Exhaust Vacuum	Normal	DV100-5H(Horizontal)
		Close	DV100-5V(Vertical)
7	Vacuum Destroy Electric Valve	Normal	DV100-5H(Horizontal)
		Close	DV100-5V(Vertical)
		Normal	DV120-5H(Horizontal)
		Open	DV120-5V(Vertical)
10	Diffuser	Al(Color Plating)	0.5(Yellow), 0.7(Red)
11	Nozzle		1.0(Green), 1.3(Silver)
12	Flux Control Screw	Al	
14	Vacuum Stop Pad	NBR	
15	Filter Cover	PA	
16	Filter Body	PA	

Replacement Components

No.	Name of Components	Material	Style Number
8	Vacuum Pressure Switch	-	VPS-N-LC VMS-N+
9	Sound-absorbing Material (Front, Both Side Surfaces)	PVA Sponge	ET-064-001
13	Vacuum Filter	PE	ET-033-001

External Dimension Drawings / Single Product Type

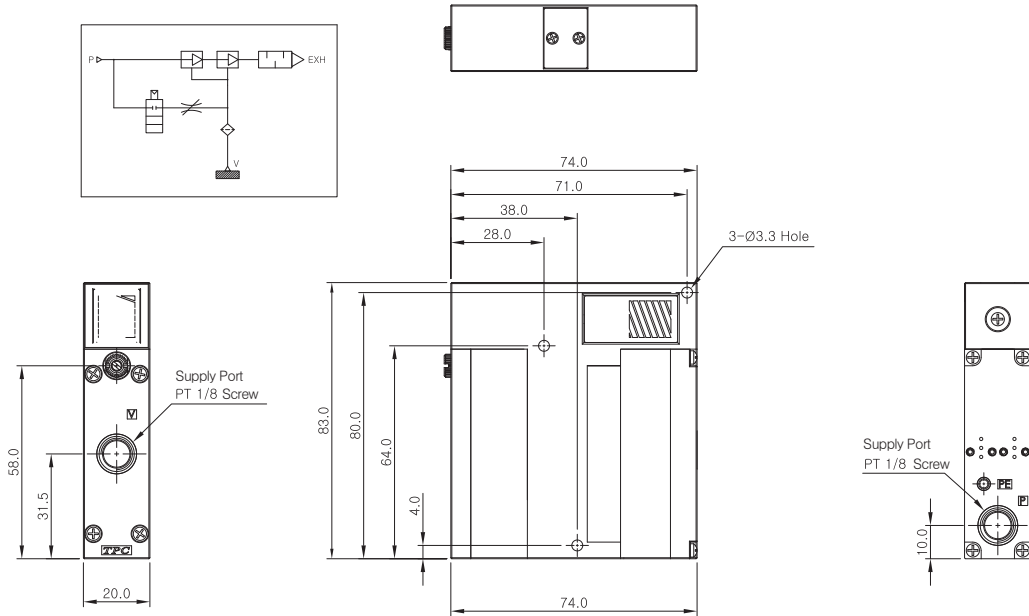
EP

EM/EL

ES

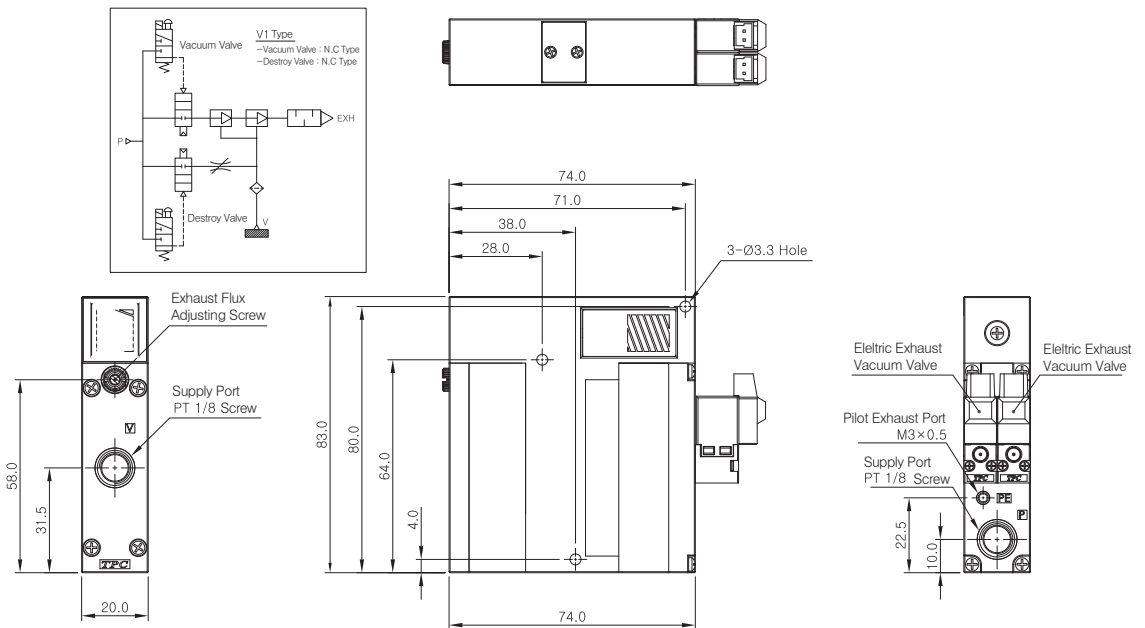
Standard Type

EM(EL)□S-□□



Non-Vacuum Switch

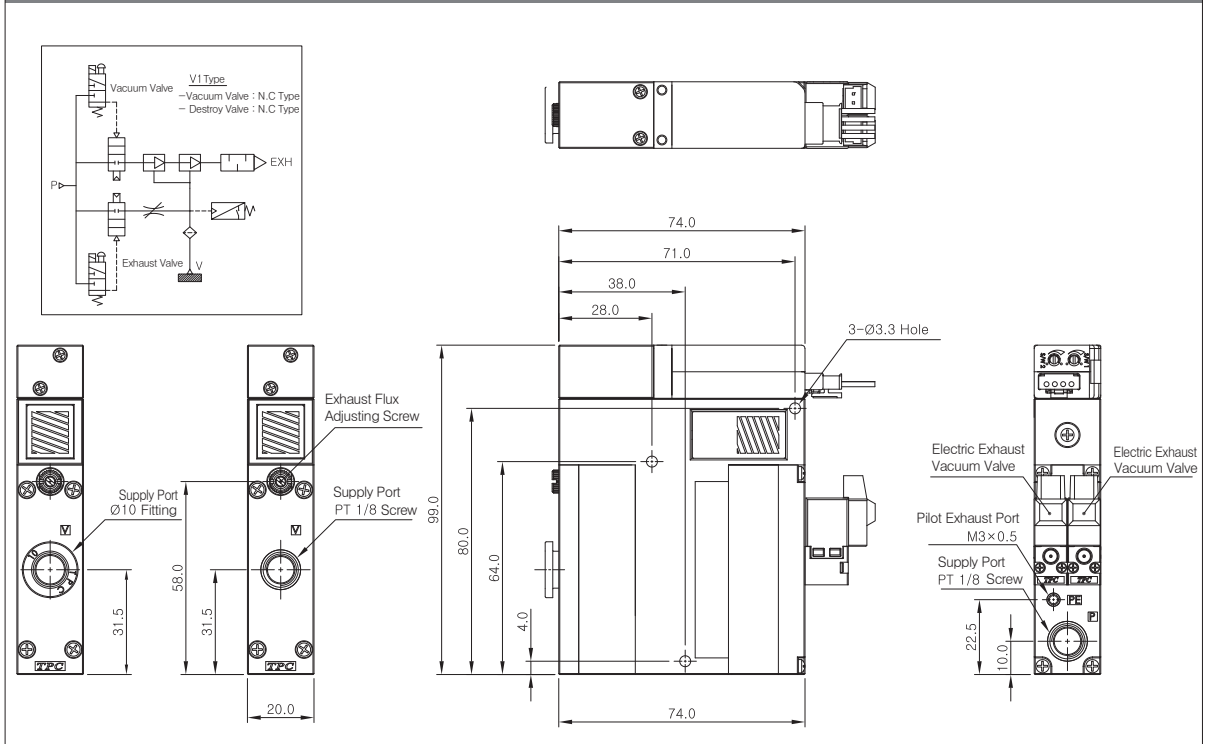
EM(EL)□S-□-□□



## External Dimension Drawings / Single Product Type

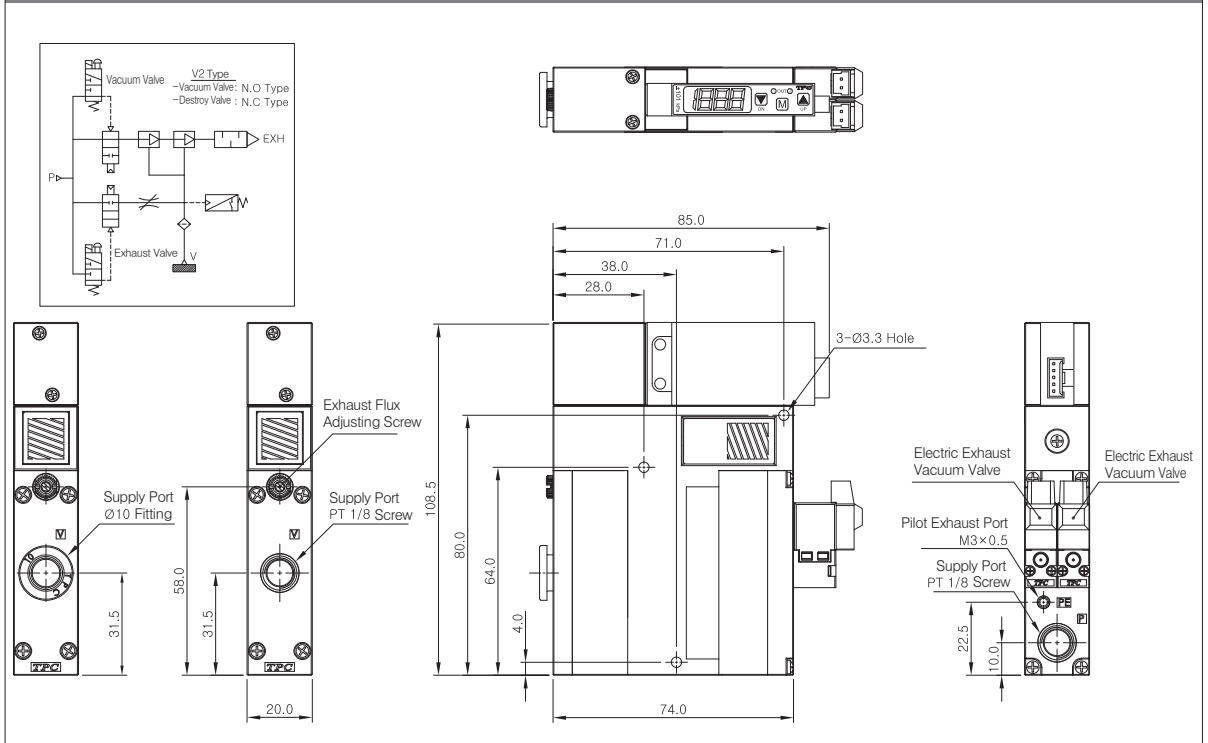
LED Turn-on Type Vacuum Switch

EM(EL)□S-□-□□-□□



LED 3 Digit Indicating Type Vacuum Switch

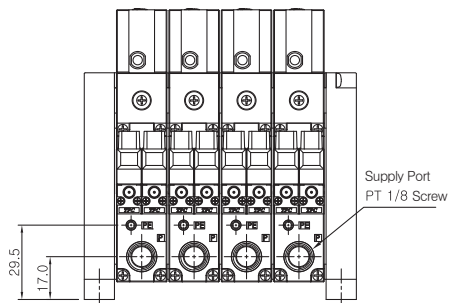
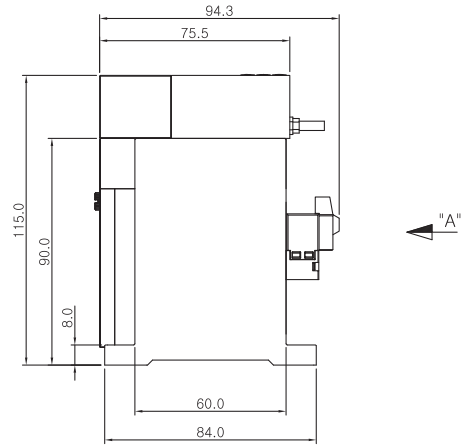
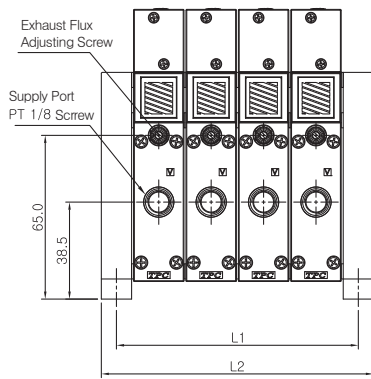
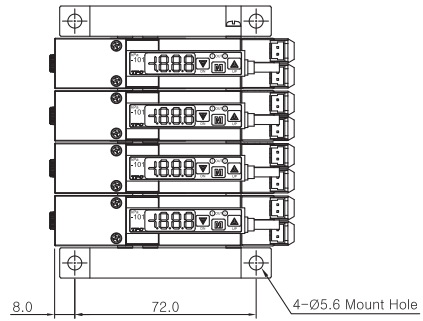
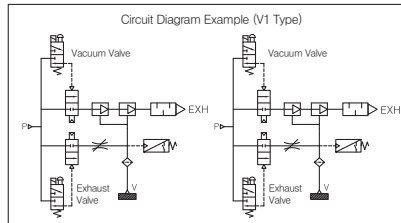
EM(EL)□S-□-□□-□□



External Dimension Drawings / Manifold

EP  
EM/EL  
ES

Individual Supply / Individual Exhaust EM(EL)□MA□-□-□□-□□



VIEW "A"

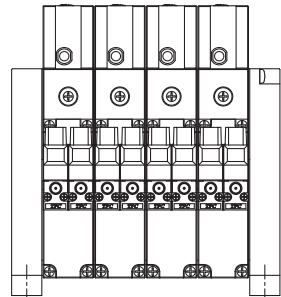
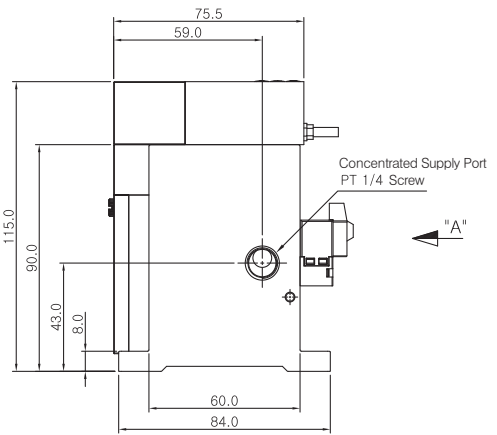
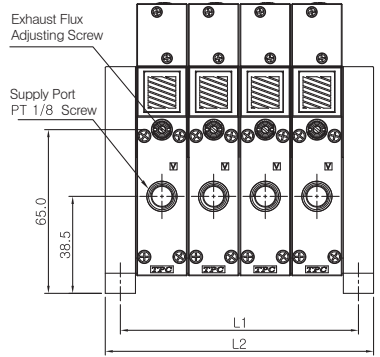
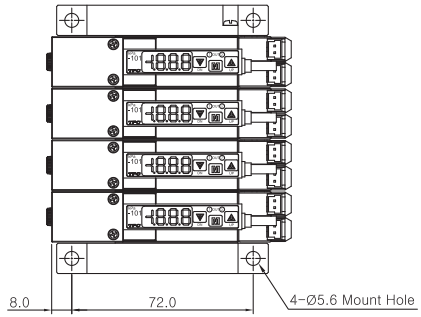
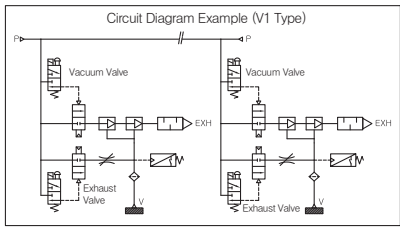
Dimensions

(Unit : mm)

Number of Connection	1	2	3	4	5	6	7	8	9	10
L1	33.6	54.4	75.2	96	116.8	137.6	158.4	179.2	200	220.8
L2	45.6	66.4	87.2	108	128.8	149.6	170.4	191.2	212	232.8

## External Dimension Drawings / Manifold

Concentrated Supply / Individual Exhaust EM(EL)□M□-□-□□-□□



VIEW "A"

**Dimensions**

(Unit : mm)

Number of Connection	1	2	3	4	5	6	7	8	9	10
L1	33	53.5	74	94.5	115	135.5	156	176.5	197	217.5
L2	45	65.5	86	106.5	127	147.5	168	188.5	209	229.5

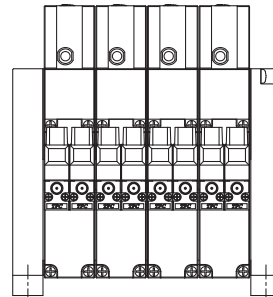
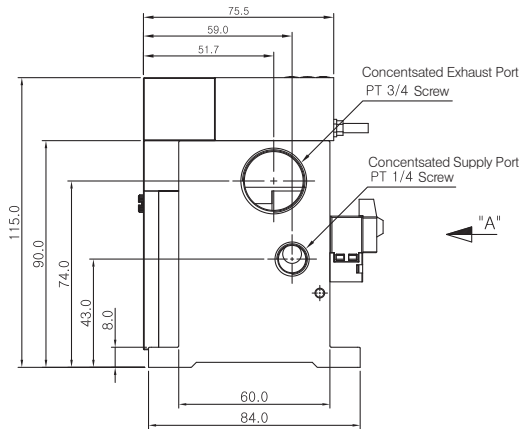
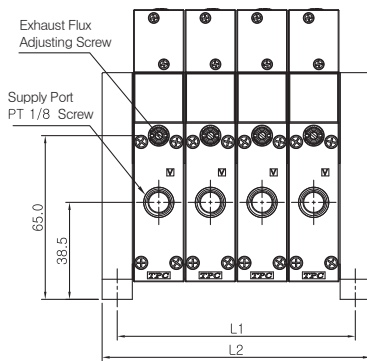
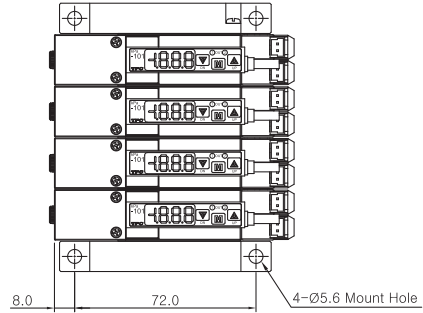
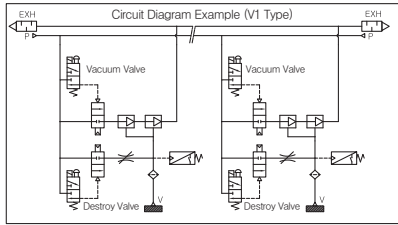


External Dimension Drawings / Manifold

EP  
EM/EL  
ES

Concentrated Supply / Individual Exhaust

EM(EL)□MB□-□-□□-□□

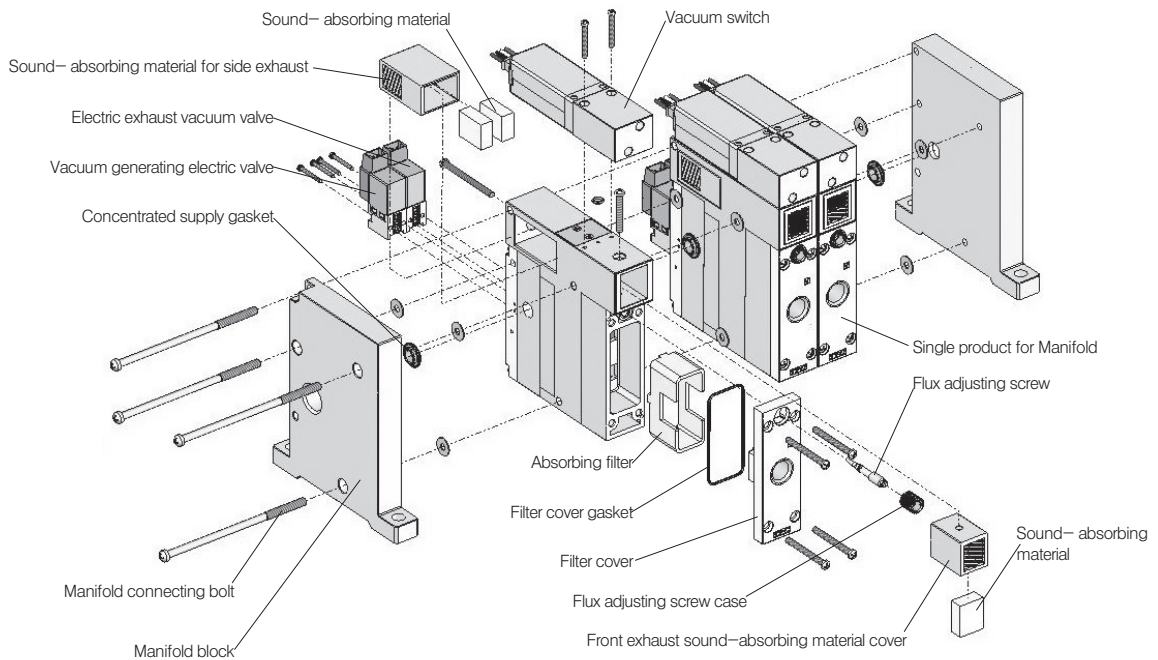


Dimensions

(Unit : mm)

Number of Connection	1	2	3	4	5	6	7	8	9	10
L1	33	53.5	74	94.5	115	135.5	156	176.5	197	217.5
L2	45	65.5	86	106.5	127	147.5	168	188.5	209	229.5

## Assembly/Disassembly of Equipment



## Notices for Ejector Utilization

### ■ Trouble shooting :

#### Vacuum function degradation owing to insufficient supply air

- ※ Measure : 1) Check supply air flux
- 2) Make pipe length as short as possible.
- 3) Make fitting size as big as possible
- 4) If supply air port specifies one side, use both sides.

#### Vacuum performance degradation owing to insufficient exhaust air capacity

**Silencer attaching type** : If exhaust resistance becomes bigger owing to lack of silencer capacity, function is degraded.

- ※ Measure : 1) If silencer specifies one side, use both sides.
- 2) Carry out individual exhaust along each station.
- 3) Do not install exhaust port at blocked places owing to external influence.
- 4) Reduce the number of manifold connections.

**Pipe exhaust type** : Function is degraded as pipe resistance becomes bigger.

- ※ Measure : 1) If pipe exhaust specifies one side, use both sides.
- 2) Make pipe length as short as possible.
- 3) Carry out individual exhaust along each station.
- 4) Reduce the number of manifold connections.

#### Failure owing to excessive supply pressure

**Max. utilization pressure (7.1kgf/cm<sup>2</sup>)**: Supplying over max. utilization pressure may cause inability of valve switching or leakage.

- ※ Measure : 1) Attach filter regulator at front side of ejector.
- 2) Operation is restored to normal with restoration of valve response if adjusting pressure applied under 7.1kgf/cm<sup>2</sup>.
- 3) Use after re-assembly of gasket if leakage occurs.

Vacuum Pressure Switch

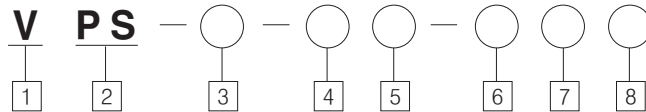
Vacuum Switch Order Form



VPS Series



VMS Series



1 V-Vacuum

2 Series Name

PS	Indicating LED 3 Digit
MS	Turning on LED (Red/Green)

\* Applied model along series

- PS : EP, EM, EL
- MS : EM, EL

3 Pressure Type

No Symbol	Negative Pressure -101.3kPa	-
C	Ductility Pressure ±100kPa	VPS

4 Output Specification

N	NPN Open Collector
P	PNP Open Collector

5 Output Contact Point

No Symbol	2-point Output, Analogue Output	VPS
1	1-point Output + Differential Setting, Analogue Output	VMS
2	2-point Output (Output1: Red, Output2: Green)	VMS

6 Wiring Method

No Symbol	Connector Type	-
L	Grommet Type	VPS

7 Wire Length

No Symbol	Wire Length 0.6M
C	Wire Length 2M

8 Base Type

No Symbol	Basic Type (No Base)
P	EP Ejector Attached Only (Base Inclusive)
B	EM/EL Ejector Attached Only (Base Inclusive)

Specification

VPS Series (LED 3Digits Method)

Type	VPS-C-□-□	VPS-□-□
Rated Pressure Range	-100.0~100kPa	0.0~101.3kPa
Set Pressure Range	-101.2~110kPa	5.0~101.3kPa
Max. Pressure Range	2 Times of Rated Pressure	
Voltage Applied	12~24VDC ±10%	
Power Consumption	50mA or Less	
Control Output	Setting	Open Collector 30V, 100mA or Less
	Response Time	Select 2.5ms, 5ms, 100ms, 500ms
	Short Circuit Protection	Built-in
Analogue Output	Output Voltage : 1~5VDC ±2% F.S.	
Control Output Feature	±2% F.S. or Lower	
Set Point	2 Point	
Operation Indicating Lamp	Turned on When ON (Out 1 : Red, Out 2 : Green)	
Setting Method	Variable Method by Button Press	
Level	±0.2% F.S. ±2 Digits	
Display Method	Indication by 3½ Line and LED 7Segments	

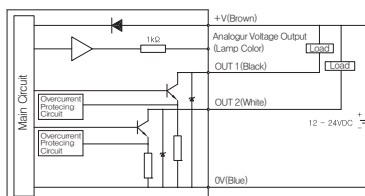
VMS Series (LED Lighting Method)

Type	VMS-N1(P1)-□	VMS-N2(P2)-□	
Rated Pressure Range	0.0~101.3kPa		
Set Pressure Range	10.0~101.3kPa		
Max. Pressure Range	2 Times of Rated Pressure		
Voltage Applied	12~24VDC ±10%		
Power Consumption	30mA		
Control Output	Setting Point	1 Point      2 Point	
	Differential(HYS)	1~10% F.S. Varied      1% F.S. Fixed	
	Repeated Error	±1% F.S.	
	Response Time	Lower than 2.5ms	
	Short Circuit Protection	Built-in	
Analogue Output	Output Voltage : 1~5DC Linearity : Within ±2% F.S.	-	
Operation Indicating Lamp	Out 1 : Red LED	Out 1 : Red LED Out 2 : Green LED	
Setting Method	Trimmer Method		
Setting Adjustment Range	1 Turn(210°)		

Connecting Circuit Diagram

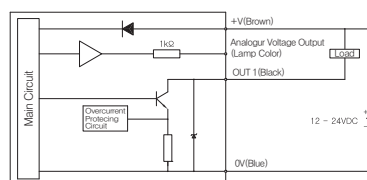
VPS Connecting Circuit Diagram

1 point output + Analogue output

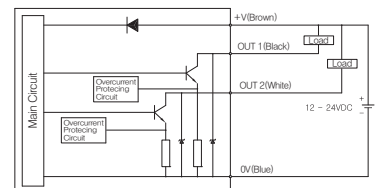


VMS Connecting Circuit Diagram

1 point output + Analogue output

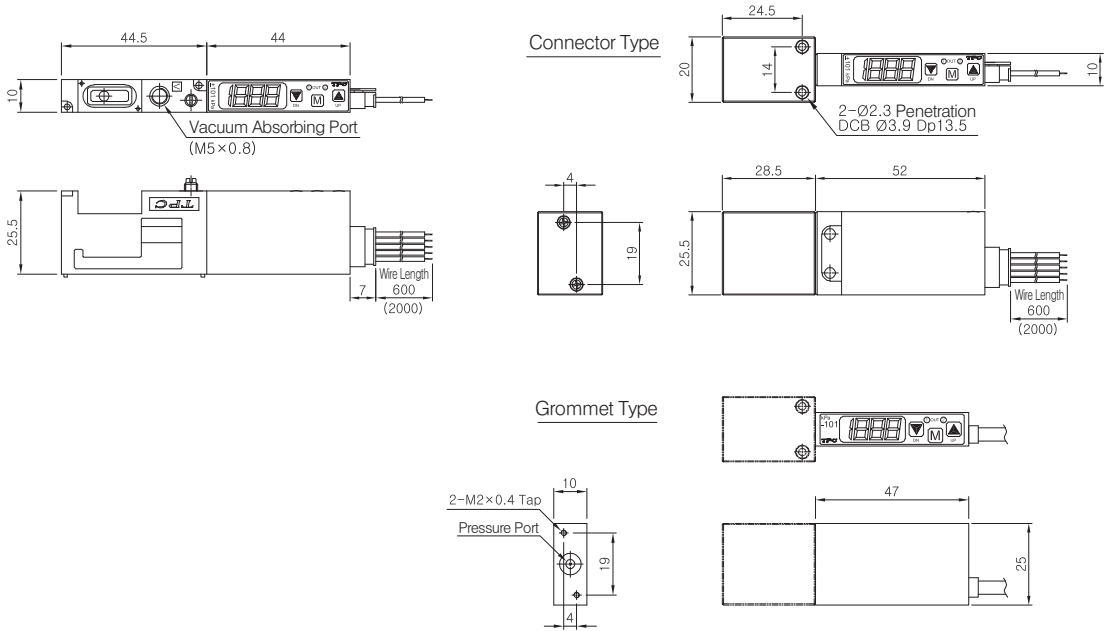


2 point output



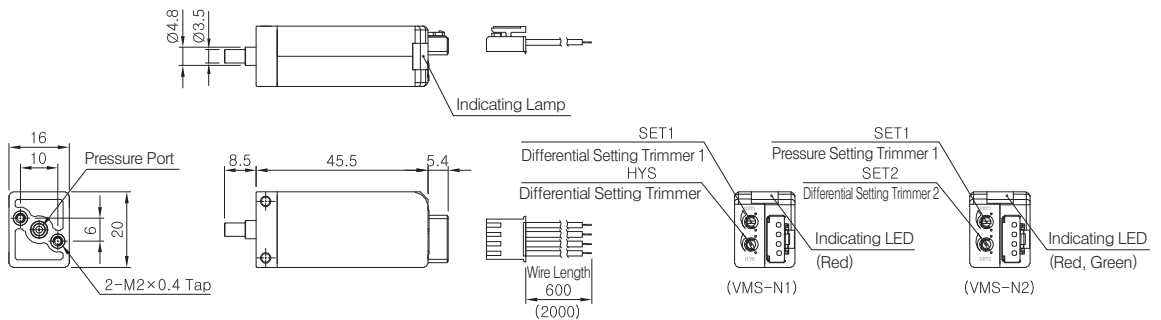
## External Dimension Drawing

### VPS Series



※ Refer to manual for pressure setting method.

### VMS Series



※ Refer to manual for pressure setting method.

### Notices for Handling

1. Do not put sharp materials into pressure port such as needle, etc, which may destroy sensor, causing system failure.
2. Do not allow direct contact with organic solvents such as thinner, water, oil or fat.
3. Avoid excessive condition (within 3 seconds) for electrical pressure.
4. In case of using switching regulator by power, make grounding of frame ground (F. G) circuit of power device.
5. Do not wire with power cable and high voltage cable together, which may cause error owing to noise.
6. Do not press each setting button with sharp materials such as needle, etc.
7. Do not excessively press inside of product for adjustment of setting trimmer, and do not rotate more if it reaches a minimum or maximum location.

# ES Series

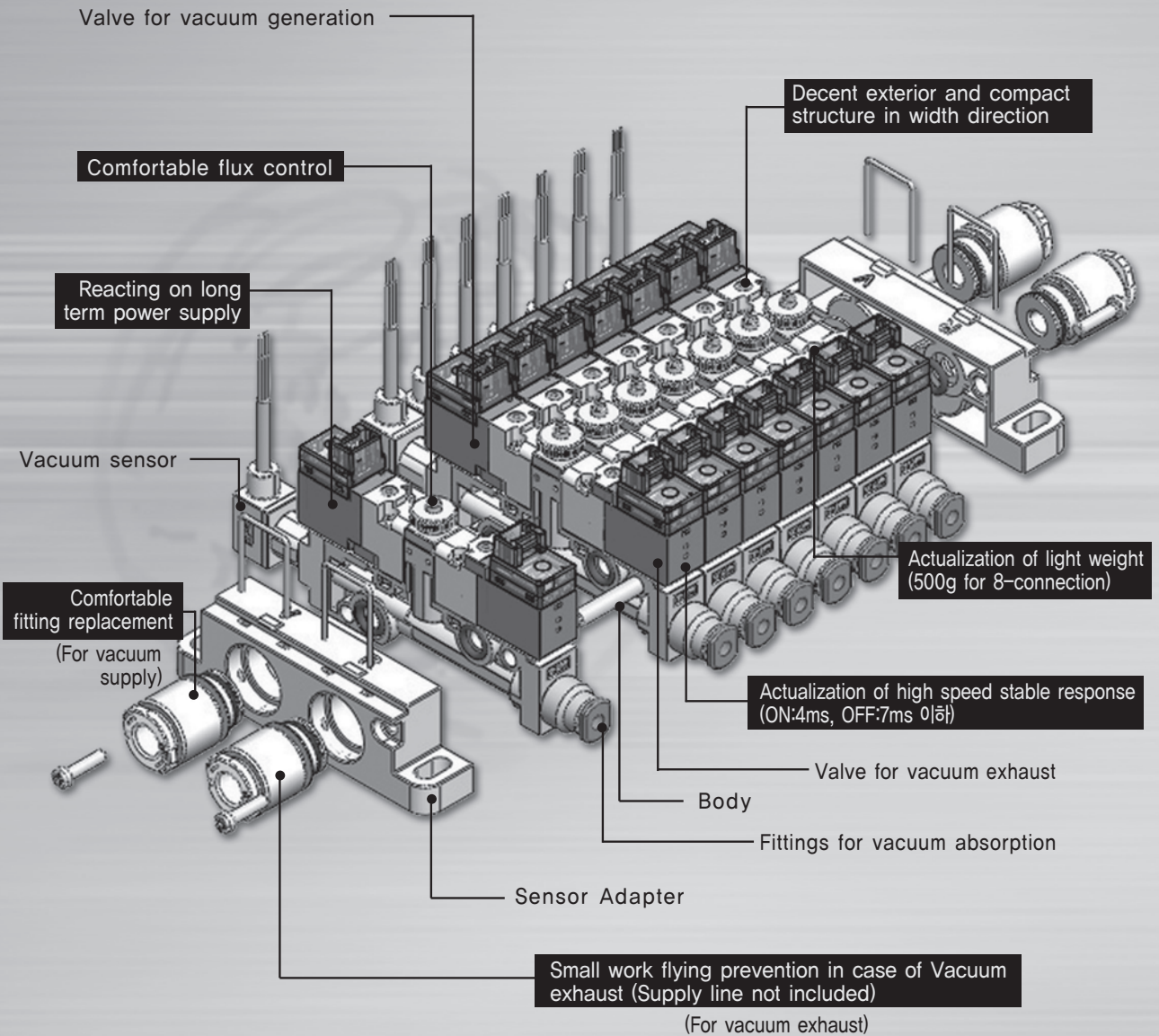
ES Series

Vacuum Ejector

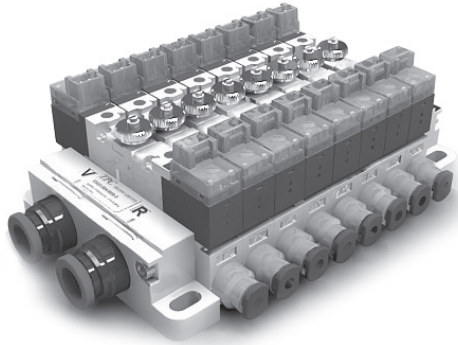
EP

EM/EL

ES

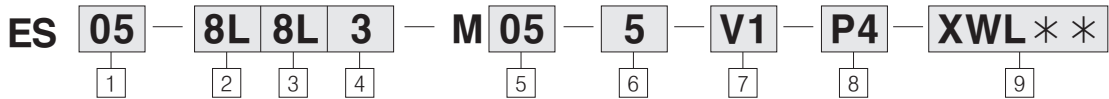


## Vacuum Ejector (ES Series)



- COMPACT DESIGN
- SUPERB LONG TERM POWER SUPPLY FEATURE
- ACTUALIZATION OF HIGH SPEED STABLE RESPONSE
- ACTUALIZATION OF LIGHT WEIGHT (500G FOR 8-CONNECTION)
- SMALL WORK FLYING PREVENTION IN CASE OF VACUUM EXHAUST (SUPPLY LINE NOT INCLUDED)

### How to Order



**1** Nozzle Diameter

- 05 : 0.5mm
- 07 : 0.7mm

**2** Vacuum Generating Supply Port

- 6 : Ø6 Straight one-touch fitting
- 8 : Ø8 Straight one-touch fitting
- 6L : Ø6 Elbow one-touch fitting (Responding for order)
- 8L : Ø8 Elbow one-touch fitting

**3** Vacuum Destroy Supply Port

- 6 : Ø6 Straight one-touch fitting
- 8 : Ø8 Straight one-touch fitting
- 6L : Ø6 Elbow one-touch fitting (Responding for order)
- 8L : Ø8 Elbow one-touch fitting

**4** Vacuum Absorbing Port

- 3 : Ø3 Straight one-touch fitting
- 4 : Ø4 Straight one-touch fitting
- 3L : Ø3 Elbow one-touch fitting (Responding for order)
- 4L : Ø4 Elbow one-touch fitting (Responding for order)

**5** Number of Valve Connection

- 02 : 2-connection
- ⋮
- 08 : 8-connection

**6** Valve Supply Voltage

- 5 : 24 VDC

**7** Electric Valve Specification

Type	Blank	V1
ES05	N.C	—
ES07	N.C	N.C

※ ES05 is basically N/C type, and N/O type is marked as "V1-7" on No.7(ex. V1-P4)

※ ES07 is basically N/O type, and N/C type is marked "V1-7" on No.7.

**8** Vacuum Sensor Specifications

- Blank : Vacuum sensor not attached
- M5 : Analogue output type (M5 universal)
- P4 : Analogue output type (Ø4 Plug)

**9** Length of Lead Wire

- Blank : 300mm(standard)
- XWL01 : 100mm
- XWL02 : 200mm
- ⋮
- XWL20 : 2000mm

※ Please contact a manufacturer for additional specification.

※ For longer length of wire, please contact us.

Product Specifications

Vacuum Ejector Specifications

Equipment Type	ES05	ES07
Nozzle Diameter (mm)	0.5	0.7
Max. Absorbing Flux ℓ /min (ANR)	Over 5	Over 11
Max. Flux Consumption ℓ /min (ANR)	Less than 12	Less than 22
Max. Vacuum Pressure kPa(mmHg)	Over -85(-638)	Over -85(-638)
Destroy Flux ℓ /min (ANR)	Over 10 Max.	
Nozzle Structure	Single Nozzle	
Exhaust Method	Silencer Built-in (Open to the Air), Individual Exhaust	
Fluid Applied	Air	
Range of Pressure Applied	0.2 ~ 0.55 MPa	
Range of Temperature Applied	5 ~ 50 °C	
Refueling	No Need	

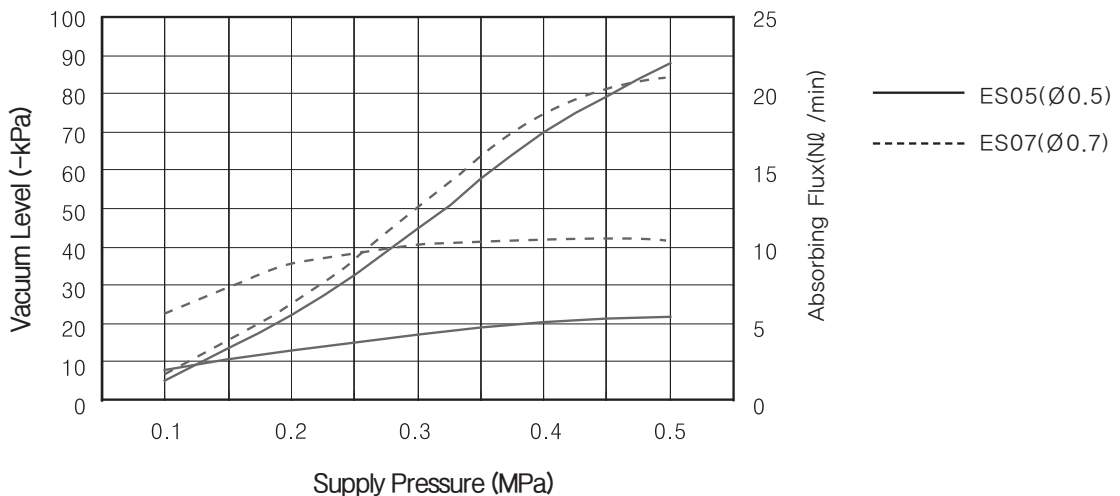
Valve Specifications

Equipment Members	Supply Valve, Destroy Valve	
Control Method	N/C Type(Basic), N/O Type	N/C Type, N/O Type(Basic)
Rated Voltage	DC24V ± 10%	
Handling Method	Electric Valve	
Effective Sectional Area mm <sup>2</sup> (Cv)	0.42 mm <sup>2</sup> (0.025)	

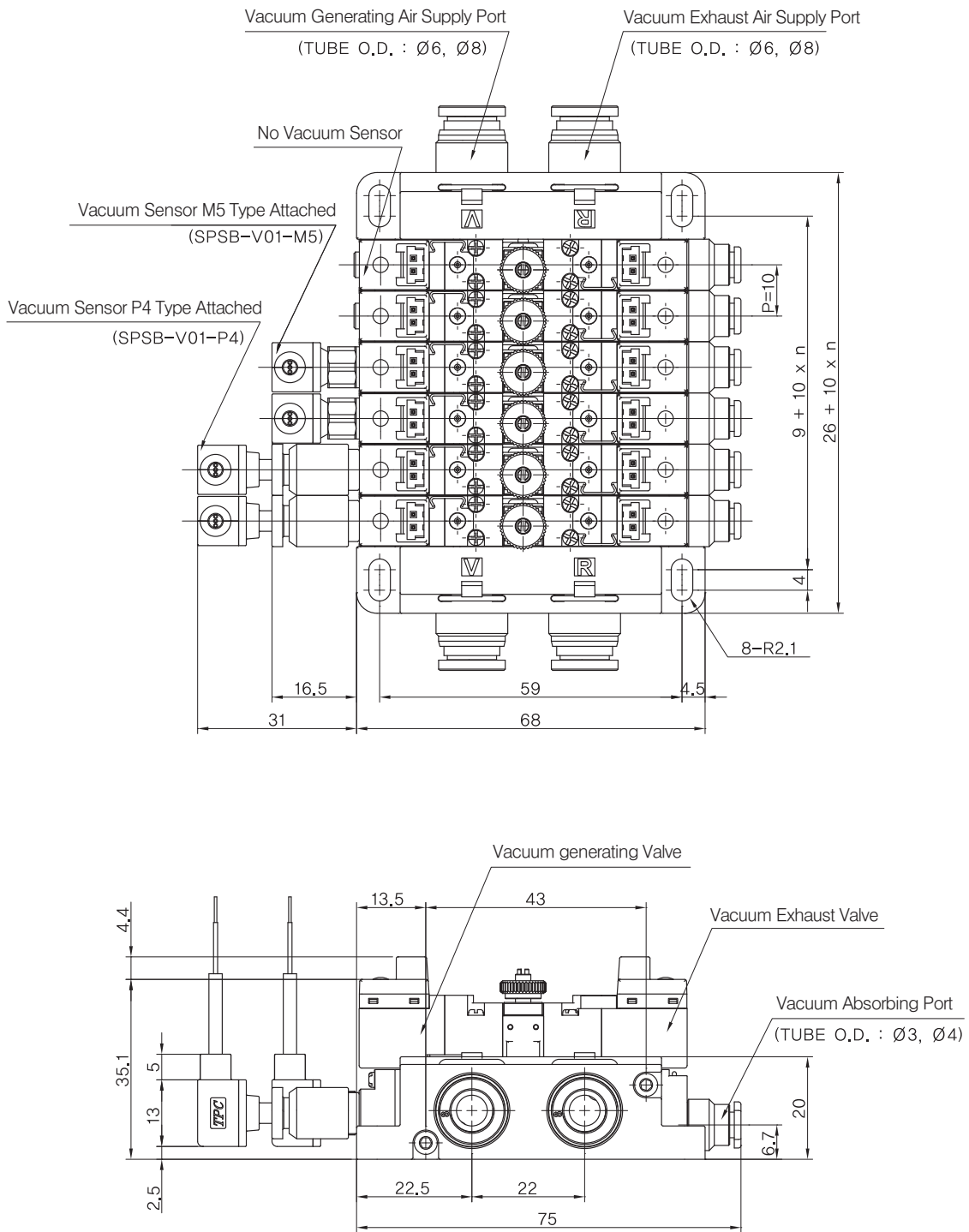
Contact Diameter

Air Supply Port	Ø6, Ø8
Vacuum Absorbing Port	Ø3, Ø4
※ Max. Ejector Connection Number	* Nozzle Diameter Ø0.5: 8-connection * Nozzle Diameter Ø0.7: 8-connection

Vacuum Feature Graph



## Exterior Dimension Drawing(ES05 : mm)



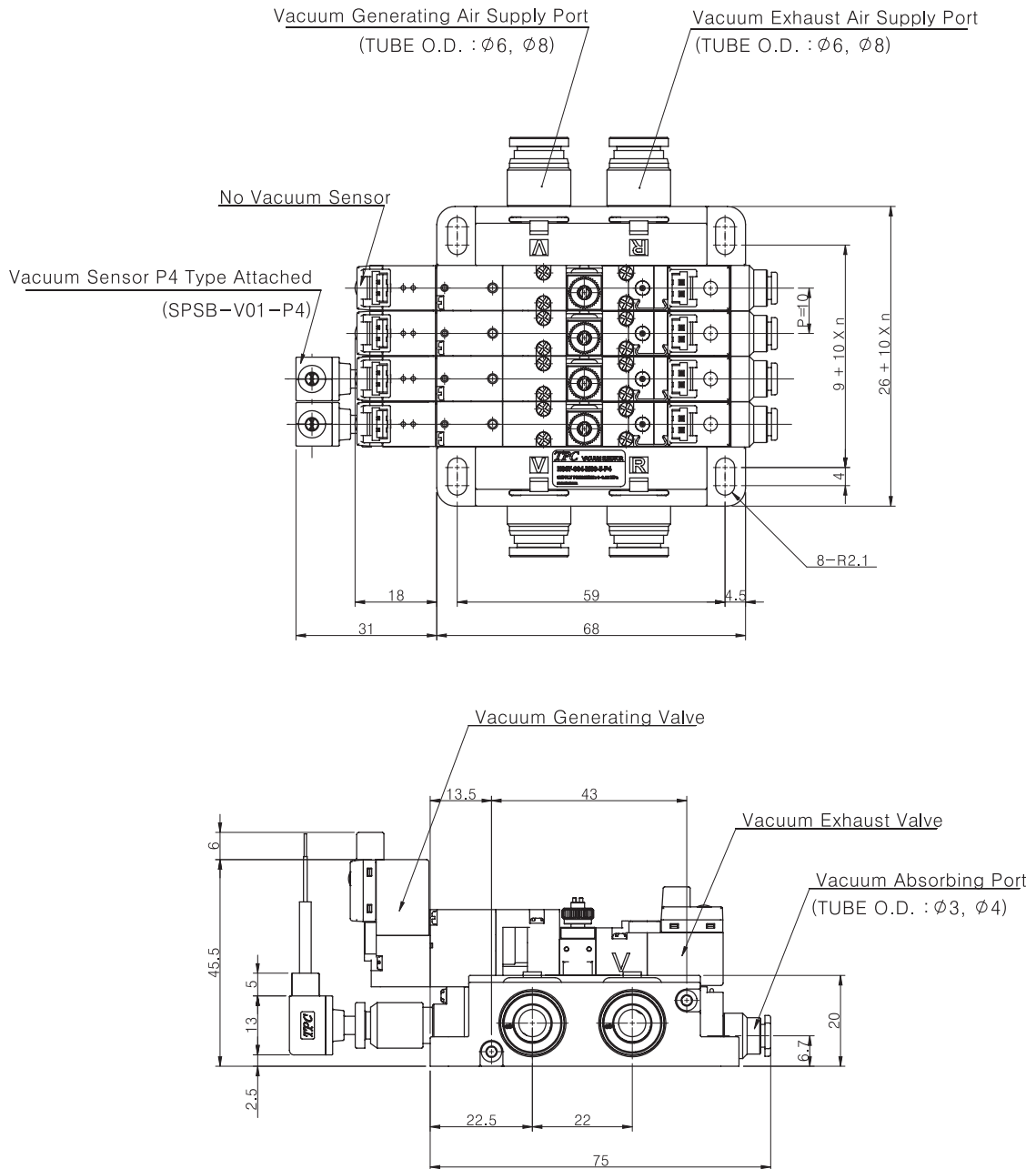


Exterior Dimension Drawing(ES07 : mm)

EP

EM/EL

ES



※ Read before utilization.

## ❗ Common Notices for Vacuum Equipment Design

Check · Selection

### ❗ Warning

1. Conduct safety check to prevent accident caused by vacuum pressure degradation owing to power failure or air source trouble.  
If absorptive power of vacuum pad is lost owing to vacuum pressure degradation, load may be dropped during transportation, or may occur injury damage to human equipment.
2. Apply vacuum specification for vacuum switch and vacuum exhaust valve.  
Application of valve which does not have vacuum function may cause leakage of vacuum.
3. Select an ejector with proper absorption.  
When there is leakage from the load or a pipe: Insufficient absorbing flux may cause adhesion failure.  
A long pipe dsa big pipe diameter may cause delay of absorption response.  
Select an ejector with suitable absorbing flux in reference of technical data.
4. Excessive absorbing flux may cause difficulty with vacuum switch setting.  
When selecting a large ejector, difficulty in the vacuum switch setting may occur due to lack of pressure difference during non-adhesion.
5. Conduct piping with sufficient effective sectional area.  
Select pipes with maximum effective sectional area to allow maximum absorbing flux through ejector. Moreover, do not allow unnecessary pipe components or leakage during piping works.  
Suitable piping design is needed for air consumption of each ejector for air supply side.  
Make sufficient effective sectional area of tube, conduit and valve to derive the least pressure drop for ejector.  
Conduct air source design in consideration of maximum air consumption of ejector and air consumption of other air circuits.

Design · Selection

### ❗ Warning

Refer to Notices in each catalogue for direction control equipment and driving equipment.

For Attachment

### ❗ Warning

Do not make exhaust hole of ejector clogged, which causes failure of vacuum generation.

For Attachment

### ❗ Warning

1. Conduct all vacuum side and supply side piping with the shortest and straight est piping line.
2. Make large effective sectional area for exhaust pipe of ejector. Reduction of exhaust may degrade ejector performance.
3. Do not allow loss caused by damage or curve of pipes.

Environment

### ❗ Warning

1. Do not use in corrosive area where corrosive gas, chemical, seawater, water or steam exist.
2. Do not use in explosive area.
3. Do not use where vibrations or impacts exist. Check specification of each series.
4. Avoid a beam with protecting cover.
5. Block radiant heat if heat source exists around equipment.
6. Set a measure for attachment of water, oil or welding spatter.
7. With a long term power supply to the vacuum unit, please make heat-radiation measure to keep vacuum unit in specified temperature.

Repair and Inspection

### ❗ Warning

1. Carry out regular removal of foreign materials from suction filter, silencer and PAD. Clogging of suction filter, silencer and PAD degrades performance of ejector. Use a large scale filter with a large flux processing for the area where a large quantity of dust exists.