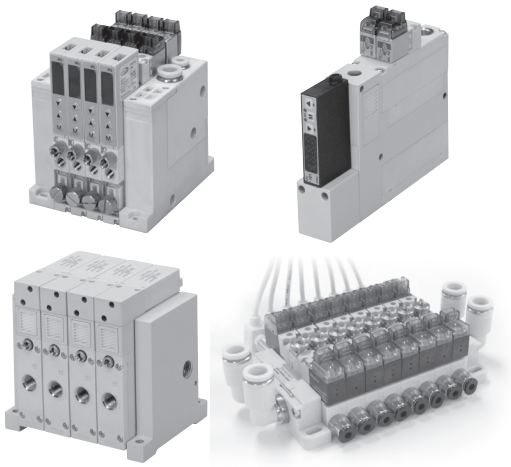
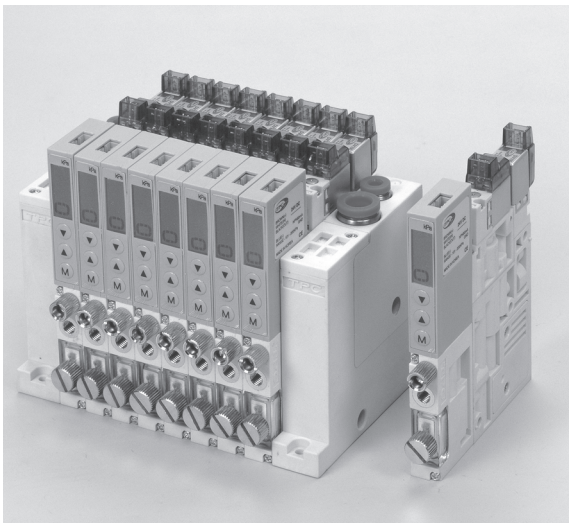
Vacuum Equipment



※ 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^2)
- LOW NOISE (BLOCKED IN TWO LAYERS)
- VARIOUS FUNCTIONS
  - LED 3 DIGIT VACUUM SWITCH
  - SOLENOID VALVE (VACUNM, BREAK)

How to order

E P 05 M 08 — V1 5 — N1 C ( )
1 2 3 4 5 6 7 8

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)	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	
02	2stations	· 0.5 : 8stations
⋮	⋮	· 0.7 : 6stations
08	8stations	· 1.0 : 4stations

4 Specification of Eectronic 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

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 · ℃(℉)	0 ~ 60℃(32~140℉)
Suction filter	polyethylene crystalline (30㎛)
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)	0.18mm²(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✻

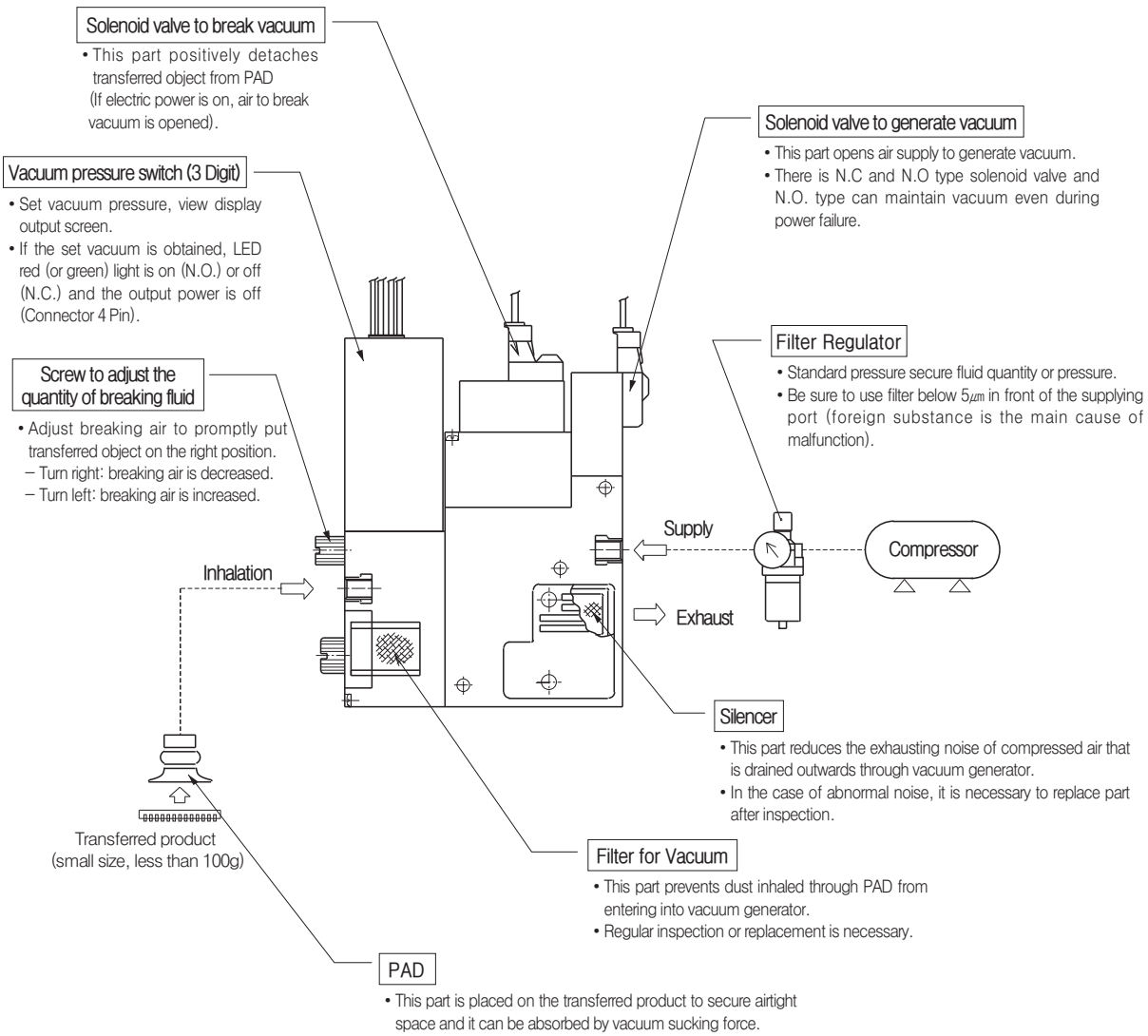
Vacuum switch

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℃)
	responding time	below 2.5ms
	internal pressure	0.2 MPa(29.0psi)

Color of lead wire

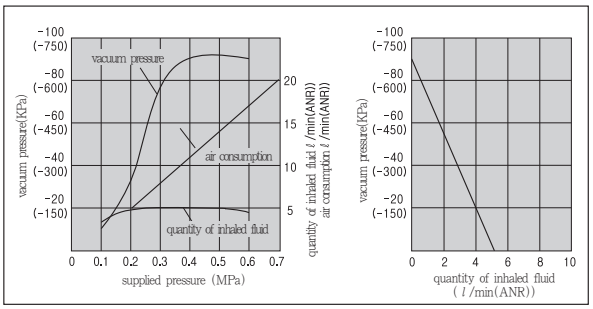
Brown	DC(+)
Black	switch output 1
White	switch output 2
Blue	DC(−)
Orange	analoge output

Components



Performance / Property

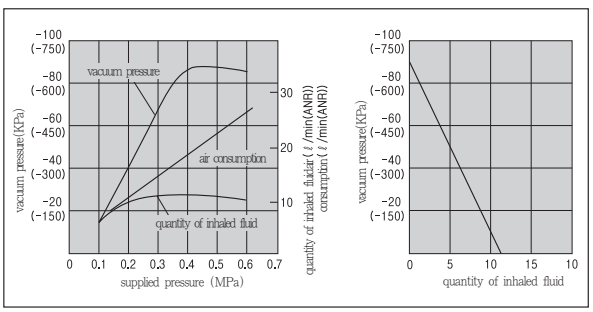
EP05 exhaustion property



EP05 fluid quantity property

The unit of value in ( ) is mmHg.

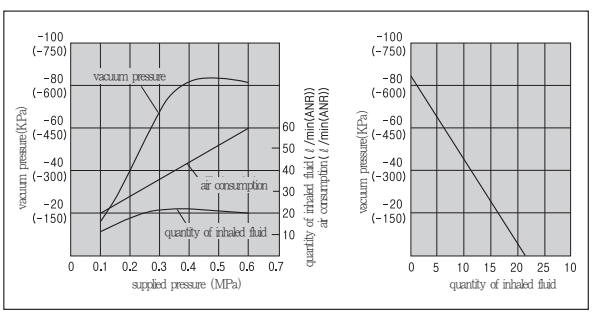
EP07 exhaustion property



EP07 fluid quantity property

The unit of value in ( ) is mmHg.

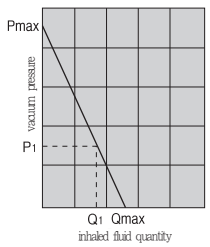
EP10 exhaustion property



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.

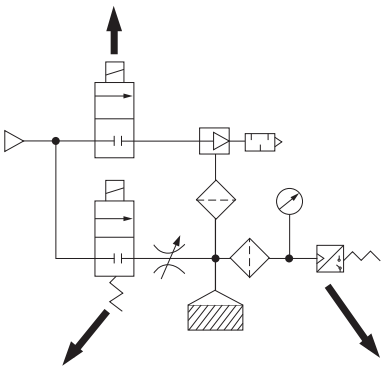
Cautions for use

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

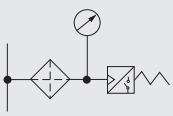
To cope with power failure, select normal open or magnet retention function for the supply valve.

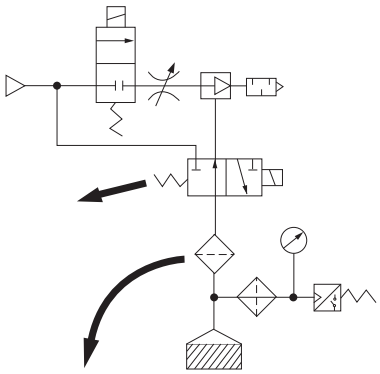


For break valve, select 2/3 port valve of low vacuum specification. Use needle valve to adjust broken fluid quantity.

Use a valve with a synthetic effective cross section that is 3 times large than to that of the nozzle diameter for vacuum transfer valve.
Ex) In event of nozzle 1.0
Effective cross section
0.52 x 0.785mm^2 x 3times = 2.35mm^2

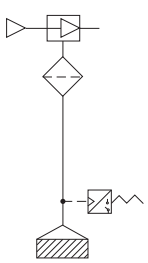
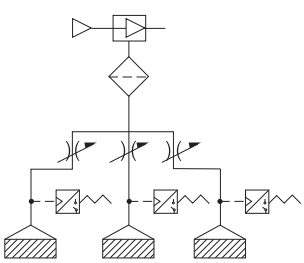
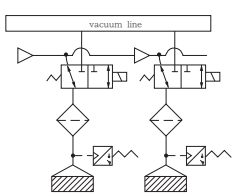
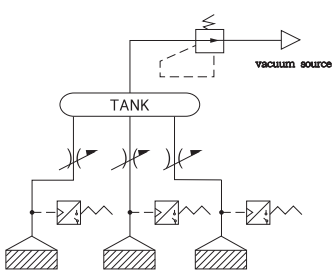
- Confirmation of the suction transference of work is needed by vacuum switch.
- For heavy substance or hazardous substance, confirm gauge as well.
- For unfavorable surrounding environment attach a filter before pressure switch.





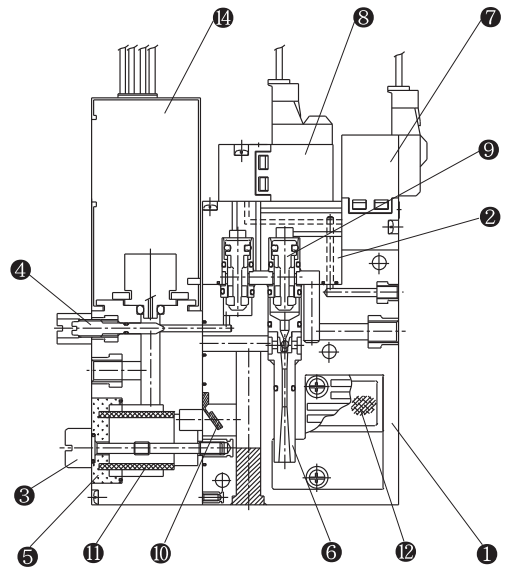
Use vacuum filter to protect transfer valve and prevent mesh of ejector from being blocked. Blocking the mesh will occur faster. When only one filter is adapted for the product

Cautions for vacuum circuit and assembled equipment

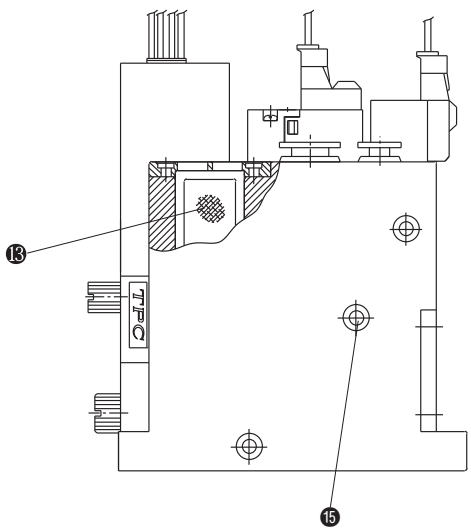
Number of ejector and pad		Number of vacuum pump and pad	
			
Ideal condition : one pad is provided for one elector.	When attaching several pads to one ejector water leakage at one work allows vacuum pressure to drop all other works as well. Perform the following measures. • Reduce the fluctuating pressure of suction and non suction by needle valve. • Install vacuum maintaining valve at each pad in order to eliminate the influence by other pad when erroneous attachment occurs.	Ideal condition : one pad is provided for one line.	When attaching several pads to one vacuum line, perform the following measures • Reduce the fluctuating pressure of suction and non suction by the needle valve. • Stabilize the setting by installing a tank and vacuum decreasing/increasing valve (vacuum control valve). • Install and attach vacuum maintaining valve at each pad.

Unit type

Unit type



Manifold type



Components

No.	Description	Material	Note
❶	ejector body	nylon	
❷	operator body	nylon	
❸	tension bolt	C3604	nickel plating
❹	screw to adjust fluid quantity	AL	nickel plating
❺	filter cover Ass'y	–	
❻	diffuser Ass'y	AL	alumite
❼	vacuum valve	–	
❽	break valve	–	
❾	poppet valve Ass'y	–	
❿	check valve	NBR	

No.	Description	Material	Part number
⓫	suction filter (for unit)	polyethylene	EP-033-001
⓬	silencer (for unit)	polyethylene	EP-064-060 EP-064-080
⓭	silencer (for manifold)	polyethylene	EPM-064-002
⓮	vacuum pressure switch	–	VPS-C-N-P VPS-C-P-P
⓯	bolt (manifold type)	chrome steel	M3×0.5×✻L

▶ 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

■ Manifold block only

EPM — 08 — M

1 2

1 Manifold station

01 : 1station
02 : 2station
⋮ ⋮
08 : 8station

2 Body and exhaustion type

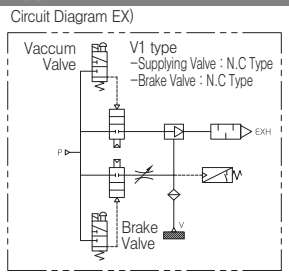
Classification	Supply & Exhaust	✻Type of Mounting
M	common supply&exhaust	manifold block(R,L)
MA	indivisual supply&exhaust	bracket(R,L)

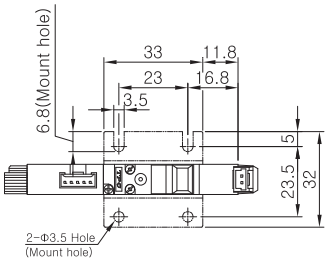
Dimensions / Unit type

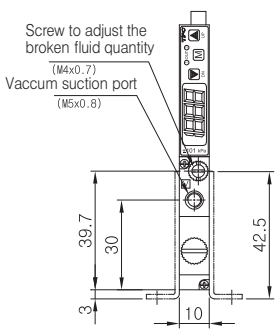
Switch type

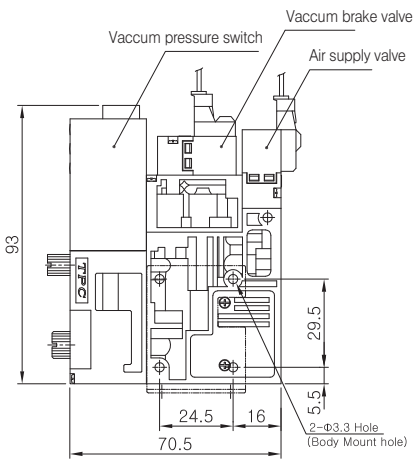
EP□S - □□- □□□

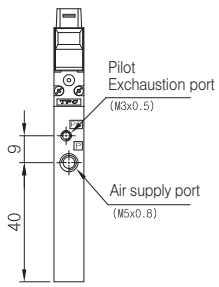
(Unit:mm)







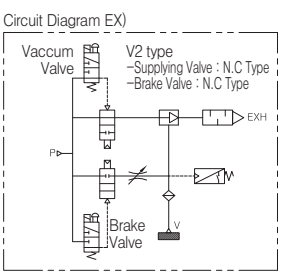


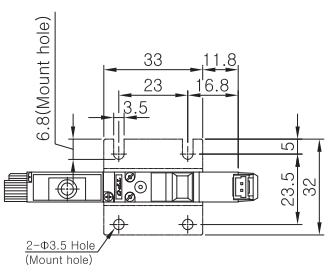


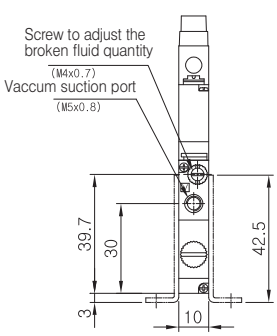
Non-switch type

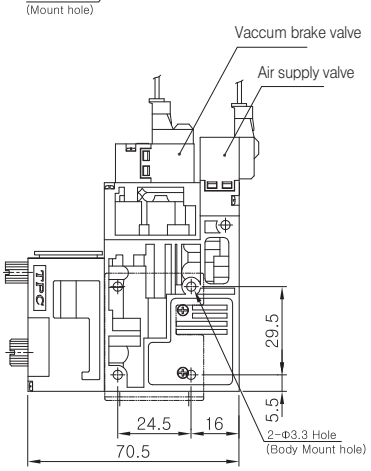
EP□S - □□- □

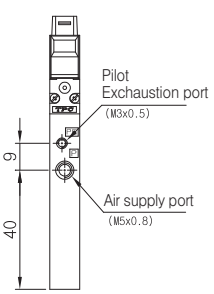
(Unit:mm)





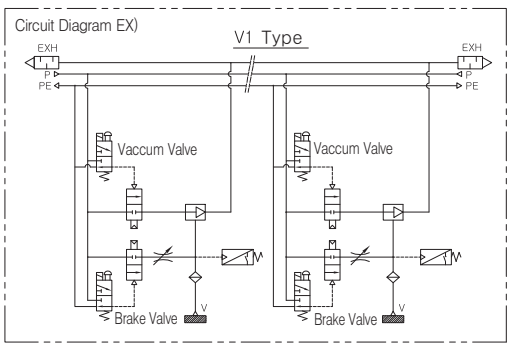


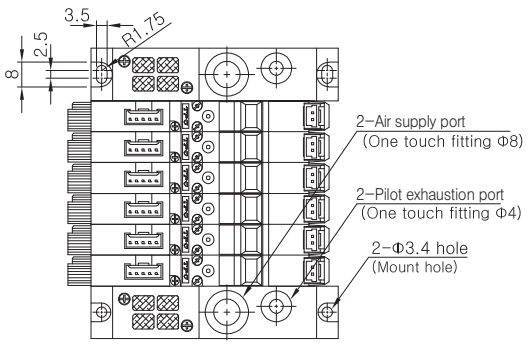


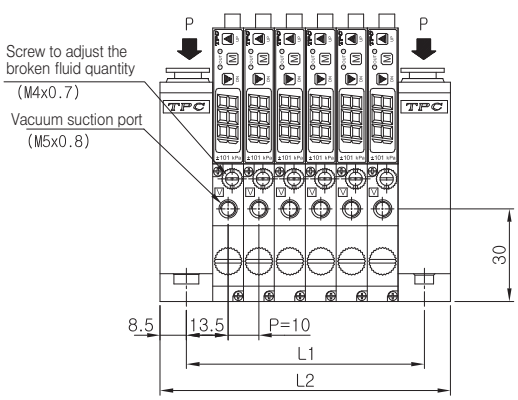


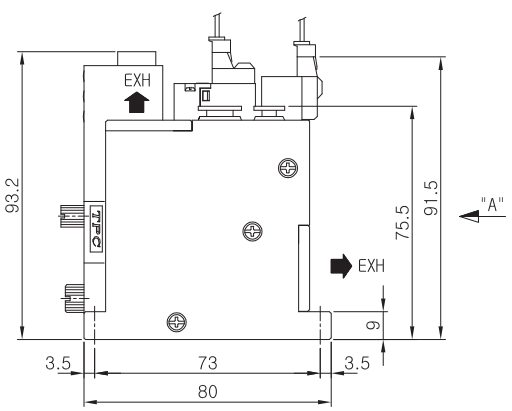
Dimensions / Manifold type

Collective exhaust (for silencer at both sides) EP□M06 - □□- □□□







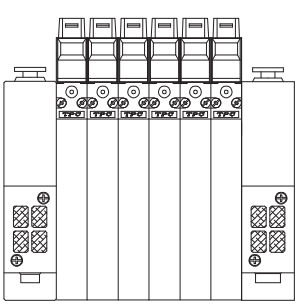


Dimensions (Unit : mm)

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

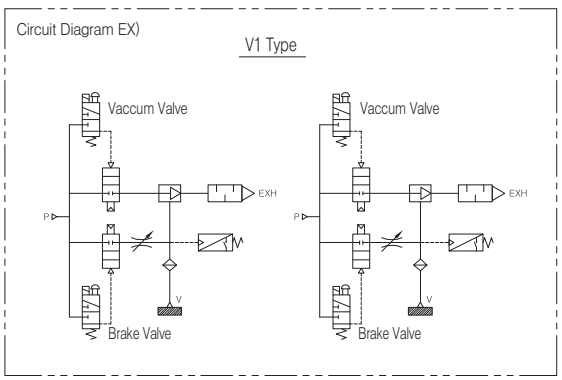
Nozzle Diamete	Maximum Number of Station
Ø0.5	8 Station
Ø0.7	6 Station
Ø1.0	4 Station

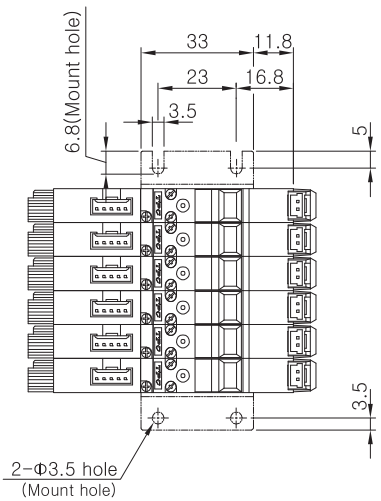


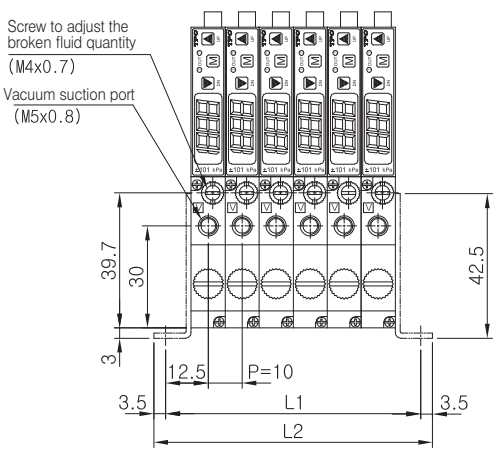
VIEW "A"

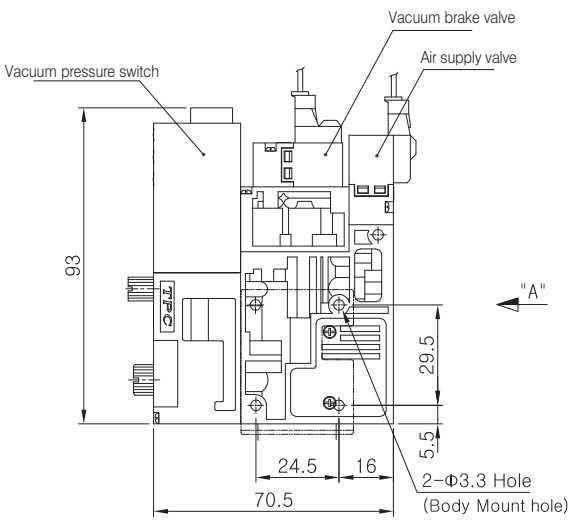
Dimensions / Manifold type

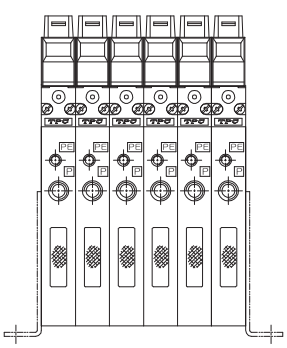
Individual exhaust (for Silencer) EP□MA06 - □□- □□□











Dimensions (Unit : mm)

Number of Station	1	2	3	4	5	6	7	8
L_1	25	35	45	55	65	75	85	95
L_2	32	42	52	62	72	82	92	102

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

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)

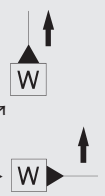
※ Calculation expression-based method

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

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

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

ØD: 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 = 6.7cm2 ÷ 5 = 1.34

$$ØD = \sqrt{A \times \frac{4}{\pi}}$$

$$W = P \times A \times 0.1 \frac{1}{S}$$

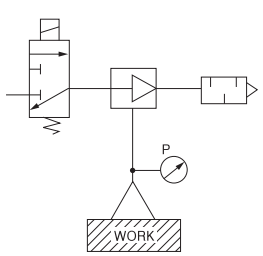
W: Lift force, A: Area, P: vacuum pressure, S: Safety rate

$$ØD = \sqrt{1.34 \times \frac{4}{\pi}} = 1.3cm$$

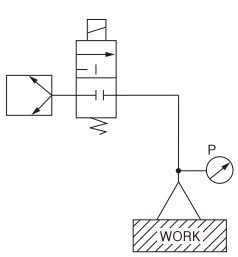
2. Selection of vacuum transfer valve of ejector
How to get the suction responding time for suction and transferring work by pad, getting the suction responding time is needed (after the operation of supplying valve, the time required for vacuum pressure in the pad to reach vacuum pressure necessary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

Vacuum System Circuit

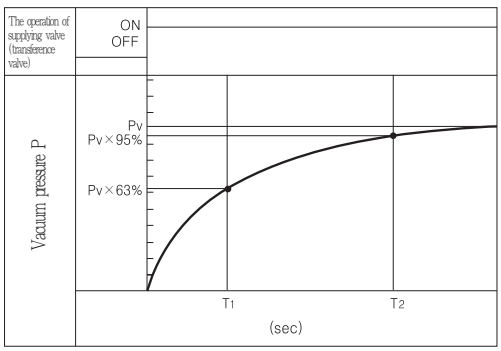
supplying valve



transfer valve



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



Pv : final vacuum pressure
T1 : time required to reach the 63% of final vacuum pressure Pv
T2 : time required to reach the 95% of final vacuum pressure Pv

Calculating by expression method

It is possible to obtain the suction response time T1,T2 based on expression.

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

Suction responce time T2 = 3 X T1

Pipe volume

T1 : Time required to reach the 63% of final vacuum pressure Pv(sec.)
T2 : Time required to reach the 95% of final vacuum pressure Pv(sec.)
Q1 : How to get the average inhaled fluid quantity i/min (ANR)

● For ejector, Q1 =('/,~','3) H maximum inhaled fluid quantity of elector

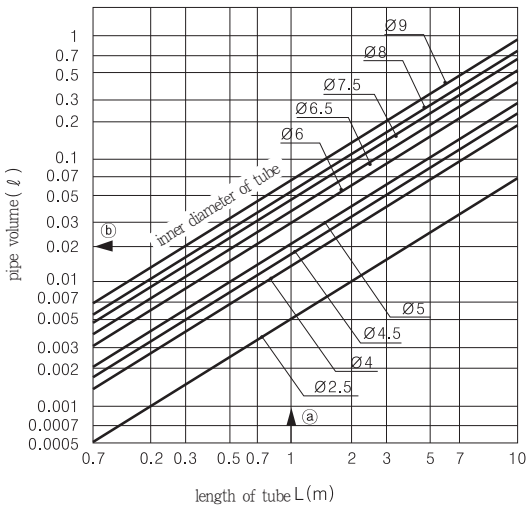
D : Inner diameter of pipe (mm)
L : Length from elector and transfer valve to Pad
v : Pipe volume from elector and transfer valve to Pad
Q2 : Maximum fluid quantity by piping system from ejector and transfer valve to Pad.
Among Q, Q1, Q2, the least fluid quantity.

Selective graph method

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

How to

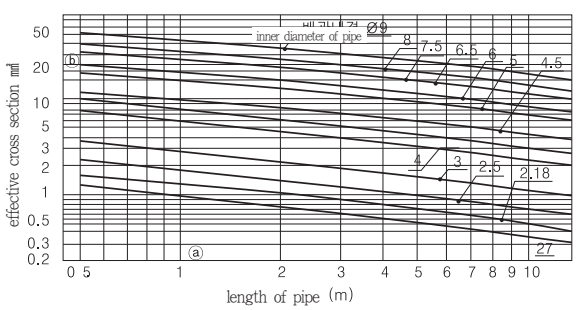
Ex) How to get the volume of the tube with a diameter of 4mm and a length of 1m.



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.



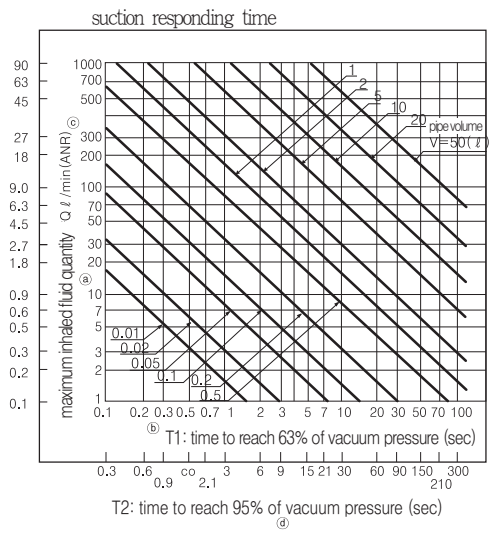
Select order

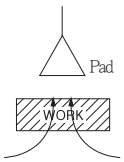
Ex) For the tube size Ø4, 1m

Select order

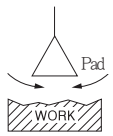
At the extended line of left axis, horizontal effective cross section of nearly 6.1mm^2 is obtained based on the intersection of the tube with a vertical length of 1m and an inner diameter of 4mm.

ⓒ The suction responding time :
With a selective graph, obtain the suction responding time T1, T2 which indicates the duration from operation of supplying valve (transfer valve) which controls the ejector to reach a designated vacuum pressure.





Ventilating work



Work with rough surface

● Quantity of water leakage

QL= 11.1 x SL
QL : Quantity of water leakage 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 12L/min(ANR). Pipe volume of the pipe system is 0.015L. Under this condition,getting the suction responding time required to drain the pressure in the pipe system up to 63% of final vacuum pressure (T1) is needed.

Select order

With the Intersection of maximum inhaling quantity of vacuum elector, 12L/min(ANR) and pipe volume, 0.015ℓ , it is needed to obtain the suction responding time T1 required to reach 63% of maximum vacuum pressure. (① in the selected graph --〉 ② T1, approximately 0.23 second)

Ex) By using valve with effective cross section of 18mm^2 and intersection of 3L, it is possible to obtain the exhaustion responding time T2 required to reach 95% of final vacuum pressure,

③ In the selected graph --〉 ④

Select order

By using valve with effective cross section of 6.1mm^2 and intersection of pipe volume 3L, it is possible to obtain the exhaustion responding time T2 required to reach 95% of final vacuum pressure. (T2, approximately 22 seconds)

Quantity of water leakage when the suction of work is performed

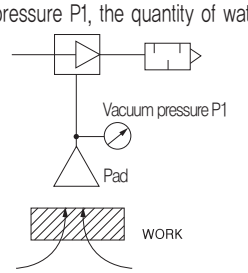
Get the quantity of water leakage :

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 P1, the quantity of water leakage of work is obtained.

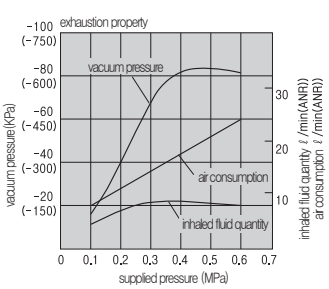


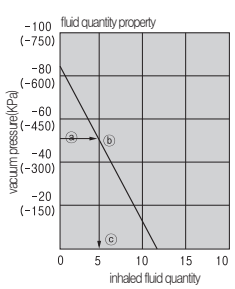
quantity of water leakage ≒ inhaled fluid quantity
(Refer to specific table of fluid quantity)

Ex) The pressure of vacuum gauge indicates -53kpa(-400mmHg) when supplied pressure is 0.45MPa 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 -53kpa (-400mmHg) is 5L/min(ANR).

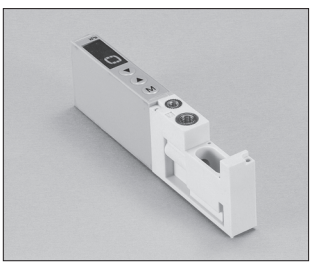
Quantity of water leakage = inhaled fluid quantity (5L/min) (ANR)

Select order





Vacuum Digital pressure switch — UNIT / VPS - □□

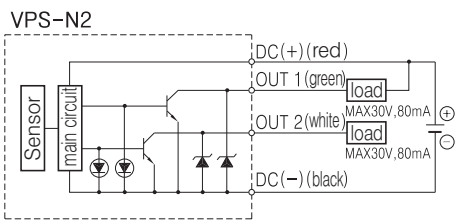


- Red LED (3 Digit)
- Automatic temperature compensation method
- High precision type of digital setting
- Super slim type (width 10 mm)
- Response in high speed (below 2mS)
- Indication of vacuum break pressure (~ 100kPa)(14.5psi))

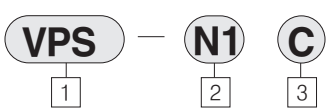
Specification

Type		VPS-N2
Fluid		Air
Range of applied temperature · ℃(°F)		−20 ~ 80℃(−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℃(32~122°F), 25℃(77°F)standard)
Display		LED (3Digit)

Example of wiring in the internal circuit



How to Order

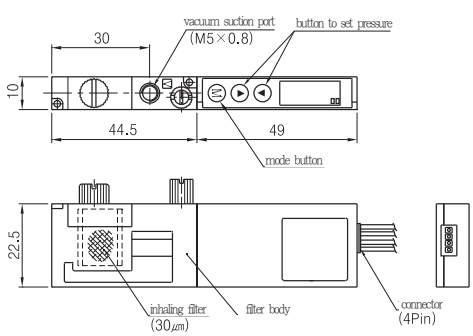


1 Switch of Vacuum Pressure

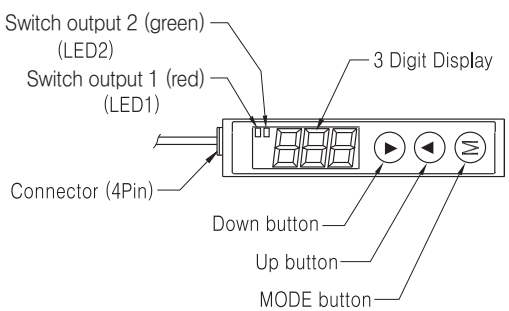
2 Output Method
N2 : NPN2 output & analog output

3 Method to Pull out Switch Lead Wire
* connector type
C : Length of lead wire−2M

Dimensions



How to set pressure



Display screen

Step1	Press Model Key+Up key (longer than 3 seconds)	after 3 seconds (output mode 1)	"A−L"
Step2	Press down or up key (convert to desired set pressure, range 0~−100)	Ex) −60 set pressure	"−60"
Step3	Press Model key(Setting pressure)	input completed	"−60"
Step4	Press Model Key+Up key	output mode 2	"A−H"
Step5	Repeat step 2,3	Ex) −90 set pressure nput completed	"−90"
	Return to the initial screen		
Step6	Press Up key+Down key	nitial state	"−0"

※ 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 elector.
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.