ANEST IWATA

CE

TÜVRheinland

c

CA72161007

Instruction Manual (Original Instructions)

Oil-free Scroll Vacuum Pump

DVSL-500E

DVSL-501E (Fluorine rubber)

This instruction manual includes very important warnings, cautions and operating procedure in order to operate this pump safely and efficiently.
Be sure to read this instruction manual thoroughly and fully understand before operation.
After reading it, store it in a convenient place for immediate and future reading.

※Before use, be sure to fill in the blank spaces below for future repair and after-service.

Serial No.
Who sold it to you
Purchase date
When you began operation

Declaration of Conformity

Identification of the product : Scroll Vacuum Pump

Name and address of the manufacturer :

ANEST IWATA Corporation
3176, Shinyoshida-cho, Kohoku-ku,
Yokohama 223-8501,
Japan

Name and address of the authorised representative :

ANEST IWATA EUROPE GmbH
Am StahlbUgel 2,
74206 Bad Wimpfen,
Germany

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration :

Series	DVSL-500E
Models Designation	DVSL-50**aEb**

a = 0 or 1 , b = -HC , S7 , -HCS7 or blank

Ratings	3-phase, 50Hz, AC200/380/400/415V
	60Hz, AC200/220/230/460V

The object of the declaration described above is in conformity with the relevant EU harmonisation legislation :

2006 / 42 / EC	Machinery Directive
2011/65/EU & (EU)2015/863	Restriction of the use of certain Hazardous Substances in Electrical and electronic equipment

References to the relevant harmonised standards used or references to the specifications in relation to which conformity is declared :

EN 1012-2:1996+A1:2009	Compressors and Vacuum Pumps-Safety Requirements, Part 2: Vacuum Pumps
EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Name and address of the notified body :

TÜV Rheinland LGA Products GmbH - Tillystraße 2 - 90431 Nürnberg, Germany

Technical Documentation From File No. AK 50332101

Signed for and on behalf of the above named manufacturer :

Place and date of issue : Yokohama, Japan 1-Apr-2020
Name, function : Hitoshi Iwata
General Manager, Vacuum Equipment Department
Signature :

Hitoshi Iwata

Important information

Be sure to read this instruction manual to understand how to operate equipment correctly. Only operators, who fully understand warnings, cautions and instructions, are to operate the equipment. Improper operation (mishandling) can cause serious bodily injury, death, fire or explosion.

Store this manual in a convenient place for immediate and future reference.

◆Regarding safety

- The safety instructions given in this manual are the minimum operating requirements. Follow all national or municipal laws and regulations pertaining to fire, electricity, and other safety regulations, as well as corporate regulations.
- Pay special attention to items which are shown by the below marks and symbols.
- Symbols and marks have the following meanings.

Examples of marks

WARNING	Indicates a potentially hazardous situation which, if not avoided, may result in serious injury or loss of life.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.

Examples of symbols

	Indicates [Beware]. We will explain briefly in or near the symbol. (The example on the left is [Beware of electric shock]).
	Indicates [Prohibited action]. We will explain briefly in or near the symbol. (The example on the left is [Do not touch]).
	Indicates [Required action]. We will explain briefly in or near the symbol. (The example on the left is [Be sure to ground]).

∗ We shall not be responsible for any injury or damage caused by disregard of warnings, cautions or instructions.

Supplementary notes

Important	Indicates notes which we ask you to observe. They are helpful to achieve full performance and functionality of the equipment.

For safe operation

Below is very important information about how to safely operate the equipment.
Before operation, be sure to read and fully understand the contents.

⚠ WARNING

Be careful about lifting	**Danger of cargo collapse** Be careful to install vacuum pump using motor eyebolt and crane with sufficient allowable load capacity (DVSL-500E・501E mass 34kgs) while paying attention to stability of suspended load. If not, it can cause damage, failure or bodily injury from falling cargo due to hoisting failure, or by being caught between suspended cargo and other material.
Avoid moisture	**Danger of electric shock** Install in an area which is not exposed to moisture such as rain or steam. If moisture comes into and tact with the electric source connection, it can cause fire or bodily injury due to short-circuit or electric shock.
Install at a safe site	**Danger of explosion, fire and accident** Install in an area free from explosive, flammable or corrosive substances. If not, it can cause explosion, fire or accident.
Ask qualified electrician	**Danger of short-circuit and electric shock** Ask a qualified electrician to perform electric wiring. If not, short-circuit or electric shock can cause fire or bodily injury.
Turn off electric source	**Danger of electric shock and entanglement** Be sure to turn off electric source on building site before wiring. If not, it can cause electric shock or bodily injury due to turning objects.
Install overcurrent protective device	**Danger of accident, fire and failure** Be sure to install protective device to protect circuitry. We recommend overcurrent protective device (rated 15A) to protect branch circuit. If equipment is not stopped in an emergency, it can cause accident, fire or failure.
Install emergency stop switch	**Danger of accident, fire or failure** Be sure to install an electric source emergency stop switch (or protective device that can urgently stop). If equipment is not stopped in an emergency, it can cause accident, fire or failure.
Install short circuit protective device	**Danger of fire and electric shock** Install short circuit protective device. If not, it can cause bodily injury due to fire or electric shock.
Install motor protective circuit breaker to protect motor	**Danger of electric fire and electric shock** Install motor protective circuit breaker to protect motor. If not, bodily injury due to electric fire or electric shock can result. If you have any questions about the selection of protective devices, contact either the dealer who sold it to you or us.
Be careful about wiring	**Danger of short-circuit and electric shock** We recommend an electric source cable of more than 2mm^2 (more than rated 6A) cross section area for electric source cable and earth cord. Be careful to avoid voltage drop considering local situation. If not, it can cause a short-circuit fire and may result in bodily injury from electric shock.
Use crimp-style terminal	**Danger of short-circuit and electric shock** Fit firmly proper round type crimp-style terminal to electric source cable using crimp tool and connect to motor terminal section. If not, it can cause short-circuit fire or bodily injury from electric shock due to looseness or disconnection.
Protect cable from being pulled	**Danger of short-circuit and electric shock** Be sure to fit cable-gland to hole of φ22mm at motor terminal box. If not, it can cause short-circuit fire or bodily injury from electric shock.

For safe operation

⚠ WARNING

 **Protect cable from being pulled**	**Danger of short-circuit and electric shock** The power-supply conductor shall be free from strain including twisting by using cord anchorage, which is specified by the local electrical wiring regulation. If not, it can cause short-circuit fire or bodily injury from electric shock.
 **Be sure to ground**	**Danger of electric shock** Connect earth cord to earth terminal in motor terminal box. If not, it can cause bodily injury from electric shock.
 **Never evacuate hazardous gas**	**Danger of explosion and ignition** Do not evacuate gas which is hazardous to humans or explosive, flammable, or corrosive. Do not evacuate with substances containing chemicals, solvents, and powders. If done, it can cause failure or bodily injury by gas, explosion or ignition. It is not guaranteed fluorine rubber can be used for all solvents.
 **Avoid foreign matter**	**Danger of entanglement and foreign matter dispersal** Never put finger or foreign matter into air holes of fan cover, FS cover. If done, it can cause bodily injury from entanglement with turning section, or foreign matter dispersal.
 **Never alter**	**Danger of electric shock and entanglement** Do not remove or alter safeguards or insulation parts. If done, it can cause bodily injury from electric shock or turning section and it can cause deteriorated performance and operating lifetime, and invalidate guarantee.
 **Change after vacuum pump is stopped**	**Danger of failure and bodily injury** Change air-flush port only after vacuum pump is stopped. If you change it during vacuum pump operation, it can cause vacuum pump failure and bodily injury.
 **Conduct periodical maintenance and inspection**	**Danger of failure and bodily injury** Conduct periodical maintenance and inspection. If not, it can cause insufficient performance, failure of vacuum pump, and bodily injury.
 **Be careful about high temperature**	**Danger of burns** Conduct maintenance and inspection only after vacuum pump becomes cool enough. Maintenance and inspection soon after vacuum pump stops can cause burn injury.
 **Turn off electric source**	**Danger of electric shock** Be sure to conduct maintenance and inspection after you turn off electric source. If not, it can cause bodily injury from electric shock or turning object.
 **Ask specialist to perform repairs**	**Danger of accident, failure and shorter operating lifetime** Ask specialist to perform repairs. Defective repairs can cause accident, failure or shorter operating lifetime.

For safe operation

⚠ CAUTION

Use at designated temperature	**Danger of overheating** Operate at ambient temperature of 5℃ ~40℃. Operating at a temperature range other than that designated can cause accident, failure or bodily injury such as burns due to overheating.
Pay attention to ventilation	**Danger of overheating** Install in a well-ventilated area. Poor ventilation can disrupt cooling and cause accident, failure or bodily injury such as burns since this vacuum pump is an air-cooled type. Do not block inlet and outlet of cooling air with obstruction. (Separate inlet side of the cooling air from obstruction or wall by 10cm or more, and separate outlet side by 30cm or more)
Avoid dust	**Danger of dust** Be sure site is free from dust. Sucking in of dust can cause failure.
Install on a solid, level floor	**Danger of unbalance** Be sure to fix vacuum pump on solid and level floor (less than 5° inclination). Uneven fix can cause failure and movement of vacuum pump. Fix pump base with 2 bolts using hole of φ8.5mm at leg section.
Avoid direct sunlight	**Danger of overheating** Install where equipment is not exposed to direct sunlight. Vacuum pump exposed to direct sunlight can overheat, resulting in failure.
Check voltage	**Motor burnout** Before doing any wiring, check electric source and voltage. This pump is a multi voltage type of AC200V/AC400V. Voltage can be changed at terminal block. This pump is wired to 200V when shipping from factory. Check your electric source, voltage, and cord correctly to terminal block. Improper wiring and incorrect voltage can cause motor burnout.
Inspect cause of problem	**Danger of problem recurrence and failure** If protective device or thermal protector activates, be sure to turn off electric source and inspect causes to solve the problem. Do not operate until problem is solved. Operation while problem is left unsolved can cause problem recurrence and failure.
Remove cap	**Danger of cap to fly** Remove cap from inlet and outlet. Operation with cap being fitted can cause cap to fly by intake or exhaust impetus, resulting in accident, failure, or bodily injury from contact with flying objects.
Prevent foreign matter from entering	**Danger of foreign matter entering inlet** When checking turning direction, be careful not to enter foreign matter into an inlet. Foreign matter entering inlet can cause failure.
Check fan	**Danger of overheating** Check that cooling fan is turning and cooling air is flowing. If not, it can cause accident, failure or bodily injury such as burns due to overheating.
Pay attention to exhaust resistance	**Danger of exhaust disruption** When connecting exhaust piping to vacuum pump and when combining piping with another vacuum pump, pay attention to piping size and length so that it does not cause exhaust resistance. Exhaust resistance can disrupt air flow, resulting in failure and over-current.
Prevent foreign matter from entering	**Danger of abnormal sound and failure** If you use the seal material or the adhesive, etc. to prevent Leak of the joint when piping with internal screw of inlet, be careful not to enter the seal material or the adhesive into an inlet. The seal material or the adhesive entering inlet can cause failure.

For safe operation

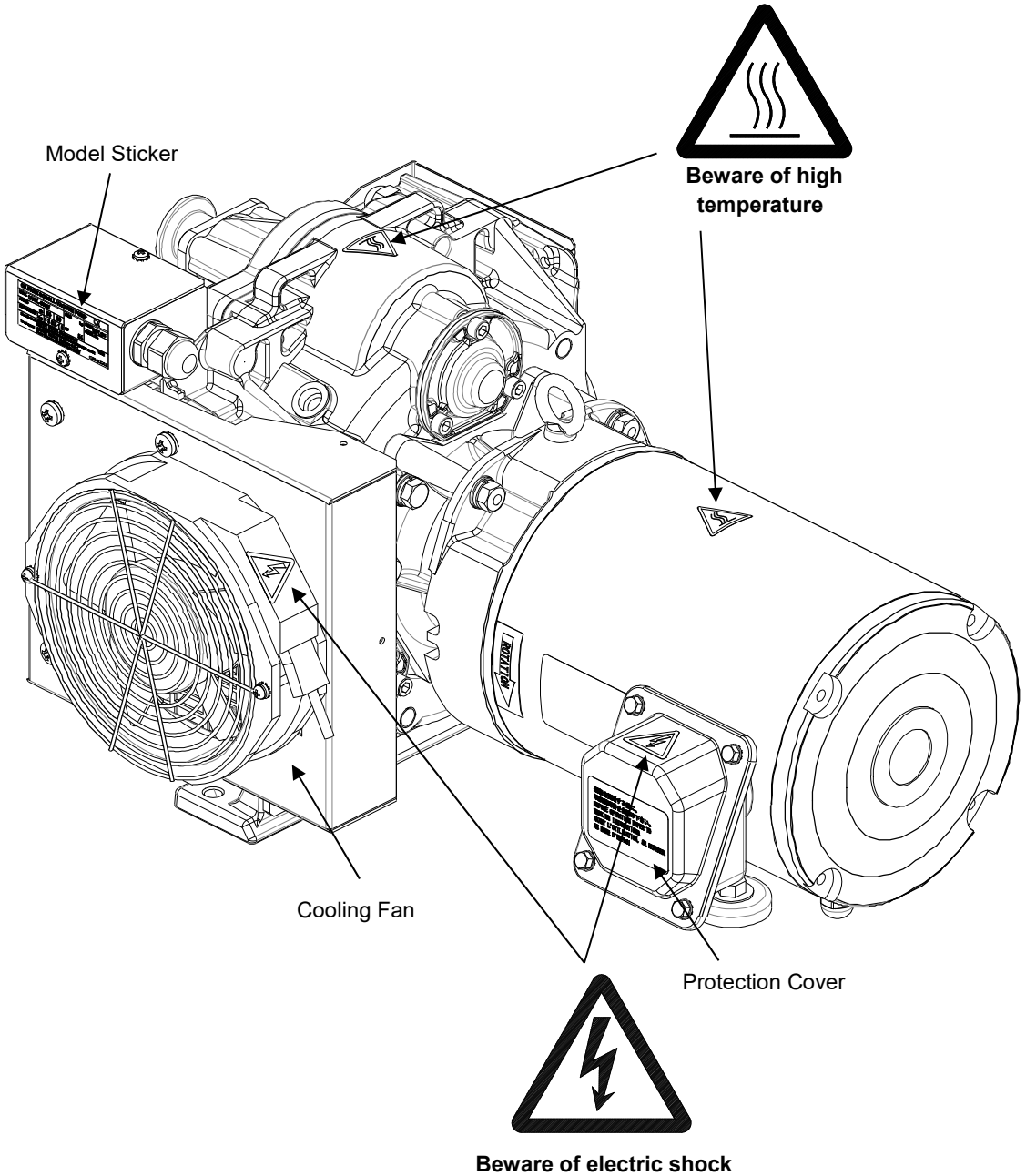
⚠ CAUTION

 **Start or stop after closing isolation valve**	**Danger of vacuum break and pollution** Be sure to close isolation valve between vacuum pump and vacuum system (chamber) during start-up and stop. Start-up or stop with isolation valve in the open position can draw back gas and debris attached to inside of pump to vacuum chamber due to pressure differential, resulting in vacuum break and pollution on vacuum chamber side.
 **Beware temperature of intake gas**	**Danger of exceeding permissible temperature of intake gas** If intake gas temperature is over 50℃, be sure to install a chiller or trap between vacuum pump and vacuum chamber so that gas intake temperature of vacuum pump keeps below 50℃. If not, vacuum pump temperature can increase, resulting in failure.
 **Operate while opening air-flush port**	**Danger of remaining moisture** When evacuating moisture, be sure to open air-flush port (air-flush operation). If you evacuate vapor while air-flush port is closed, condensed water will remain inside vacuum pump and cause failure.
 **Caution after exhausting vapor**	**Danger of insufficient vapor exhaust** After evacuating vapor, do air-flush operation for at least one hour. If you close air-flush port or stop vacuum pump soon after evacuating vapor, condensed water will remain inside vacuum pump which will cause failure.
 **Beware of intake gas volume**	**Danger of exceeding permissible intake gas volume** When sending N_2 gas or dry air into air-flush port, pressure should be the same as atmospheric pressure and flow rate should be less than 10L/min. If not, it can increase pressure inside vacuum pump, resulting in failure.
 **Caution for frequent start/stop and short interval**	**Risk of motor malfunction** Refrain from frequent start/stop operation. It induces malfunction of motor such as burn out. Please consult your dealer or factory representative for details. Appropriate operating mode with adequate interval and frequency of start/stop is varies owing to operating condition.

Where to attach warning stickers

Where to attach warning stickers

Always keep warning stickers clean and legible. If they become dirty or detached, replace them with new ones. If you need replacement stickers, contact the dealer who sold the vacuum pump to you.



Contents

1. Before use

1.1 Check the product

- **Check that the package is right-side-up before opening.**
- **Check that the model of the product is the same as the one you ordered.**
  How to read model name

Surface treatment
No mark：Normal coat
HC　　：Hard coat

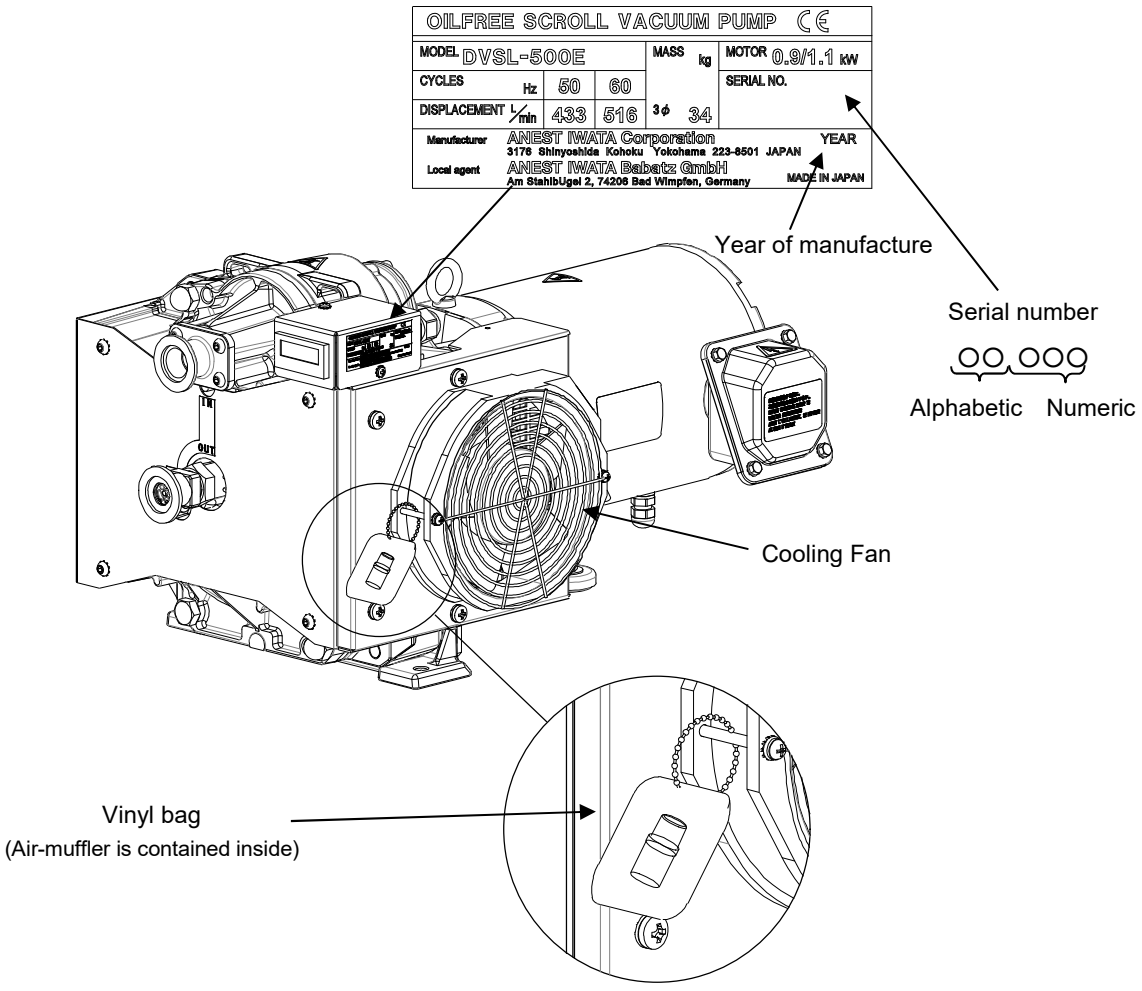
DVSL：model

D V S L – 5 0 1 E – H C

Displacement (swept volume)
50:500 L/min at 60Hz Motor

Ultimate pressure, Back-up material
0：　30Pa , Silicon rubber seal
1：100Pa , Fluorine rubber seal

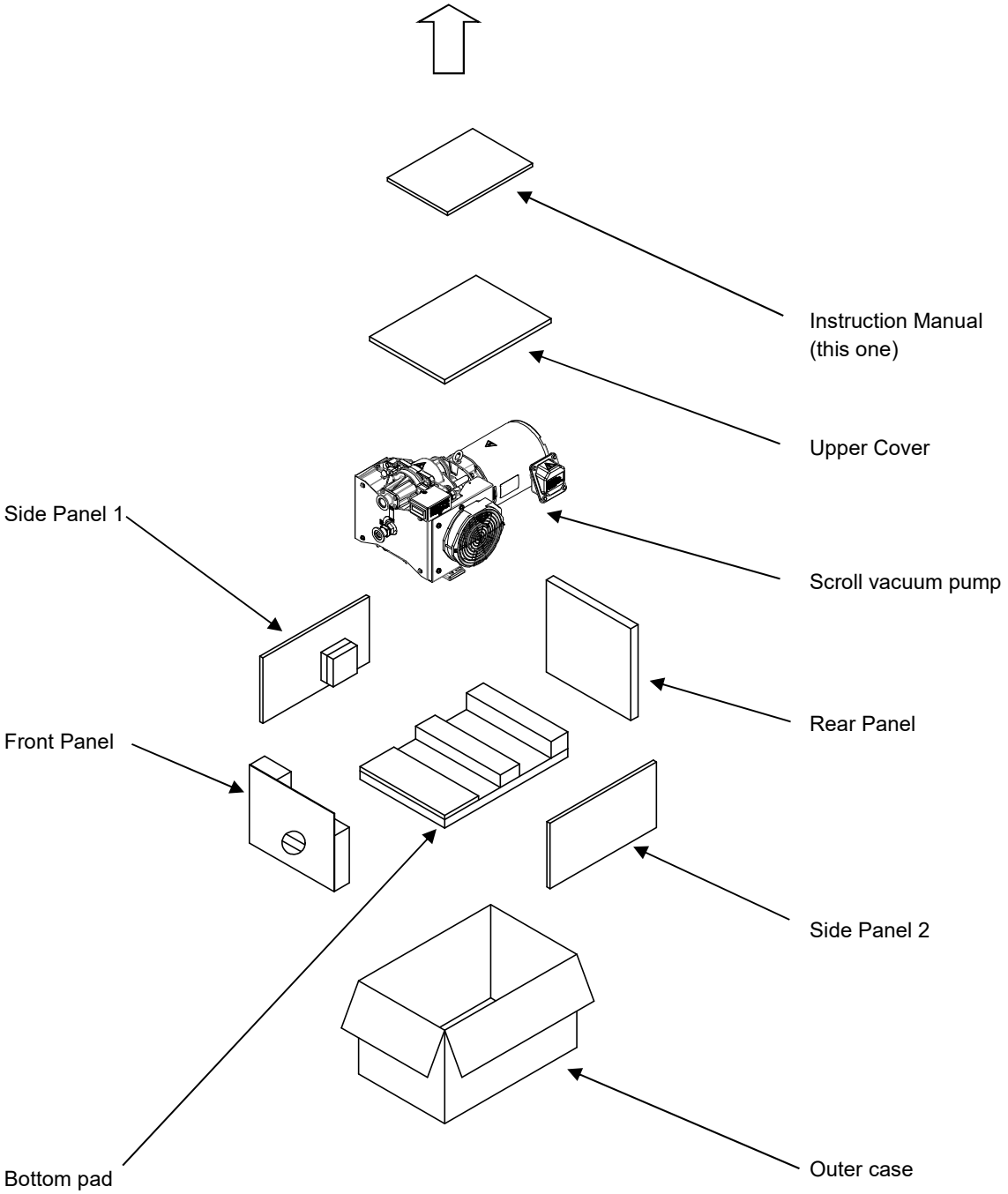
- **Check that there is no damage.**
  If there is any damage, contact either the dealer who sold it to you or us.
- **Check the following accessories.**
  Instruction manual (this one)
  Air-muffler for air-flushing (which is attached to bolt of cooling fan)



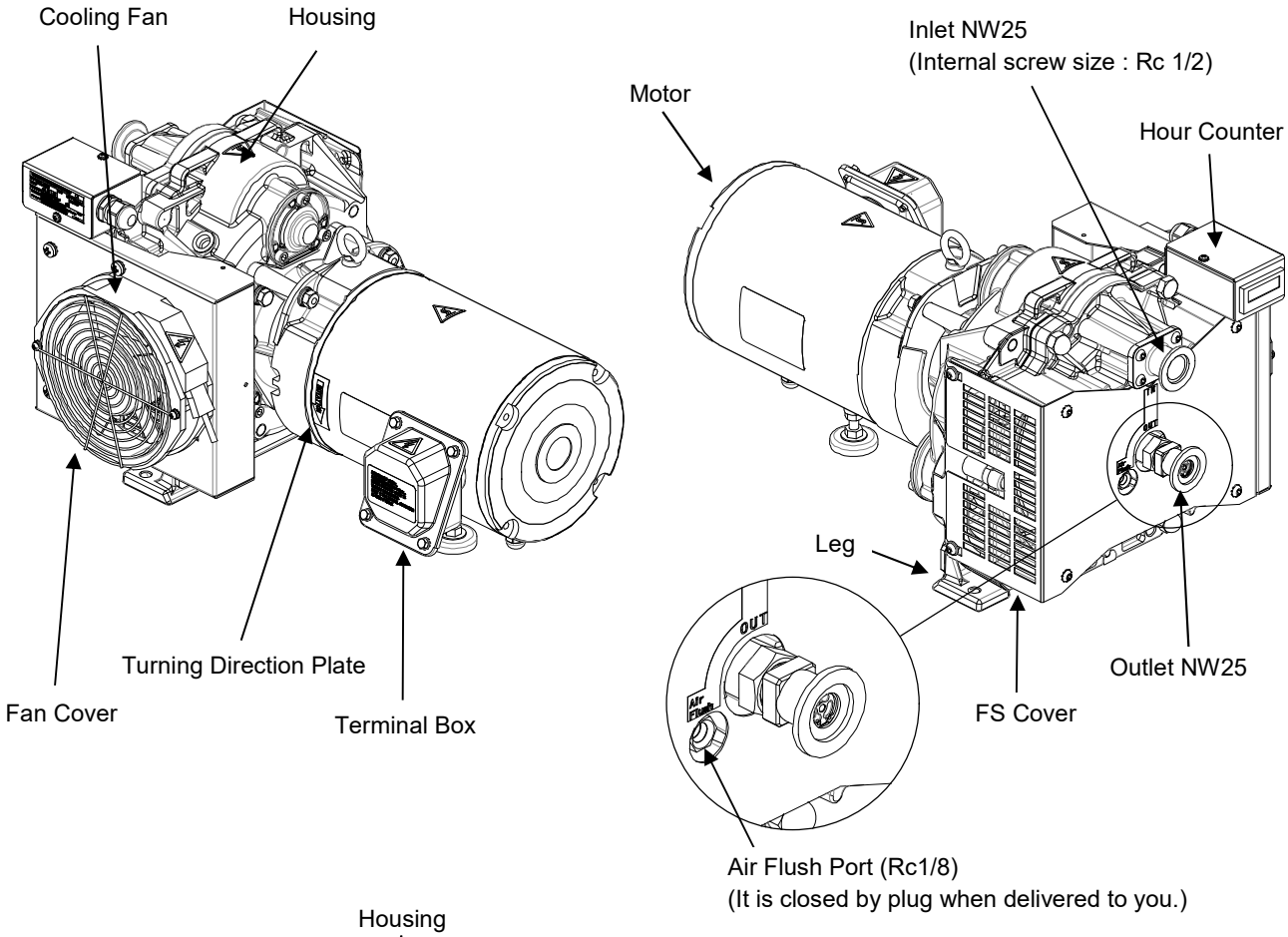
※Please prepare electric source cables, crimp-style terminal, electric source protective devices, piping to inlet, and piping from outlet on customer side.

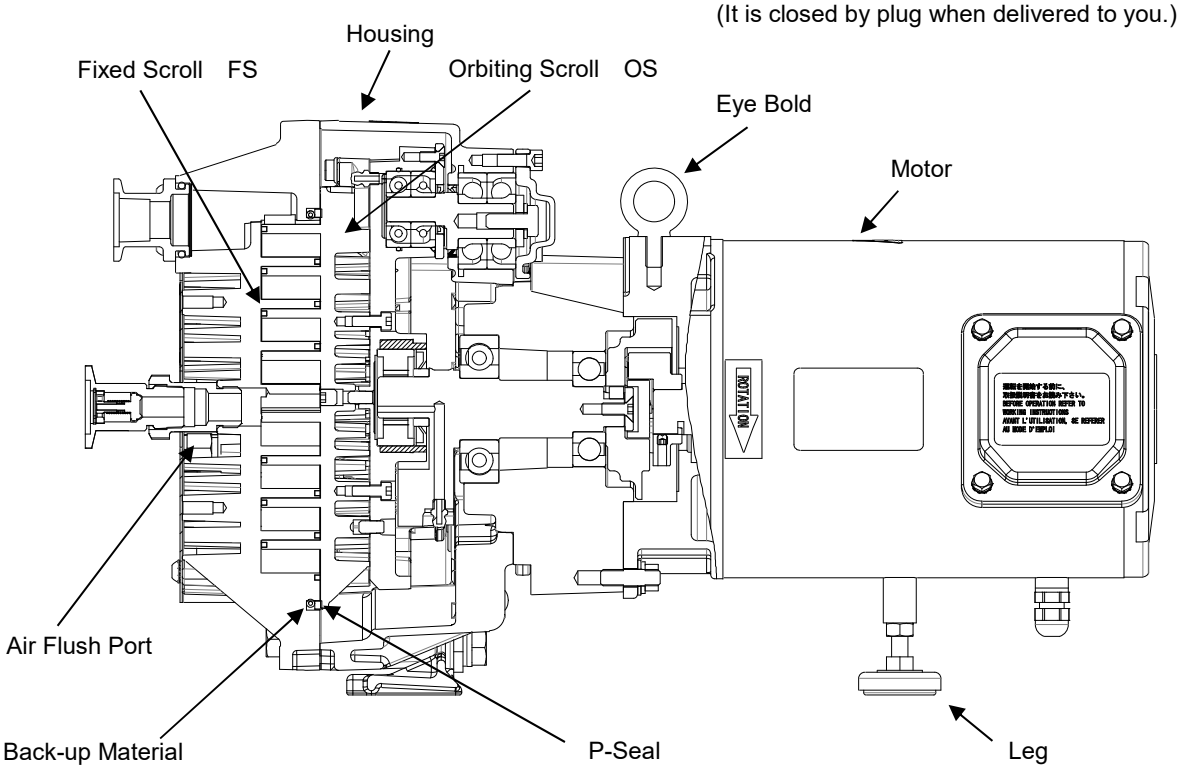
Open package

⚠ WARNING	
Danger of cargo collapse **Be careful to install vacuum pump using motor eyebolt and crane with sufficient allowable load capacity (DVSL-500E・501E mass 34kgs) while paying attention to stability of suspended load.** If not, it can cause damage, failure or bodily injury from falling cargo due to hoisting failure, or by being caught between suspended cargo and other material.	**Be careful about lifting**



2. Name and structure of each section





・Silicon Rubber Seal Type : DVSL-500E
・Fluorine Rubber Seal Type : DVSL-501E, DVSL-501E-HC

Structure of vacuum pump

3. Installation

⚠ WARNING

Danger of electric shock

Install in an area which is not exposed to moisture such as rain or steam.
If moisture comes into and tact with the electric source connection, it can cause fire or bodily injury due to short-circuit or electric shock.

Avoid moisture

Danger of explosion, fire and accident

Install in an area free from explosive, flammable or corrosive substances.
If not, it can cause explosion, fire or accident.

Install at a safe site

⚠ CAUTION

Danger of overheating

Operate at ambient temperature of 5℃~40℃.
Operating at a temperature range other than that designated can cause accident, failure or bodily injury such as burns due to overheating.

Use at designated temperature

Danger of overheating

Install in a well-ventilated area (refer to below chart).
Poor ventilation can disrupt cooling and cause accident, failure or bodily injury such as burns since this vacuum pump is an air-cooled type.
Do not block inlet and outlet of cooling air with obstruction.
(Separate inlet side of the cooling air from obstruction or wall by 10cm or more, and separate outlet side by 30cm or more)

Necessary ventilated air volume
Over 8m^3/min

Pay attention to ventilation

Danger of dust

Be sure site is free from dust.
Sucking in of dust can cause failure.

Avoid dust

Danger of movement

Be sure to fix vacuum pump on solid and level floor (less than 5° inclination).
Uneven fix can cause failure and movement of vacuum pump. Fix pump base with 2 bolts using hole of φ8.5mm at leg section.

Install on a solid, level floor

Danger of overheating

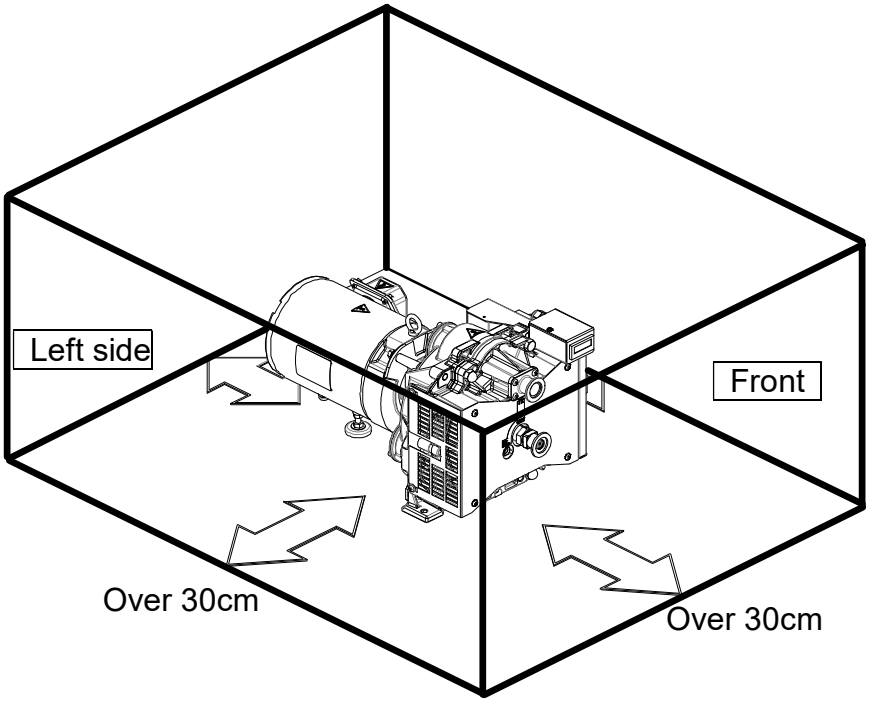
Install where equipment is not exposed to direct sunlight.
Vacuum pump exposed to direct sunlight can overheat, resulting in failure.

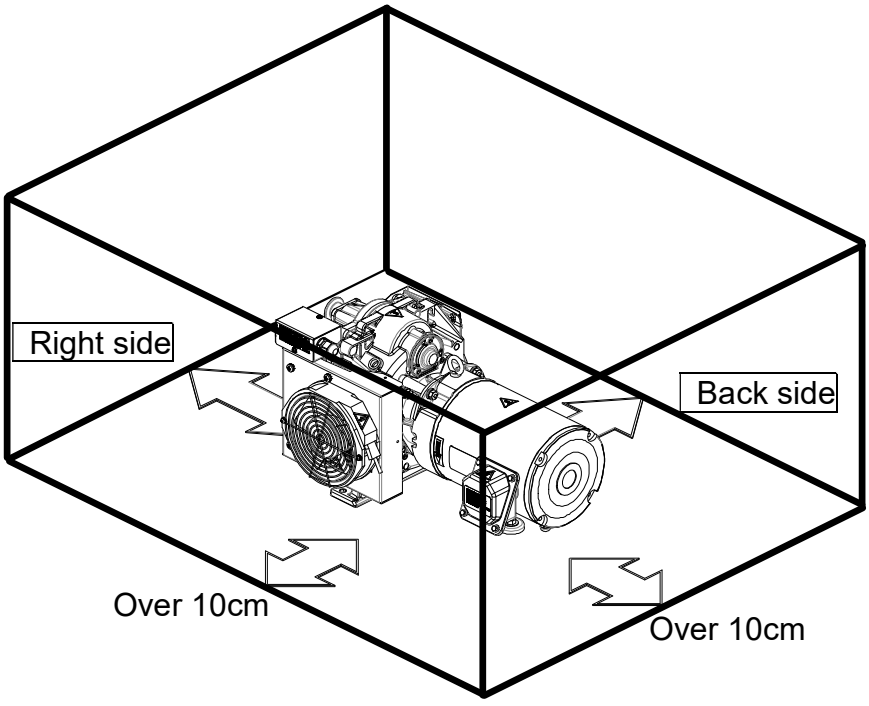
Avoid direct sunlight

Installation space

For the maintenance, keep the space as below drawing around vacuum pump.

Keep over 30cm space front of vacuum pump if the vacuum pump can not be moved because of wiring and connecting.





Important

When building vacuum pump into vacuum system, pay attention to space for maintenance, ambient temperature and piping. Be sure to fix vacuum pump on solid and level floor.

If you have any questions, contact the dealer who sold it to you or us.

3.1 Wiring

⚠ WARNING	
Danger of short-circuit and electric shock **Ask a qualified electrician to perform electrical wiring.** If not, short-circuit or electric shock can cause fire or bodily injury.	 **Ask qualified electrician**
Danger of electric shock and entanglement **Be sure to turn off electric source on building site before wiring.** If not, it can cause electric shock or bodily injury due to turning objects.	 **Turn off electric source**
Danger of accident, fire and failure **Be sure to install protective device to protect circuitry. We recommend overcurrent protective device (rated 15A) to protect branch circuit.** If equipment is not stopped in an emergency, it can cause accident, fire or failure.	 **Install overcurrent protective device**
Danger of accident, fire or failure **Be sure to install an electric source emergency stop switch (or protective device that can urgently stop).** If equipment is not stopped in an emergency, it can cause accident, fire or failure.	 **Install emergency stop switch**
Danger of fire and electric shock **Install short circuit protective device.** If not, it can cause bodily injury due to fire or electric shock.	 **Install short circuit protective device**
Danger of electric fire and electric shock (refer to chart 1 on page 15) **Install motor protective circuit breaker to protect motor.** If not, bodily injury due to electric fire or electric shock can result. If you have any questions about the selection of protective devices, contact either the dealer who sold it to you or us.	 **Install motor protective circuit breaker to protect motor**
Danger of short-circuit and electric shock **We recommend an electric source cable of more than 2mm² (more than rated 6A) cross section area for electric source cable and earth cord.** **Be careful to avoid voltage drop considering local situation.** If not, it can cause a short-circuit fire and may result in bodily injury from electric shock.	 **Be careful about wiring**
Danger of short-circuit and electric shock **Fit firmly proper round type crimp-style terminal to electric source cable using crimp tool and connect to motor terminal section.** If not, it can cause short-circuit fire or bodily injury from electric shock due to looseness or disconnection.	 **Use crimp-style terminal**
Danger of short-circuit and electric shock **Be sure to fit cable-gland to hole of φ 22mm at motor terminal box.** If not, it can cause short-circuit fire or bodily injury from electric shock.	 **Protect cable from being pulled**
Danger of short-circuit and electric shock **The power-supply conductor shall be free from strain including twisting by using cord anchorage, which is specified by the local electrical wiring regulation.** If not, it can cause short-circuit fire or bodily injury from electric shock.	 **Protect cable from being pulled**

Danger of electric shock

Connect earth cord to earth terminal in motor terminal box.
If not, it can cause bodily injury from electric shock.

Be sure to ground

Canadian regulation

Motor not protected. External overheat protection in accordance with Canadian Electric Code Part I [C22.1], must be provided.
Min. circuit ampacity of conductor is 6A.
Max. branch circuit breaker is 15A.

When you used this pump in Europe.

This vacuum pump must be equipped with a main disconnect device in accordance with requirements of EN60204-1, clause 5.3.2. It is recommended to use a circuit breaker as main breaker which is suitable for isolation according to EN60947-2 and is equipped with an operating handle which is lockable in OFF position and complies with the other requirements of EN60204-1, clause 5.3.

⚠ CAUTION

Motor burnout

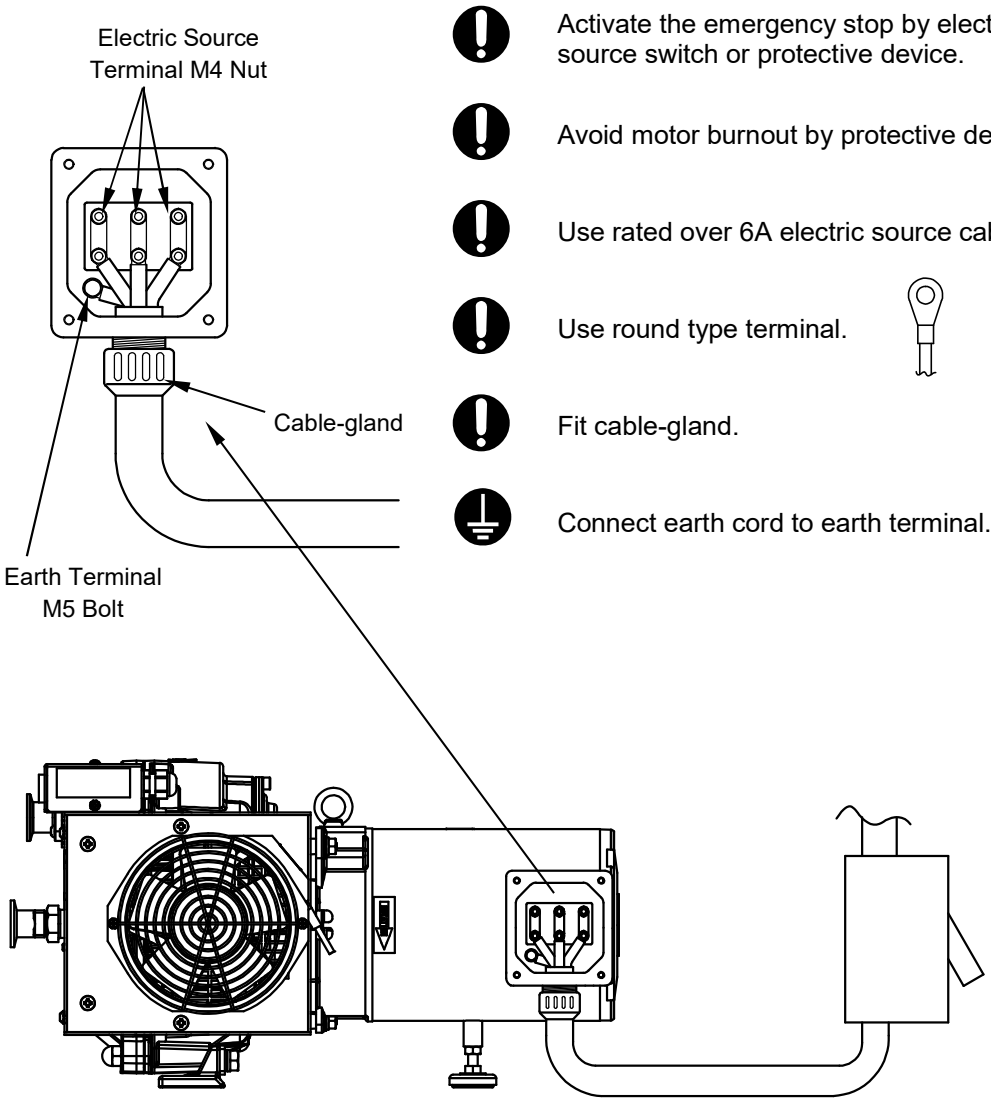
Before doing any wiring, check electric source and voltage.
This pump is multi voltage type of AC200V/AC400V.
Voltage can be changed at terminal block.
This pump is wired to 200V when shipping from factory.
Check your electric source, voltage, and cord correctly to terminal block.
Improper wiring and incorrect voltage can cause motor burnout.

Check voltage

Danger of problem recurrence and failure

If protective device activates, be sure to turn off electric source and inspect causes to solve the problem. Do not operate until problem is solved.
Operation while problem is left unsolved can cause problem recurrence and failure.

Inspect cause of problem



Activate the emergency stop by electric source switch or protective device.

Avoid motor burnout by protective device (chart 1).

Use rated over 6A electric source cable and earth cord.

Use round type terminal.

Fit cable-gland.

Connect earth cord to earth terminal.

Chart－1

Voltage V	Frequency Hz	Recommended breaker (or protective device) capacity A
200	50	4.3
200	60	4.7
220	60	4.5
230	60	4.4
380	50	2.1
400	50	2.1
415	50	2.1
460	60	2.2

How to wire

① Remove 4pcs. of M5 bolts at motor terminal box and remove protection cover.
※Be sure to keep M5 bolts and washer, which were removed from the protection cover.

② Wiring diagram is shown inside protection cover.
You can change to a 200V or 400V connection by changing terminal plate (3pcs.) and lead wire connection.
<u>※It is wired to 200V when shipping from factory.</u>

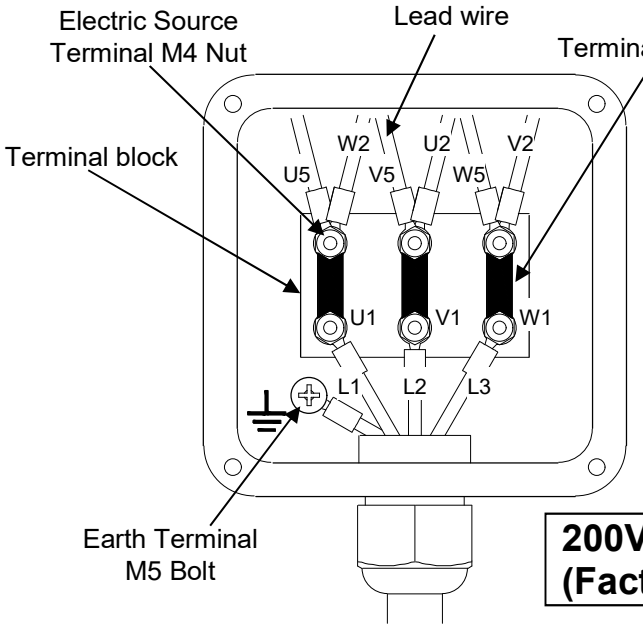
③ If you want to change to a 400V connection, change terminal plate and lead wire connection as illustrated below.
※Never lose terminal plates. They will be required for altering wiring connection to 200V.

④ Connect electric source cable to terminal by using cable-gland at φ22mm hole of motor terminal box.

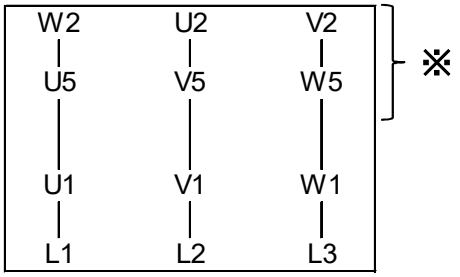
⑤ Insert electric source cable through cable-gland on the bottom side of terminal box.

⑥ Connect each phase L1-L2-L3 to each electric source terminal respectively in accordance with the below wiring diagram.
Terminal screw nuts should be torqued between 1.2 N・m and 1.5N・m.

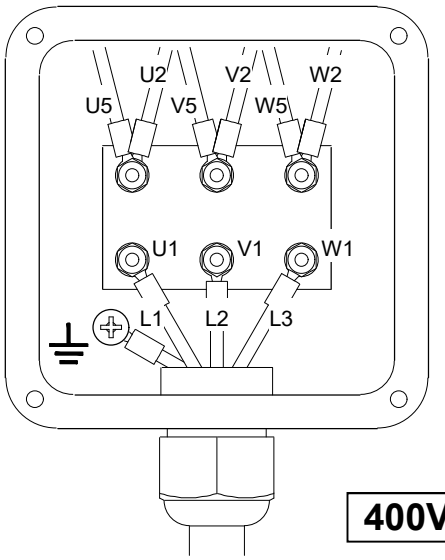
⑦ The protective earth cord shall be suffice in length and put up to keep the cord the last to take the strain if the cable slips in its anchorage.



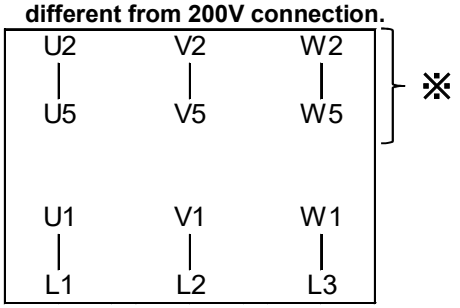
Be sure to connect wiring in accordance with the below wiring diagram.
※Combination of connection of wires, which are come out from the motor inside are different from 400V connection.



200V connection (Factory setting)



Be sure to connect wiring in accordance with the below wiring diagram.
※Combination of connection of wires, which are come out from the motor inside are different from 200V connection.



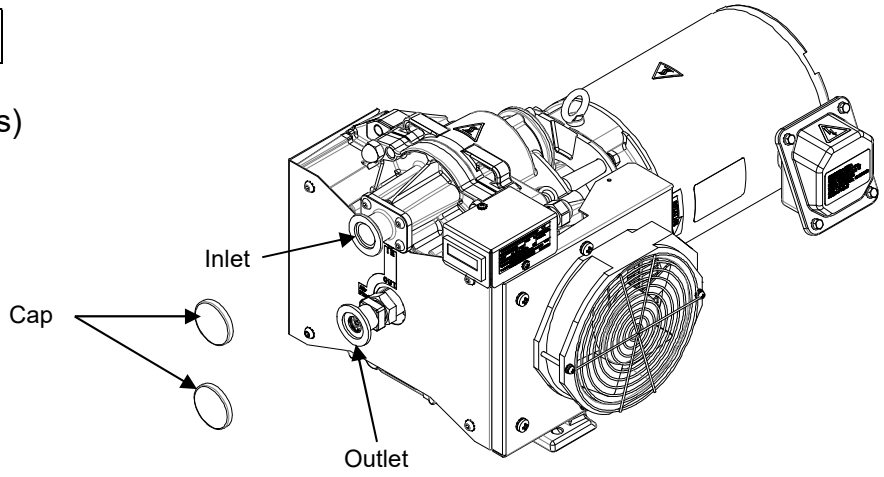
400V connection

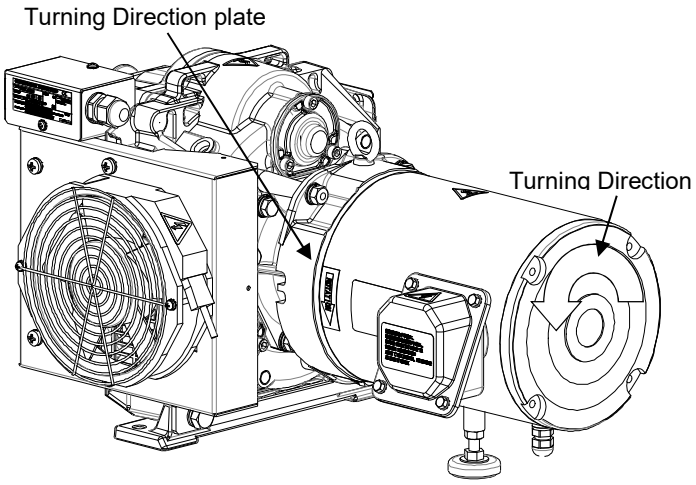
3.2 Test operation

⚠ CAUTION	
Danger of cap to fly **Remove cap from inlet and outlet.** Operation with cap being fitted can cause cap to fly by intake or exhaust impetus, resulting in accident, failure, or bodily injury from contact with flying objects.	**Remove cap**
Danger of foreign matter entering inlet **When checking turning direction, be careful not to enter foreign matter into an inlet.** Foreign matter entering inlet can cause failure.	**Prevent foreign matter from entering**
Danger of overheating **Check that cooling fan is turning and cooling air is flowing.** If not, it can cause accident, failure or bodily injury such as burns due to overheating.	**Check fan**

Test operation

① Open inlet and outlet
Remove caps (2 places) from inlet and outlet of vacuum pump.

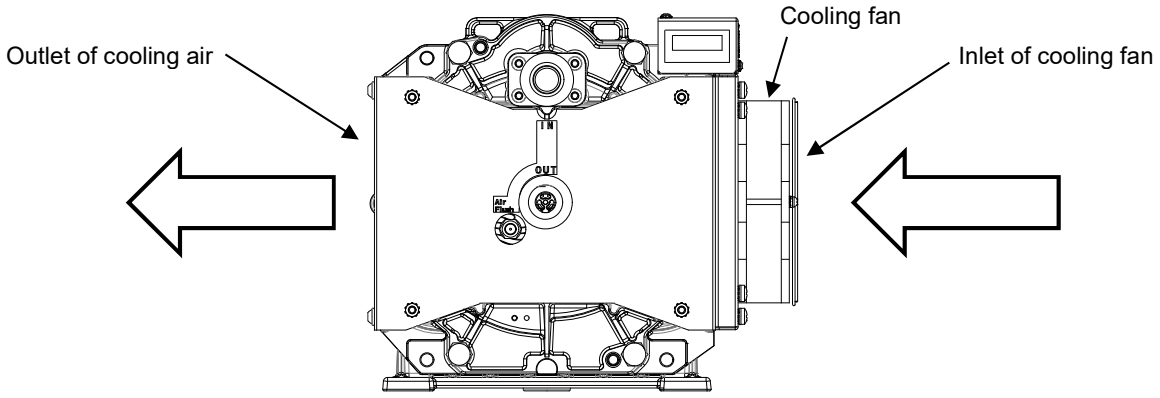




② Check turning direction
Open inlet, turn on electrical source to start operating vacuum pump, and Check that air comes out from outlet. (Vacuum pump turns counter-clockwise when viewed from motor side.)
If air does not come out from outlet, vacuum pump may turn in reverse.
In that case, stop vacuum pump, turn off main electrical source and change 2 out of 3 cords of electric source connection and change turning direction to correct one.

If you fit pump to vacuum system and control operation of vacuum pump by remote control, **first check pump itself for turning direction** and then fit it to vacuum system.

③ Check cooling air
Check that cooling fan is turning and cooling air is flowing in that direction as indicated.



Important

Vacuum pump turns counter-clockwise when viewed from motor side.

Check that air comes out from outlet.
If air does not come out from outlet, stop vacuum pump, turn off electrical source and change 2 out of 3 cords of electrical source connection.

3.3 Connection to vacuum system (chamber)

Inlet is NW25 (Internal screw size : Rc 1/2) and outlet is NW25.

⚠ CAUTION	
Danger of exhaust disruption **When connecting exhaust piping to vacuum pump and when combining piping with another vacuum pump, pay attention to piping size and length so that it does not cause exhaust resistance.** Exhaust resistance can disrupt air flow, resulting in failure and over-current.	**Pay attention to exhaust resistance**
Danger of foreign matter entering inlet **If you use the seal material or the adhesive, etc. to prevent Leak of the joint when piping with internal screw of inlet, be careful not to enter the seal material or the adhesive into an inlet.** The seal material or the adhesive entering inlet can cause failure.	**Prevent foreign matter from entering**

Important

Use isolation valve between vacuum system and inlet.

Isolation valve is necessary to prevent the drawback of debris attached to the inside of vacuum pump into the vacuum chamber during start-up and shut-down. (We recommend the use of leak valve also). We recommend the use of an **automatic valve** as the isolation valve which closes during power failure in order to prevent the drawback of debris inside pump into the vacuum chamber during power failure.

Use the clean connecting pipe between vacuum chamber and vacuum pump.

We recommend the use of a flexible tube between inlet of vacuum pump and vacuum chamber so that vibration of pump does not transmit to vacuum chamber.

When connecting exhaust piping to outlet of vacuum pump, refer to the following size and length.

・max. **2m** direct pipe length for exhaust pipe size **Rc1/2 (inner dia.16)**

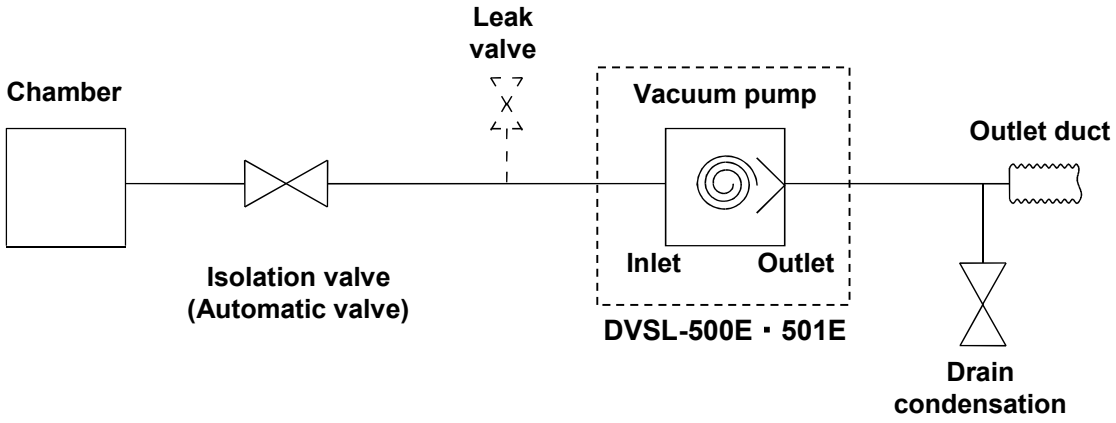
But if pipe length becomes longer, use a larger size exhaust pipe.

Make sure that exhaust piping is not clogged during pump operation.

Make sure that pressure at outlet does not exceed atmospheric pressure at any conditions.

In order to keep condensation away from feeding into the exhaust port, take proper measure.

It causes exhaust disturbance. Drain condensations periodically by using valve separately arranged.



4. Operation

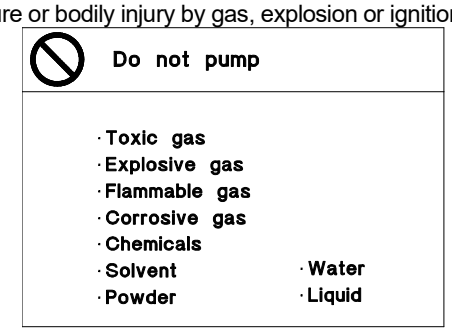
Be sure to use the procedure below to start up or shut down the pump.

- When you do not use air-flush device,
  proceed 4.1 Standard operation [page 22].
- When you use air-flush device,
  proceed 4.2 Air-flush operation [page 23].

⚠ WARNING

Danger of explosion and ignition

Do not evacuate gas which is hazardous to humans or explosive, flammable, or corrosive. Do not evacuate with substances containing chemicals, solvents, and powders.
If done, it can cause failure or bodily injury by gas, explosion or ignition.

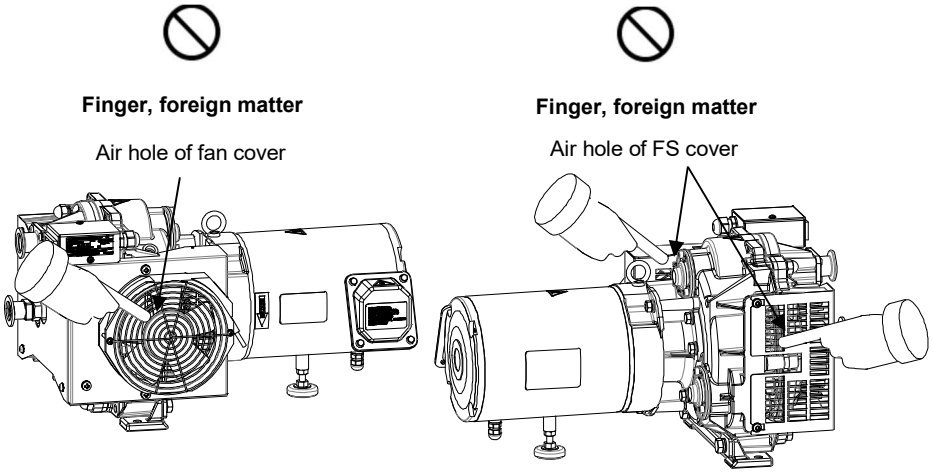


※When evacuating vapor, operate in accordance with 4.2 [page 23].
※DVSL-501E, DVSL-501E-HC of fluorine rubber seal specification can be used for exhaust some solvents.
However It is not guaranteed fluorine rubber can be used for all solvents.

Never evacuate hazardous gas

Danger of entanglement and foreign matter dispersal

Never put finger or foreign matter into air holes of fan cover, FS cover.
If done, it can cause bodily injury from entanglement with turning section, or foreign matter dispersal.



Avoid foreign matter

Danger of electric shock and entanglement

Do not remove or alter safeguards or insulation parts.
If done, it can cause bodily injury from electric shock or turning section and it can cause deteriorated performance and operating lifetime, and invalidate guarantee.

Never alter

Danger of failure and bodily injury

Change air-flush port only after vacuum pump is stopped.
If you change it during vacuum pump operation, it can cause vacuum pump failure and bodily injury.

Change after vacuum pump is stopped

⚠ CAUTION

Danger of vacuum break and pollution **Be sure to close isolation valve between vacuum pump and vacuum system (chamber) during start-up and stop.** Start-up or stop with isolation valve in the open position can draw back gas and debris attached to inside of vacuum pump to vacuum chamber due to pressure differential, resulting in vacuum break and pollution on vacuum chamber side.	 **Start or stop after closing isolation valve**
Danger of exceeding permissible temperature of intake gas **If intake gas temperature is over 50℃, be sure to install a chiller or trap between vacuum pump and vacuum chamber so that gas intake temperature of vacuum pump keeps below 50℃.** If not, vacuum pump temperature can increase, resulting in failure.	 **Beware temperature of intake gas**
Danger of remaining moisture **When evacuating moisture, be sure to open air-flush port (air-flush operation).** If you evacuate vapor while air-flush port is closed, condensed water will remain inside vacuum pump and cause failure.	 **Operate while opening air-flush port**
Danger of insufficient vapor exhaust **After evacuating vapor, do air-flush operation for at least one hour.** If you close air-flush port or stop vacuum pump soon after evacuating vapor, condensed moisture will remain inside vacuum pump, which will cause failure.	 **Caution after exhausting vapor**
Danger of exceeding permissible intake gas volume **When sending N_2 gas or dry air into air-flush port, pressure should be the same as atmospheric pressure and flow rate should be less than 10L/min.** If not, it can increase pressure inside vacuum pump, resulting in failure.	 **Beware of intake gas volume**
Risk of motor malfunction **Refrain from frequent start/stop operation.** It induces malfunction of motor such as burn out. Please consult your dealer or factory representative for details. Appropriate operating mode with adequate interval and frequency of start/stop is varies owing to operating condition.	 **Caution for frequent start/stop and short interval**

Important

If it takes time to reach ultimate pressure of pump during initial operation (also operation after pump has not been used for a long time),

Close inlet, and continue operation for 6~8 hours while opening inlet for 3~5 seconds to atmosphere 2~3 times per hour. During pump stoppage, moisture might have entered inside of pump and deteriorated performance to reach ultimate pressure.

If pump has evacuated liquid such as water or high humid air (over 60%RH),

Moisture can deposit inside pump and cause pump failure. In that case, close isolation valve, and open inlet to atmosphere for 3~5 seconds several times and exhaust moisture inside pump to outside.

If pump has continued operation around ultimate pressure or continuously evacuated high humid gas

Moisture can be condensed and remains inside pump, causing insufficient ultimate pressure and failure.
In that case, do air-flush operation in accordance with 4.2 [page 23].

4.1 Standard operation

4.1.1 Start-up

① Check that caps of inlet and outlet is removed.

② Close isolation valve in order to prevent the drawback of debris attached to the inside of vacuum pump into vacuum chamber due to pressure differential, resulting in vacuum break and pollution.
(Open leak valve if you use leak valve).

③ Turn on vacuum pump.
Please install an external power switch or protective device (breaker) before letting vacuum pump operate.

④ Check start-up of vacuum pump and open isolation valve (close leak valve soon after start-up if you use leak valve) and evacuate vacuum chamber.

Important

When continuously operating pump at around ultimate pressure,
It can cause foreign matter or moisture to deposit inside pump, resulting in failure.
In that case, do air-flush operation or close isolation valve and open inlet to atmosphere for 3~5 seconds, 3~5 times daily.
Be careful not to damage air-flush port (especially air-muffler section).
If not, it can cause failure.
When doing air-flush operation,
Noise level will increase (by 5dB).
Install pump in an area which is not exposed to debris such as iron powder, stone powder, polish powder or wood dust.
Debris can clog air-muffler, undercutting air-flush effect.

4.1.2 Shut-down

① Be sure to close isolation valve in order to prevent the drawback of debris attached to inside of vacuum pump into vacuum chamber during operation due to pressure differential (open leak valve if you use leak valve).

② Turn off vacuum pump.
Please install an external power switch or protective device (breaker) before letting vacuum pump operate.

③ Check shut-down of vacuum pump.

Important

Be sure to close isolation valve between vacuum pump and vacuum chamber during pump shut-down.
If vacuum pump stops during air-flush operation, atmospheric air is drawn back from air-flush port to inside of vacuum pump, and vacuum on chamber side cannot be maintained. Be sure to close isolation valve between vacuum pump and vacuum chamber to prevent the drawback of debris from vacuum pump into vacuum chamber before stopping vacuum pump.
When returning air-flush operation to standard operation, operate as per 4.2.3[page 24].

4.2 Air-flush operation

This pump is equipped with air-flush port. Before evacuating vapor, read precautions below completely and be sure to understand the contents.

Purpose of air-flush

Processing humid air by vacuum pump may cause condensed water to remain in pump. This remaining condensation will cause a failure of ultimate pressure of pump. Air-flush operation will contribute to remove the remaining condensation inside. Air-flush operation does not only removing condensation but also restores ultimate pressure.

※Continuous operation with the air flush function does not affect performance of the vacuum pump.
※Vapor disposal volume is max. 250g/day when doing air-flush operation(ambient temperature 25℃, humidity 60%RH).

Important

Maintenance interval of this pump is based on clean gas applications The standard differs when evacuating vapor.

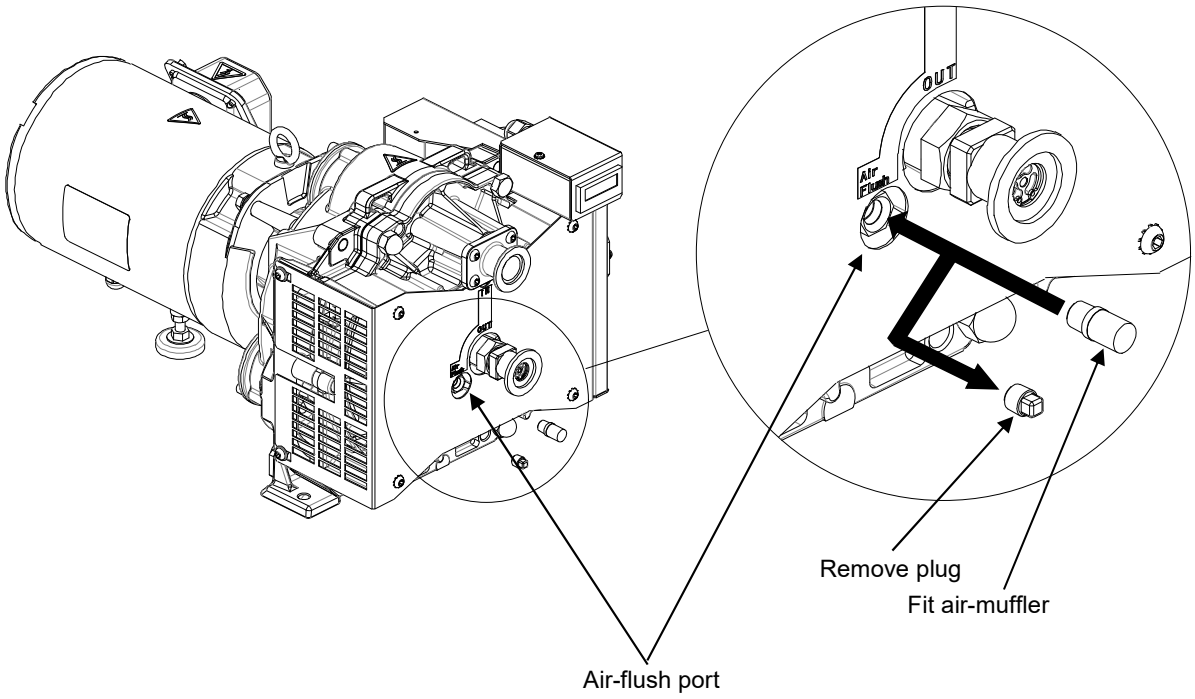
You must shorten maintenance interval (5.2[page 27]) when evacuating vapor since vapor temperature, disposal volume, disposal frequency and substances in vapor have an influence on pump operation. When evacuating vapor, pay attention to all WARNING, CAUTION and Important notes (4 [page 20~21]).

4.2.1 Preparation

Before starting air-flush operation, first stop vacuum pump and proceed in accordance with the following procedure. Never try to do air-flush operation during operation.

Fit air-muffler

① Stop vacuum pump.
② Remove plug from air-flush port with a spanner (nominal dia. 7mm).
③ Lightly fit the attached air-muffler to air-flush port.
※Store the removed plug and do not misplace it.



4.2.2 Start-up and shut-down

① Start vacuum pump according to 4.1.1 Operation [page 22].
② Stop vacuum pump according to 4.1.2 Shut-down[page 22].

Important

Continuous evacuating of humid gas
When evacuating vacuum chamber while humidity in chamber is high, moisture volume drawn into pump differs according to temperature and pressure in chamber.
When pumping vacuum chamber containing humid gas, be sure to open air-flush port and operate pump (air-flush operation).

Be careful not to damage air-flush port (especially air-muffler section).
Damage to air-flush port can cause failure.

When doing air-flush operation
Noise level will increase (by 5dB).

Install pump in an area which is not exposed to debris such as iron powder, stone powder, polish powder or wood dust.
Debris can clog air-muffler, undercutting air-flush effect.

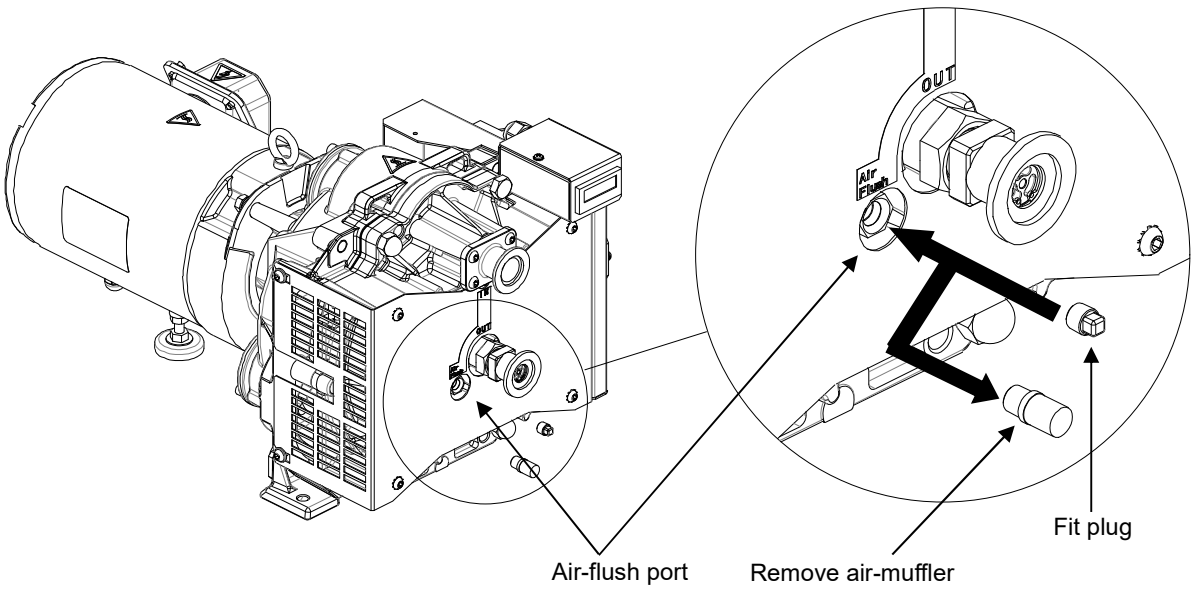
Be sure to close isolation valve between vacuum pump and vacuum chamber during pump shut-down.
If vacuum pump stops during air-flush operation, atmospheric air is drawn back from air-flush port to inside of vacuum pump, and vacuum on chamber side cannot be maintained. Be sure to close isolation valve between vacuum pump and vacuum chamber to prevent the drawback of debris from vacuum pump into vacuum chamber before stopping vacuum pump.
When operating with air-flush OFF (closed), operate as per 4.2.3[page 24].

4.2.3 When returning to standard operation

Before starting air-flush operation, first stop vacuum pump and proceed in accordance with the following procedure. Never perform this procedure during operation.

Remove air-muffler

① Stop vacuum pump.
② Remove air-muffler from air-flush port.
③ Lightly fit plug to air-flush port with a spanner (nominal dia. 7mm).
※When restarting air-flush operation, refer to 4.2.1~4.2.2[page 23~24] and prepare and start.
※Store removed air-muffler and pay attention not to misplace it.

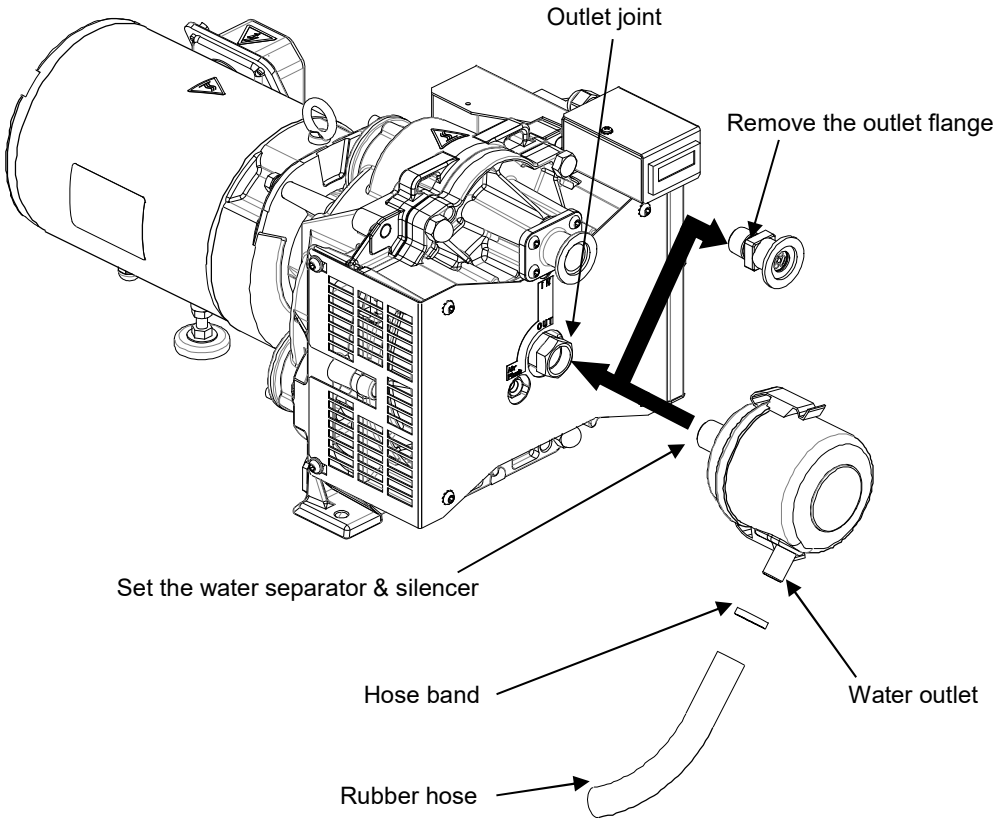


4.3 Water separator & silencer [Option]

When always evacuating water vapor, install water separator & silencer, which is prepared as an option.

How to fit water separator & silencer

① Remove outlet.
② Screw the water separator & silencer into the outlet joint.
③ Set the water outlet of water separator & silencer downwards. Put the rubber hose into water outlet and tighten the connection by hose band.
④ Be sure to open air-flush port and operate pump.



5. Maintenance and inspection

⚠ WARNING	
Danger of failure and bodily injury **Conduct periodical maintenance and inspection.** If not, it can cause insufficient performance, failure of vacuum pump, and bodily injury.	 **Conduct periodical maintenance and inspection**
Danger of burns **Conduct maintenance and inspection only after vacuum pump becomes cool enough.** Maintenance and inspection soon after vacuum pump stops can cause burn injury.	 **Be careful about high temperature**
Danger of electric shock **Be sure to conduct maintenance and inspection after you turn off electric source.** If not, it can cause bodily injury from electric shock or turning object.	 **Turn off electric source**
Danger of accident, failure and shorter operating lifetime **Ask specialist to perform repairs.** Defective repairs can cause accident, failure or shorter operating lifetime.	 **Ask specialist to perform repairs**

5.1 Daily maintenance and inspection

Conduct the following daily maintenance and inspection.

Items	Contents	Measures
Vacuum pump itself	Abnormal sound	Ask specialist to repair.
	Abnormal vibration	Ask specialist to repair.
	Abnormal temperature	Ask specialist to repair.
	Cooling fins are dirty or clogged	Blowing air, cleaning
Cooling fan Fan cover	Abnormal rotation	Ask specialist to repair.
	Dirty, clogged, damaged	Blowing air, cleaning, ask specialist to repair.
Air-muffler	Dirty, clogged	Replace
Exhaust valve	Dirty, clogged	Blowing air, clean
Water separator & silencer	Dirty, clogged	Blowing air, cleaning
Electric source cable	Deteriorated	Replace

5.2 Maintenance

When maintenance interval has elapsed, be sure to contact our dealer who sold it to you. This vacuum pump requires maintenance conducted only by our authorized specialist.
Never try to disassemble, reassemble or alter on user's side. We are not responsible for any accidents caused by disassembly, reassembly or alteration which was done by the user or non-specialist.

The following parts are consumable and need to be replaced periodically.
Whenever something goes wrong with them, replace them immediately.

Where to inspect	Maintenance interval			
	Yearly or 8,000 h	Biennially or 16,000 h	Triennially or 24,000 h	4th years or 32,000 h
Ball bearing set	-	Grease / △	−	○
Pin crank set	Grease / △	Grease / △	Grease / △	○
Duplex arrangement angular contact ball bearing set [Housing]	-	Grease / △	−	○
Roller bearing set [OS]	Grease / △	Grease / △	Grease / △	○
Spider	○	○	○	○
P-seal [FS set]	○	○	○	○
Tip seal FS	○	○	○	○
Tip seal OS	○	○	○	○
O-ring [Inlet flange]	○	○	○	○
Air-flush kit	○	○	○	○
Cooling fan	△	△	△	○
Vacuum pump itself	-	-	-	○

○・・・Replace
△・・・Replace if something goes wrong.
Note 1：Be sure to use designated DVSL exclusive grease.
Note 2：You must shorten maintenance standard when pumping vapor since vapor temuperature, disposal volume, disposal frequency and substances in vapor have influence on pump operation.
Note 3：The maintenance interval should be earlier one in either the period or running hours.
Note 2：When you want further operation after either the 4th year or 32,000 operating hours, please contact our dealer who sold it to you.

Important

Causes of failure
Shorten maintenance interval if conditions of installation or operation are unfavorable.
In particular, ambient temperature has a great influence on failure. Maintenance interval is based on an ambient temperature 5~40℃ and a yearly average ambient temperature 25℃.
Shorten the maintenance interval if temperature exceeds the foregoing. If not, it can cause failure.
Maintenance interval is not a guarantee period.

Exceeding maintenance interval
Operation exceeding maintenance interval increases risk of failure and accidents.
When maintenance interval has elapsed, be sure to contact either the dealer who sold it to you or us.

6. Problems and remedies

If something goes wrong, refer to the following chart and remedy problems.
If you cannot solve your problems, please contact either our dealer who sold it to you or us.

Problems	Causes	Remedies
Motor does not rotate.	Protective device (or breaker) activates.	Check protective device (or breaker) capacity. ※Inspect and repair.
	Electric source cable is loose or cut.	Check connection. Repair or replace.
	Voltage drops.	Check size and length of cable.
	Motor malfunctions.	※Inspect and repair.
	Pump malfunctions. Foreign matter enters.	※Inspect and repair.
	Motor protection gear activates.	Air outlet is clogged. ※Inspect and repair.
Motor stops soon.	Protective device (or breaker) activates.	Check protective device (or breaker) capacity. ※Inspect and repair.
	Voltage drops.	Check size and length of cable.
	Motor malfunctions.	※Inspect and repair.
	Pump malfunctions. Foreign matter enters.	※Inspect and repair.
	Improper exhaust piping.	Check exhaust piping diameter and length. Air outlet is clogged.
	Motor protection gear activates.	Air outlet is clogged. ※Inspect and repair.
Ultimate pressure is insufficient.	Air leaks from piping. O-ring is damaged.	Check tightness of piping. Replace.
	Moisture and solvent are drawn.	Open inlet to atmosphere and operate for a few minutes and then close inlet and operate for about 24 hours. Do air-flush operation. Install trap and filter.
	Number of motor revolutions drops.	Check wiring and voltage. ※Inspect and repair.
	Pump malfunctions.	※Inspect and repair.
Abnormal sound, abnormal vibration	Connection becomes loose.	Tighten connection. ※Inspect and repair.
	The fix is not level.	Fix vacuum pump on solid and level floor (less than 5° inclination). ※Inspect and repair.
	Foreign matter enters pump.	※Inspect and repair.
	Motor malfunctions.	※Inspect and repair.
	Pump malfunctions.	※Inspect and repair.
Cooling fan does not rotate.	Cooling fan cord is loose or cut.	Check connection. ※Inspect and repair.
	Cooling fan malfunctions.	※Inspect and repair.

※ Contact our dealer who sold it to you.

7. Disposal

When a vacuum pump is disposed, please comply with local law and/or regulations such as the Waste Disposal Law.

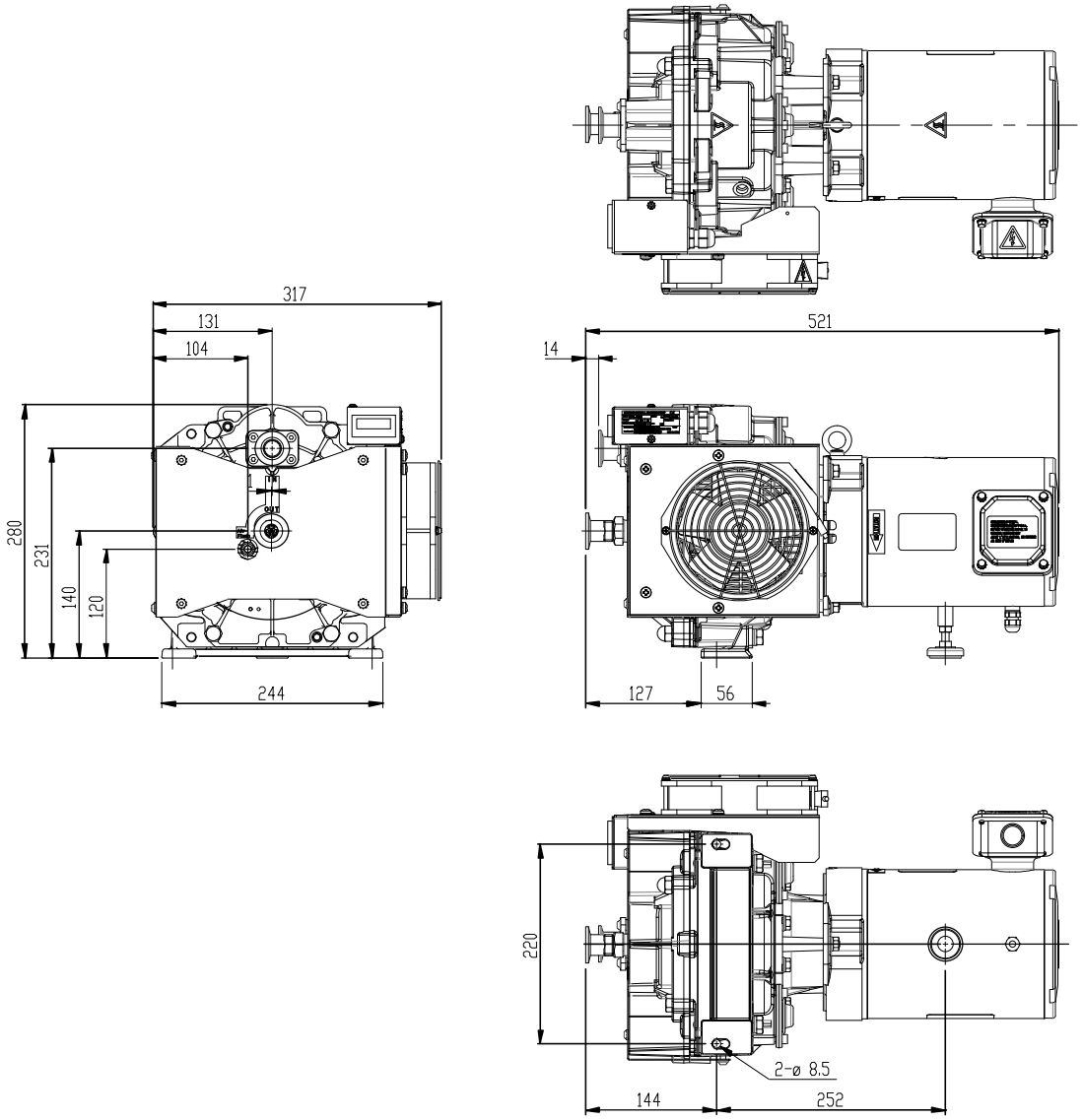
8. Specifications

8.1 Specifications

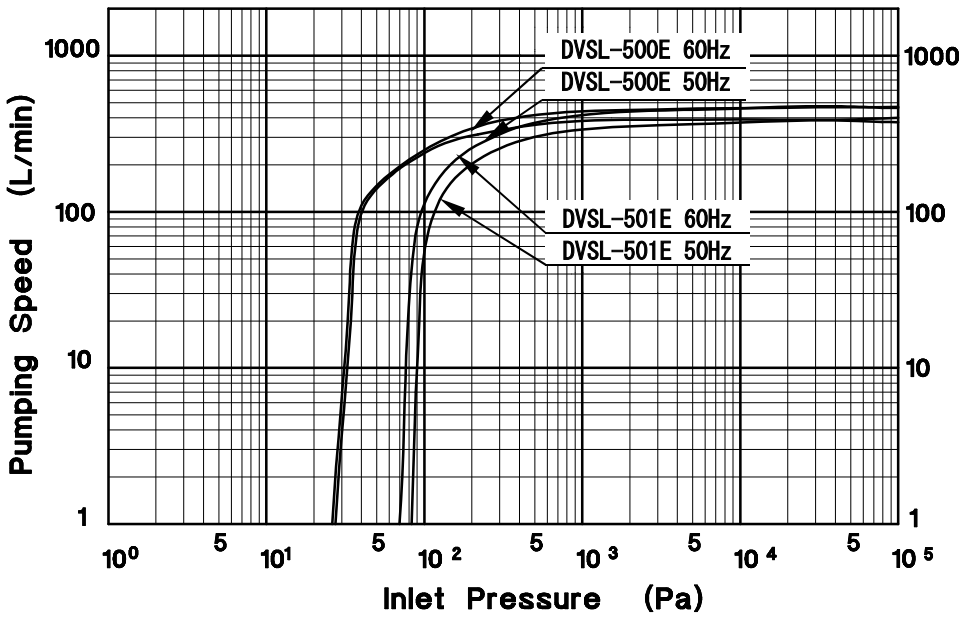
Model			DVSL-500E		DVSL-501E			DVSL-501E-HC	
Surface treatment			Normal coat					Hard coat	
Back-up material			Silicon rubber		Fluorine rubber				
Displacement L/min		50Hz	433						
		60Hz	516						
Ultimate pressure Pa			≦30		≦100				
Max. inlet pressure			Atmospheric pressure						
Ambient operating temperature ℃			5~40						
Motor	Type		3-phase squirrel cage induction motor, IE3, Totally-enclosed, 2-pole, Thermal class 155(F), Multiplex voltage						
	Output kW		0.9 / 1.1 (50Hz / 60Hz)						
	Voltage V		200	220	230	380	400	415	460
	Rated current A	50Hz	3.7	-	-	1.88	1.87	1.88	-
		60Hz	4.1	3.9	3.8	-	-	-	1.92
	Revolution min^{-1}{rpm}	50Hz	2920	-	-	2910	2920	2920	-
		60Hz	3480	3500	3510	-	-	-	3510
Noise level 1m dB(A) (With air-flush ON)			≦64 (≦69)						
Inlet connection			NW25 [Internal screw size : Rc1/2]						
Outlet connection			NW25 [With exhaust valve]						
Dimensions mm L×W×H			521×317×280						
Mass kg			34						
Cooling system			Air-cooled system with cooling fan						
Others			With hour counter and air-flush						

Note 1 : The model number scheme is defined by material, which is used for back-up of P-seal.
(Refer to page 10 [Structure of vacuum pump] of the instruction manual)
Note 2 : Fluorine rubber used in this product may not be compatible for certain chemicals.
Please contact chemical supplier.
Note 3 : Pumping speed and ultimate pressure should remain the same whether air-flush system is used or not.
Note 4 : Maximum voltage allowance is + or - 10% from motor rating.
Note 5 : Noise level is measured at ultimate pressure in an anechoic room.
Note 6 : Vapor handling volume is no more than 250g/day (at 25℃ 60%RH) with air-flush operation.
Air-flush flow rate is 10L/min.
Note 7 : This product is wired for 200V at the factory.
Note 8 : For continuous duty with water vapor, install optional exhaust silencer.
Note 9 : This product is not equipped with motor protection device.
Install branch circuit protection device for safety. Consult to qualified electrician for details.
Note 10 : This product is designed for indoor use. Install the product away from moistures or excessive humidity.
Note 11 : All data shown in this literature were measured based on our test standard and specific conditions.
Actual measurements are subject to change of conditions of use.
Note 12 : ANEST IWATA reserves the right to change descriptions or specifications in this literature without prior notice.

8.2 Dimensions



8.3 Performance data



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