**In laboratory equipment and production facilities, which vacuum chamber is used, there is a case of installing the laser optical system and the detecting optical element in a chamber. There are many optics that can be used in a vacuum. But for the holders and the bases, the use of the generic product may not reach the degree of vacuum required, or there is a risk that cleaning of the chamber becomes necessary by the chamber contamination. Previously, the vacuum bases and holders have been fabricated as custom-made products according to customer's request. However, by the degree of vacuum and the intended use, specifications and production process of each product was different. For this reason, it could not be a standard product. Our vacuum bases and holders has examined various conditions of use in the design stage. It is a product that can exert its performance in any vacuum conditions. We greatly expanded the selection of standard products, and has enabled responses to customer requests for short delivery time.**

## Features of vacuum products

Availability of vacuum products have been sorted by the degree of vacuum. Our vacuum products, with considering every single factor such as the material, design, cleaning, packing and evaluation, it has been completed as a product that can reach ultra-high vacuum.

**■Factor and product comparison by the degree of vacuum**

| Environment | Clean room | Low-medium vacuum | High vacuum | Ultra-high vacuum |
|---|---|---|---|---|
| Degree of vacuum | $10^{5}$Pa | $10^{-1}$Pa | $10^{-5}$Pa | $10^{-9}$Pa |
| Exhaust system | Fan | Mechanical pump | Diffusion pump | Turbo-molecular pump Ionization pump, etc. |
| Major factor | Cleanliness | Residual gas | Volatile substance | Surface adsorption |
| General aluminum parts | ○ Need Cleaning | △ Need vent holes | × Outgas from anodizing | × Baking generate contamination |
| Stainless steel parts | ○ Need Cleaning | △ Need vent holes | △ Need vacuum grease | × Baking generate contamination |
| Vacuum compatible products | ◎ Already cleaned | ◎ Vent holes pre-designed | ◎ Vacuum grease pre-applied | ◎ Baking applicable |

## Materials

Outgas from the material itself can be a problem in the ultra-high vacuum. Our products have selected the best material by examining the amount and type of outgas.

- Stainless steel (SUS316L)・・・・Strong corrosion resistance when exposed to high temperature baking, and less outgassing.
- Aluminum (A6061)・・・・Special surface treatment is used to reduce the degradation of the surface and outgassing.

The other parts also use the material that is suitable in the ultra-high vacuum.

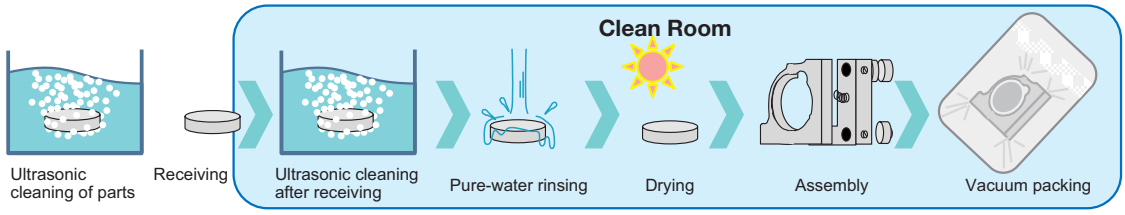
Mounting vacuum chamber

## Design

Screw holes and insert parts create enclosed space, and there is a possibility that air is trapped in this spade. This creates outgas when pumping down the vacuum and causing instability of the vacuum. In our design, holes or grooves for degassing is being processed on all of the screw holes and insert parts that could create an enclosed space. This allows for stabilization of the vacuum in a short period of time even at high vacuum environment.

## Cleaning

In the ultra-high vacuum, gas adsorbed on the metal surface can be a problem. Stainless steel and aluminum are protected from corrosion by creating an oxide film immediately after processing. However, when oil and water is present on the surface after processing, oxide film can not be generated properly and it may cause outgassing. For this reason, proper cleaning is first carried out for the parts and later for the finished product also.



# Guidance of Vacuum Products | Vacuum Base·Holder

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## Packing

Products are assembled in a clean booth and packed in a clean room. Packaging is also different from the normal packaging. It is delivered in a special packing method, and a deterioration of quality which become problematic in a high vacuum environment does not occur.

- Wrap the product with aluminum foil
- Vacuum packing using special bags

It is recommended to unpack the vacuum products inside the clean room or vicinity of the vacuum chamber. If the vacuum product has been left for a long time after unpacking, there is a possibility that quality with respect to the vacuum is degraded.

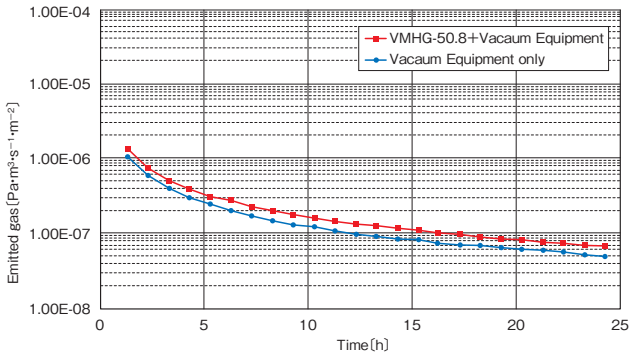
## Evaluation

Evaluation of the outgassing of the finished product to are conducted using the actual vacuum chamber. The following data is an example of the outgas measurement of the vacuum mirror mount (VMHG-50.8) using the conductance modulation method. It also shows the mass ratio analysis of the outgas. Through such evaluation, we have confirmed that the design and production process of vacuum products are appropriate.
These data will not be attached to the product. If the data is necessary please request us in advance. Data attachments are available at an additional fee.

### ■Outgassing

| Pump down time h | Outgas [Pa·m³·s⁻¹/unit] |
|---|---|
| 1 | 2.6E-07 |
| 2 | 1.8E-07 |
| 3 | 7.6E-08 |
| 4 | 3.9E-08 |
| 5 | 2.0E-08 |

The value measured with the conductance modulation method will be different depending on the conductance (ex. exhaust speed and the degree of vacuum) of the vacuum system. Please use the data for the confirmation of outgassing decay or the relative comparison of the products. Please contact us if the comparison is necessary with other evaluation methods.




### ■System specifications

- Vacuum pump
  Type: Turbo-molecular pump
  Model: STP-301
  Manufacturer: Seiko Seiki (now Edwards)
  Exhaust speed: 300 l/s
- Mass spectrometer
  Type: Quadrupole mass spectrometer
  Model: M-201QA-TDM
  Atomic mass number range: 1 – 200
  Manufacturer: Canon Anelva

### ■Mass ratio

| | 10 hours | 24 hours | |
|---|---|---|---|
| Vacuum pressure (Pa) | $3.06\times10^{-6}$ | $1.42\times10^{-6}$ | |
| Outgas speed ($Pa\cdot m^3\cdot s^{-1}\cdot m^{-2}$) | $2.15\times10^{-6}$ | $1.08\times10^{-6}$ | |
| Total ion current value (A) | $1.68\times10^{-10}$ | $1.40\times10^{-10}$ | |
| Atomic mass number | Mass ratio (10 hours) | Mass ratio (24 hours) | Gas molecules |
| 1 | 2.11 | 1.94 | $H_2$ |
| 2 | 0.51 | 0.47 | $H_2$ |
| 12 | 0.27 | 0.28 | CO, $CO_2$ |
| 14 | 0.19 | 0.50 | $N_2$ |
| 18 | 4.74 | 4.86 | $H_2O$ |
| 22 | 0.22 | 0.20 | $CO_2$ |
| 28 | 1.52 | 0.36 | CO, $CO_2$, $N_2$ |
| 32 | 0.46 | 0.26 | $O_2$ |
| 40 | 0.21 | 0.24 | Ar |
| 44 | 0.31 | 0.32 | $CO_2$ |