

**ANELVA**

VACUUM  
COMPONENTS  
Catalog

**CANON ANELVA CORPORATION**

<http://www.canon-anelva.co.jp>







## Preface



Accompanying the advance of vacuum application technology, vacuum equipment/components and materials are being utilized in a variety of fields, with new types of equipment and components appearing increasingly each year.

In order to provide our customers with an overall understanding of the wide variety of products (Vacuum Components) that CANON ANELVA has developed and manufactures, we have combined the individual product catalogs into a single comprehensive catalog. We are pleased to present it to you here as the CANON ANELVA Vacuum Components Catalog.

We hope you will keep this catalog at your side for quick reference whenever you need to order any of our products.

CANON ANELVA CORPORATION



# Vacuum Components

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- Information

- Pumps

- Measurements

- Components

## Vacuum Components

-- Read Before Using This Catalog --

### (1) How to use this catalog

This catalog covers all vacuum pumps, gauges, and vacuum components offered by Canon Anelva (these products are hereafter referred to as Components).

The catalog is divided into the following chapters: Vacuum Pumps, Gauges, and Vacuum Components.

A Table of Contents is included at the beginning of each chapter.

The catalog is organized so that you can easily find the desired component.

Refer to the Table of Contents for the specific page.

The dimensions in the figures are in millimeters (mm) unless specified otherwise.

### (2) Contact information

At the end of each product description, a table listing the parts numbers, types, product names, and product codes of the described products and related components is provided as ordering information.

Select the required components from this list, and order by specifying the parts numbers, types, product names, and product codes.

### (3) Others

Please note that the specifications of the products in this catalog may change due to performance improvements without prior notice.

Please contact our sales department (head office, local branch) or vendor for questions or inquiries regarding the order or delivery of your product.

### (4) Maintenance service

Our components are manufactured and sold upon close scrutiny and careful testing at all stages, from development to marketing, in order to deliver "reliable and easy-to-use" products.

Nevertheless, even highly reliable components can fail, or reach their end of life due to wear and tear after long use. Periodic maintenance and repair are therefore essential. Accordingly, we provide periodic maintenance of pumps and repair/adjustment of gauges, and offer service parts that are indispensable for creating vacuum systems.

If you have any suggestions or questions concerning our products, please feel free to contact us.

(5) Sales network (Japan)

**CANON ANELVA CORPORATION Main Office**

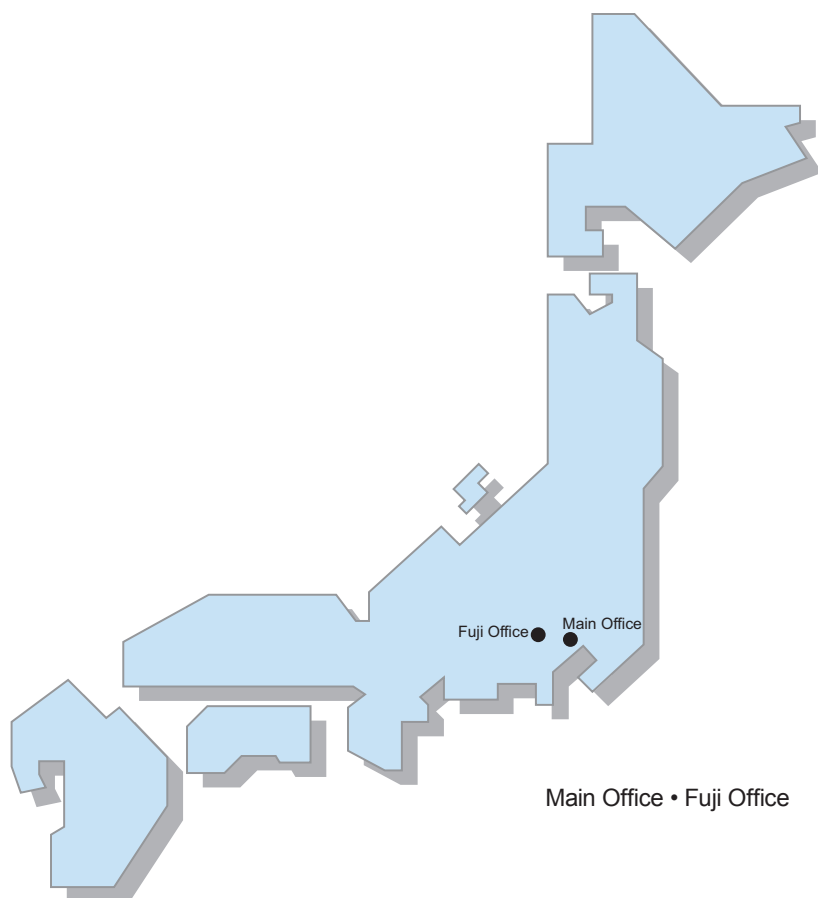
5-1, Kurigi 2-chome, Asao-ku, Kawasaki,  
 Kanagawa 215-8550, Japan  
 Phone +81-44-980-5078 FAX +81-44-986-4249

**CANON ANELVA CORPORATION Fuji Office**

8532-28, Narusawa-mura, Minamitsuru-gun,  
 Yamanashi 401-0397, Japan  
 Phone +81-555-20-5585 FAX +81-555-85-2199



**Fuji Office**



**Main Office • Fuji Office**

(6) Sales network (Overseas)



**Canon Anelva Corporation  
German Service**

Phone	FAX	Address
+49-0-351-892-5207	+49-0-351-892-5209	Manfred-von-Ardenne-Ring 20, 01099 Dresden, Germany

**Canon Anelva Corporation  
UK Service**

Phone	FAX	Address
+44-28-7136-1697	N/A	Unit 4, 1st Floor, Phase 2 18 Balliniska Road Springtown Industrial Estate Londonderry BT48 0NA United Kingdom

**Canon U.S.A., Inc.**

Phone	FAX	E-Mail (About Components Only)	Address
+1-408-468-2000	+1-408-468-2343	anelva_cdg@usa.canon.com	3300 North First Street San Jose, CA 95134 U.S.A.

**Canon Semiconductor Engineering Korea, Inc.**

Phone	FAX	Address
+82-31-677-6182	+82-31-677-6187	Bong Bldg., 5F #1014-15 Youngtong-Dong, Youngtong-Gu, Suwon-City, Gyeonggi-Do, 443-470 Korea

**Canon Semiconductor Equipment Taiwan, Inc.**

Phone	FAX	Address
+886-3-668-6600	+886-3-668-6969	9F-2, No.25, Pu-Ding Road, Hsinchu, 300, Taiwan

**Canon Singapore Pte. Ltd.**

Phone	FAX	Address
+65-6799-8888	+65-6721-4226	1 HarbourFront Avenue #4-01 Keppel Bay Tower Singapore 098632

**Canon Optical Industrial Equipment Service (Shanghai), Inc.**

Phone	FAX	Address
+86-21-2316-3200	+86-21-2316-3222	18F,Urban City Center, No.45 Nanchang Road Shanghai

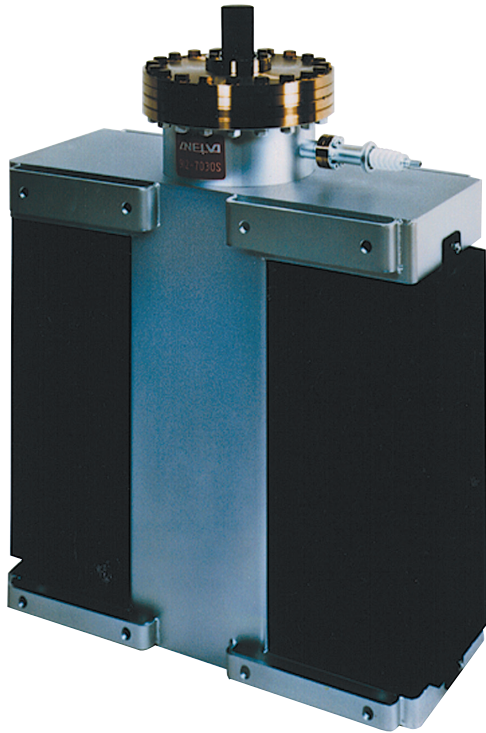
*Memorandum*



# Vacuum Pumps

Ion Pump/Noble Pump  
Excel Pump  
Ion Pump/Noble Pump Controller  
Titanium Sublimation Pump/Ti-Vac Pump  
Combination Pump  
Cryopump POWER/POWER<sup>Eco</sup> Series  
Cryopump POWER Series  
Cryopump POWER<sup>Eco</sup> Series  
Foreline Trap

# Ion Pump/Noble Pump



P-500 Series Controller

## ■ Summary

The ion, noble, and excel pumps are ultra-high vacuum pumps which utilize the gas adsorption properties of the cathode material sputtered by cold cathode discharge within a magnetic field and the continuous formation of active getter film by sputtering cathode material (Ti) during collision with the cathode.

Since no organic materials such as oil are used, a completely oil free, ultra-high vacuum can be obtained. Operation requires only electrical power and there is no vibration or noise because there are no moving parts. In addition, the pumps can be used safely for unattended operation at night because there is no need to worry about the pumped system becoming contaminated in case of an accident such as a sudden power failure or vacuum leak.

The noble and excel pumps are tripolar type ion pumps with improved inert gas pumping speed. They have all the features of an ion pump, but are capable of stable pumping of inert gas.

Furthermore, the excel pump has improved discharge characteristics at the extreme high vacuum region due to optimized discharge conditions.

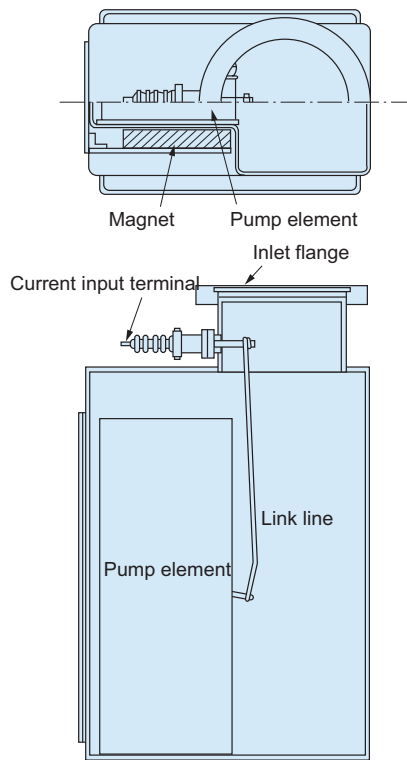
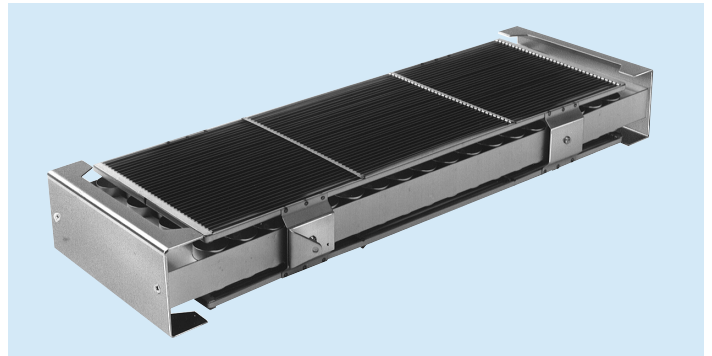
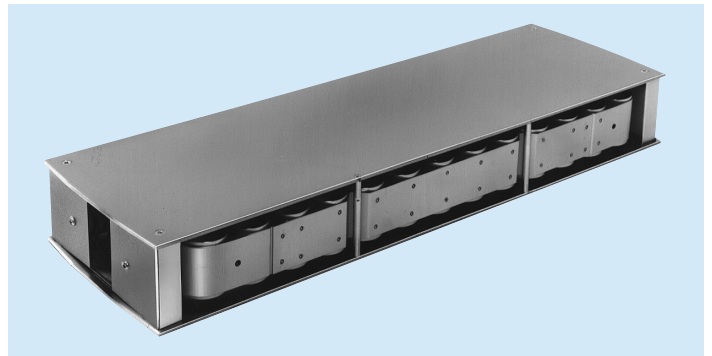


Fig. 1 Ion Pump/Noble Pump external  
(Example: 140L/s Ion Pump, 110L/s Noble Pump)



915-9520 Noble Pump element



915-9510 Ion Pump element

Fig. 2 Pump elements

## ■ Features

### 1. Completely oil free

A clean vacuum can be obtained without contaminating the system because no organic materials such as oil are used. In addition, there is no need to close the valve even in case of a power failure.

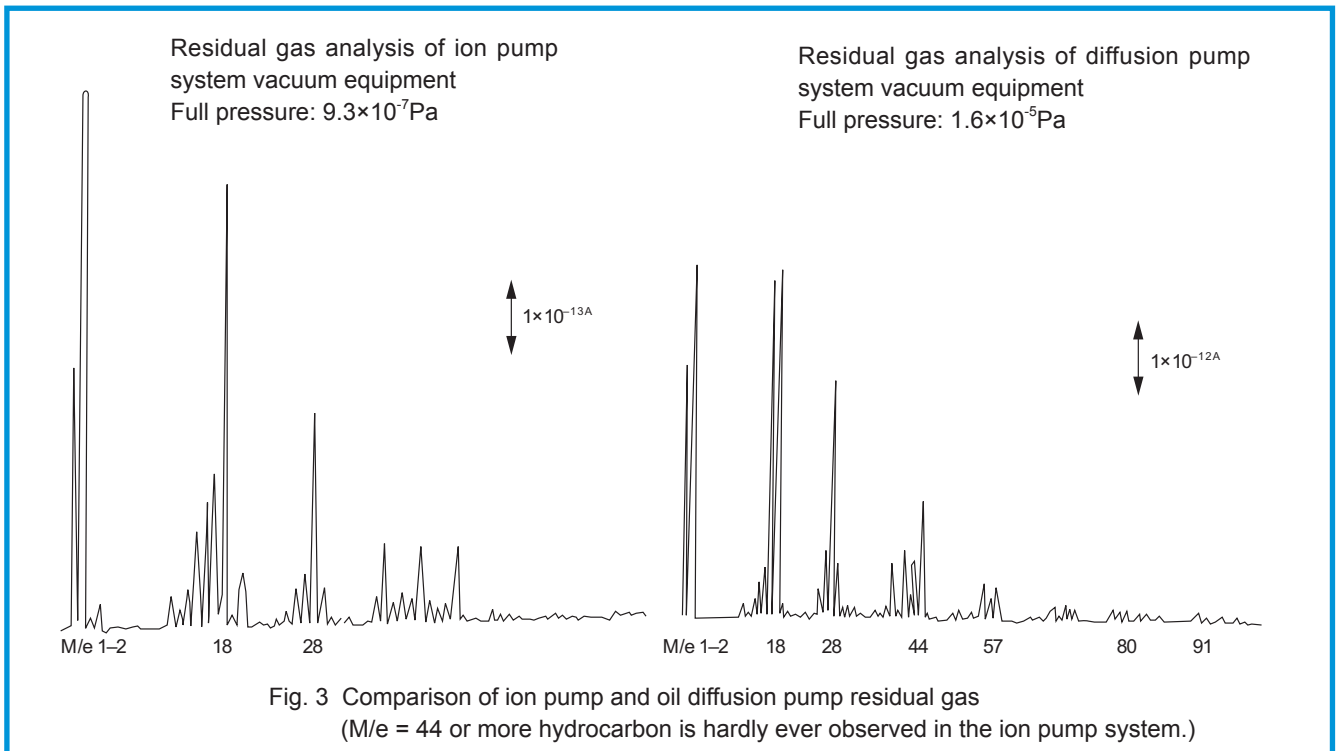


Fig. 3 Comparison of ion pump and oil diffusion pump residual gas  
(M/e = 44 or more hydrocarbon is hardly ever observed in the ion pump system.)

## 2. Ultra-high vacuum, extreme high vacuum

The ion pump/noble pump is best suited for creating extreme high vacuum in the range of  $10^{-1}$ Pa to  $10^{-9}$ Pa. Especially when used in combination with a titanium sublimation pump, a ultra-high vacuum of  $10^{-9}$ Pa can be achieved quickly.

In addition, an excel pump can achieve practical extreme ultra-high vacuum (approx.  $10^{-10}$ Pa) using a newly developed pump element and an NEG module (option) with improved discharge characteristic at the ultra-high vacuum and extreme high vacuum region.

## 3. Unattended operation

Only electrical power is required making it convenient for night-time unattended or remote operation.

In addition, there is a protection circuit that automatically turns off the power when the pressure exceeds  $10^{-3}$  to  $10^{-2}$ Pa\*.

\* Note that the above pressure range changes according to the controller used.

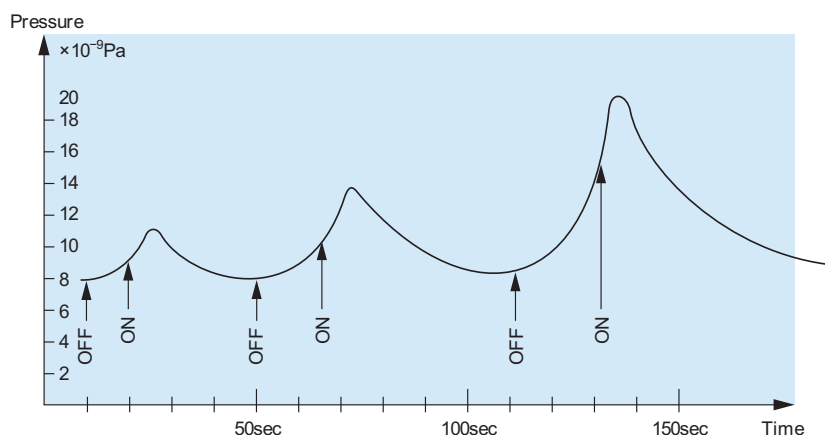


Fig. 4 Pressure change when ion pump is turned ON-OFF at  $10^{-9}$ Pa  
(The pressure rises immediately when the pump is turned OFF and drops within a few seconds after it is turned ON again. You can see that the ion pump is operating normally at  $10^{-9}$ Pa.)

## 4. Quiet operation

Completely free of vibration and noise because there are no mechanical moving parts.

## 5. Energy saving

Because power consumption decreases in proportion to pressure, very little power is consumed except during startup.

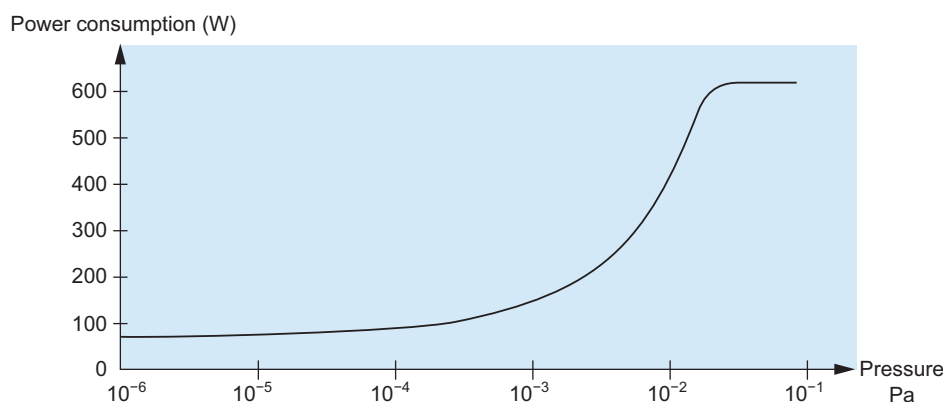


Fig. 5 Power consumption example (60L/s ion pump)

## 6. No vacuum gauge necessary

The pressure within the pump can be determined from the discharge current which is proportional to the pressure. Therefore, the approximate pressure can be monitored simply by using the pump as a vacuum gauge. [ $10^{-3}$ Pa to  $10^{-6}$ Pa] region.

In addition, the recorder output of the pressure is output logarithmically.

## 7. Fast startup

Compared to diode ion pumps, noble pumps start up fast at low vacuum. They can also be started at higher pressure.

Ion pump 1.3Pa or less

Noble pump 6.7Pa or less

\* Note that the above pressure range changes according to the controller used.

## 8. Inert gas pumping

### (Noble Pump/Excel Pump)

Improved inert gas pumping speed compared to diode ion pumps. (Approximately 21% of air with argon)

In addition, argon instability is less likely to occur compared to ion pumps. Table 1 shows the pumping speed ratio of ion pumps and noble/excel pumps for each gas.

## 9. Free mounting direction

There is no restriction on the mounting direction; up, down, horizontal or diagonal.

## 10. Low leakage magnetic field

A ferrite magnet is used for 20L/s or more pumps.

The leakage magnetic field decays close to geomagnetism at 30cm from the flange.

(See Fig. 10 for details)

Table 1 Pumping speed ratio of various gases against nitrogen (%)

	Ion pump	Noble pump	Excel pump
Hydrogen [10 <sup>-4</sup> Pa or less]	200 to 270*	200 to 270*	200 to 270*
Nitrogen	100	100	100
Vapor	100	100	100
Carbon monoxide	100	100	100
Carbon dioxide [10 <sup>-3</sup> Pa or less]	100	100	100
Various hydrocarbon	90 to 160	90 to 160	90 to 160
Oxygen	57	57	57
Helium	10	30	30
Argon	1	21	21

\* 100 to 110 for ion, noble, and excel pumps at pressures equal to or more than 10<sup>-3</sup>Pa.

## ■ Principle

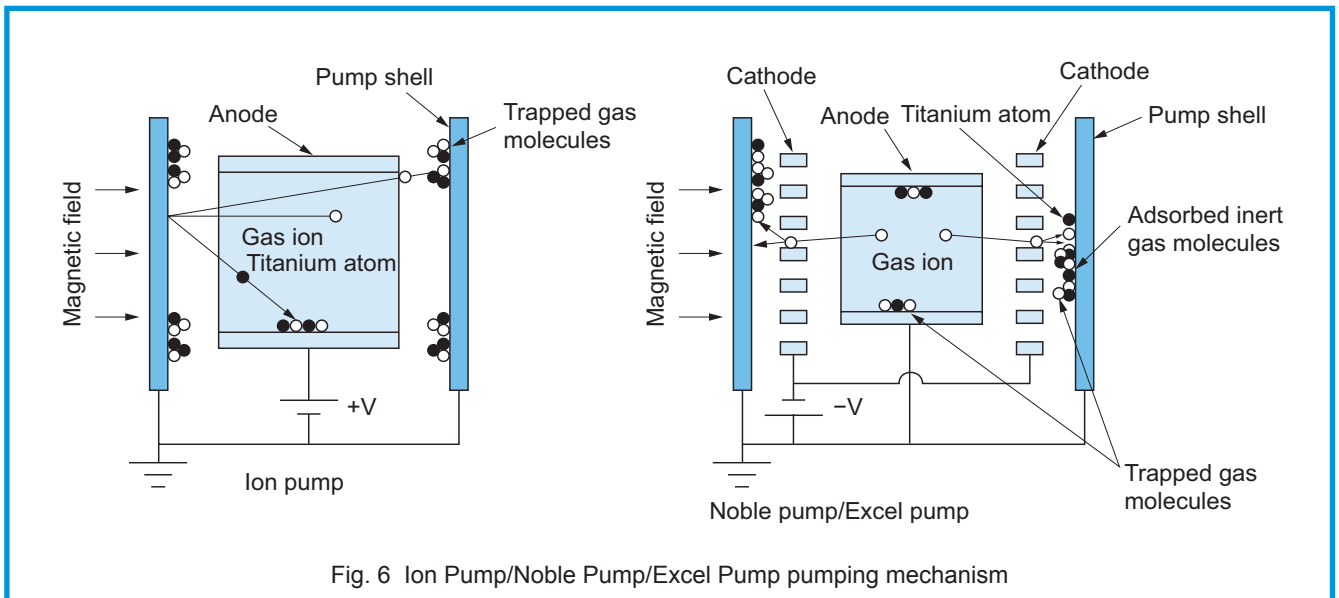


Fig. 6 Ion Pump/Noble Pump/Excel Pump pumping mechanism

## ■ Applications

- Completely oil free ultra-high vacuum and extreme vacuum pumping systems
- Ultra-high vacuum and extreme high vacuum experimental equipment
- Pumping systems such as electron microscopes, surface and other analyzers
- Pumping systems such as particle accelerators, nuclear fusion experimental devices, and space environmental testing equipment
- Vacuum retention pump for electron tubes, etc.
- Heating pumping equipment such as electron tubes

etc.

## ■ 20L/s Ion Pump/Noble Pump

### ● Specifications

Pump	Name	20L/s Ion Pump	20L/s Noble Pump
	Type	912-7125	912-7120
	Pumping speed (N <sub>2</sub> gas)	20L/s	
	Operating range <sup>(Note 1)</sup>	10 <sup>-1</sup> to 10 <sup>-9</sup> Pa	1 to 10 <sup>-9</sup> Pa
	Ready to start pressure <sup>(Note 1)</sup>	2x10 <sup>-2</sup> Pa or less	
	Capacity	1.4L	
	Maximum heating temperature	250°C	
	Inlet	φ70ICF	
	Current input terminal	Non-replaceable	
	Element (replaceable)	Non-replaceable	
	Magnet	912-7121 (x1) included	
Weight	10.5kg		

Note 1: Note that the value in the table will change depending on the controller used.

### ● Standard configuration

Pump	Name and Type	20L/s Ion Pump	20L/s Noble Pump
	Components	912-7125	912-7120
Pump body		x1	
Attachment gasket for φ70ICF		x2	

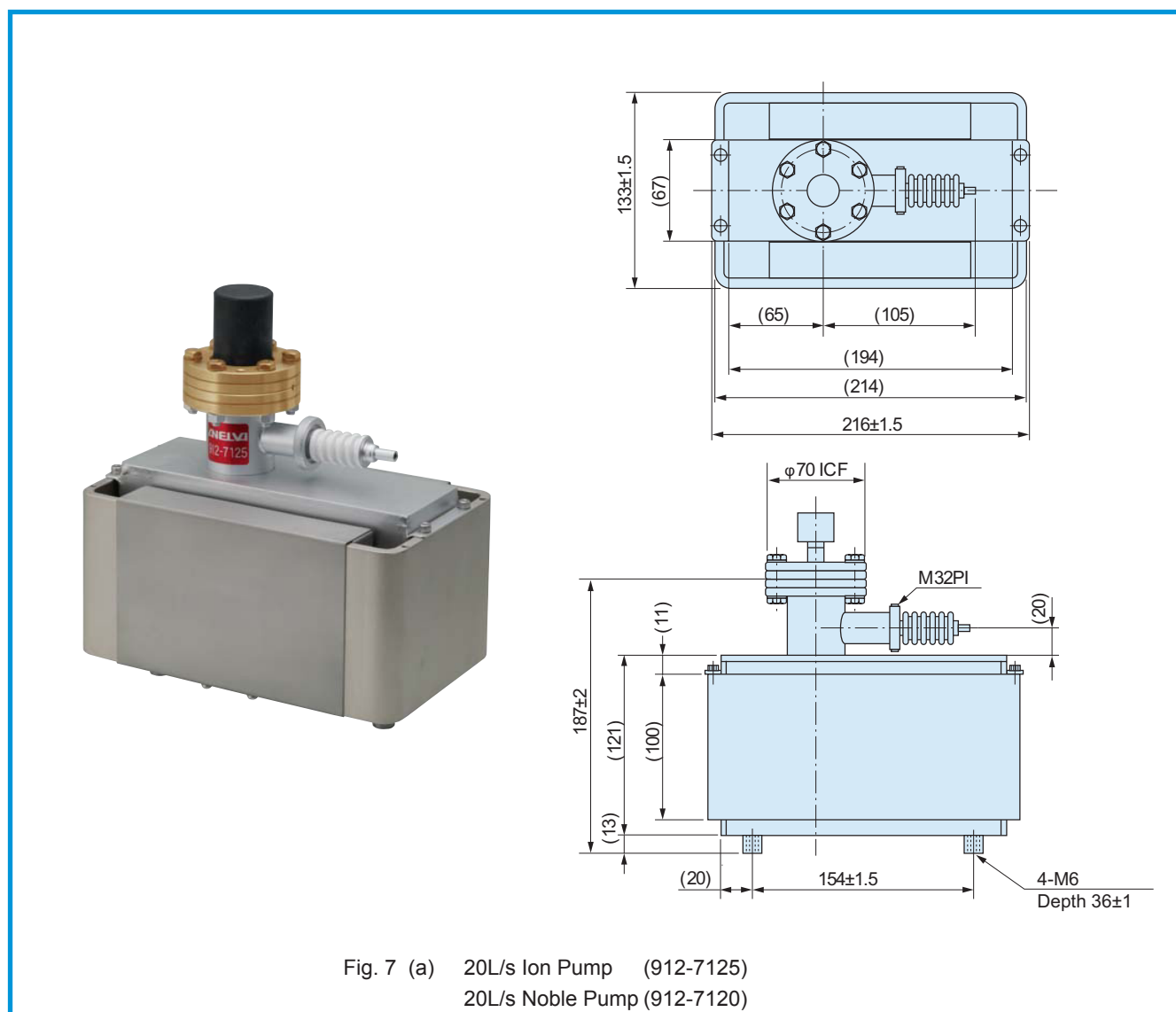


Fig. 7 (a) 20L/s Ion Pump (912-7125)  
20L/s Noble Pump (912-7120)

## ■ 30L/s Ion Pump/Noble Pump

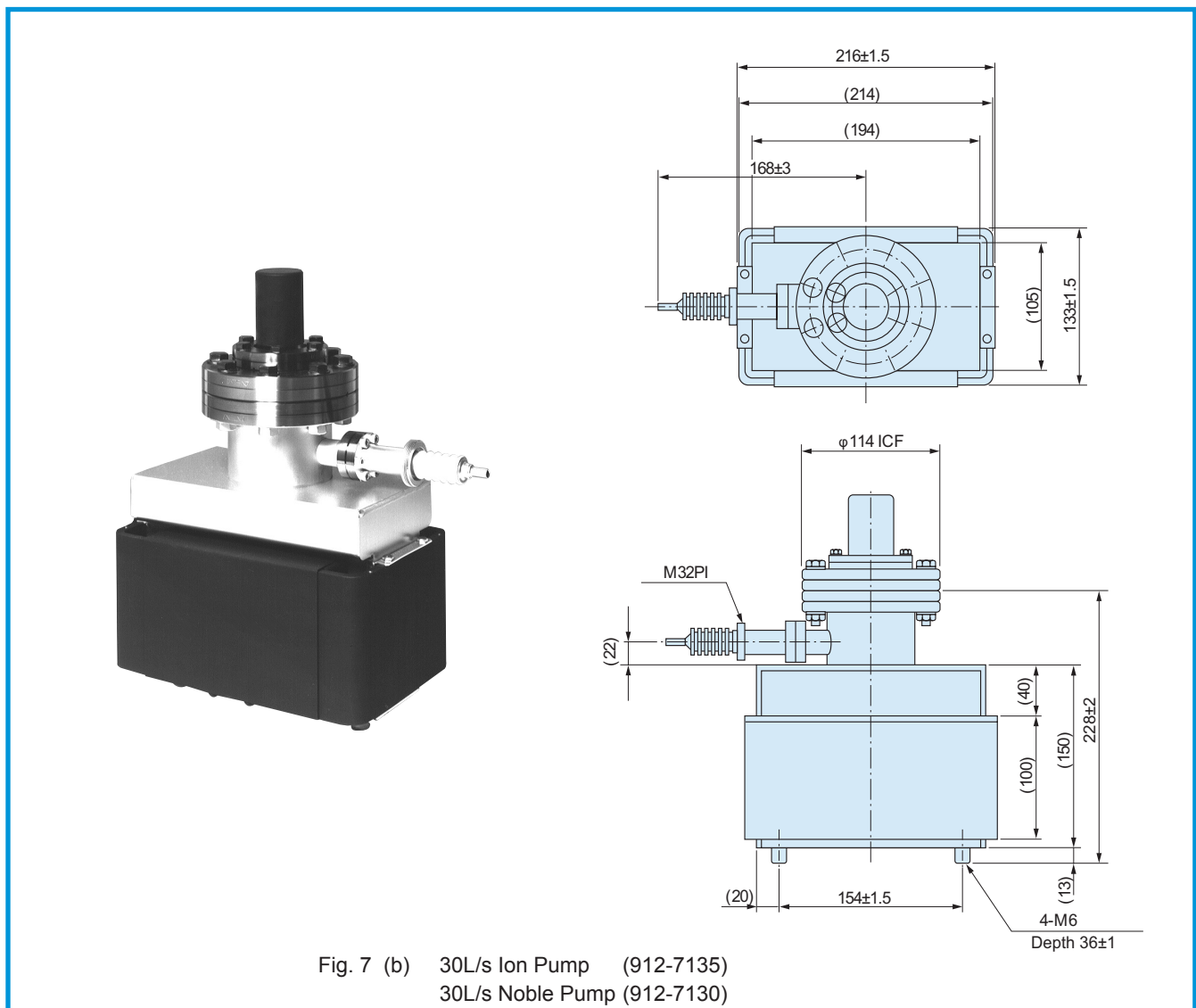
### ● Specifications

Pump	Name	30L/s Ion Pump	30L/s Noble Pump
	Type	912-7135	912-7130
	Pumping speed (N <sub>2</sub> gas)	30L/s	
	Operating range <sup>(Note 1)</sup>	10 <sup>-1</sup> to 10 <sup>-9</sup> Pa	1 to 10 <sup>-9</sup> Pa
	Ready to start pressure <sup>(Note 1)</sup>	2x10 <sup>-2</sup> Pa or less	
	Capacity	2.2L	
	Maximum heating temperature	250°C	
	Inlet	φ114ICF	
	Current input terminal	954-7281	
	Element (replaceable)	Non-replaceable	
	Magnet	912-7121 (x1) included	
	Weight	12.5kg	

Note 1: Note that the value in the table will change depending on the controller used.

### ● Standard configuration

Pump	Name and Type		30L/s Ion Pump	30L/s Noble Pump
			912-7135	912-7130
	Components			
	Pump body			x1
	Attachment gasket for φ114ICF			x2



## ■ 60L/s Ion Pump/Noble Pump

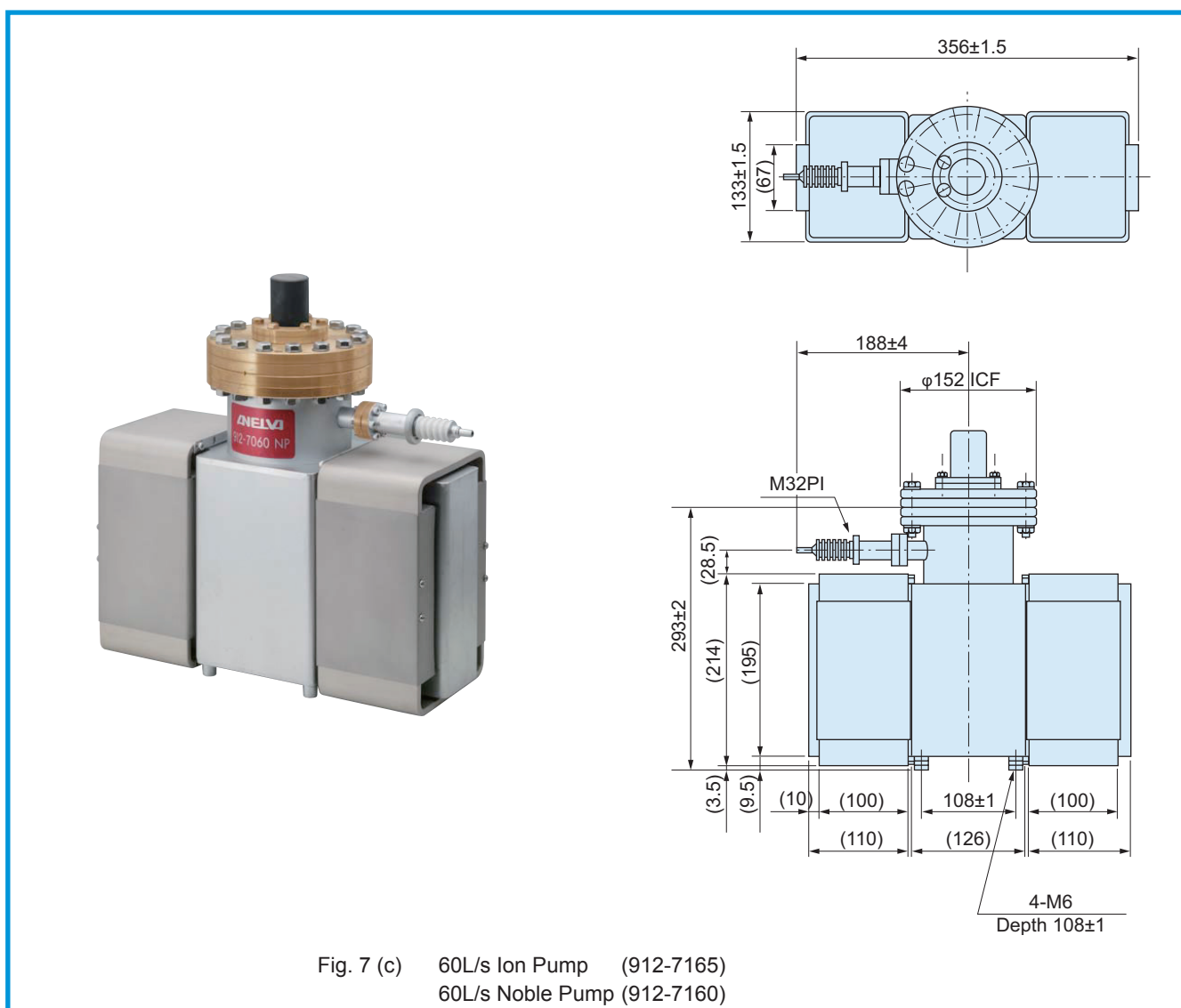
### ● Specifications

Pump	Name	60L/s Ion Pump	60L/s Noble Pump
	Type	912-7165	912-7160
	Pumping speed (N <sub>2</sub> gas)	60L/s	
	Operating range <sup>(Note 1)</sup>	10 <sup>-1</sup> to 10 <sup>-9</sup> Pa	1 to 10 <sup>-9</sup> Pa
	Ready to start pressure <sup>(Note 1)</sup>	2x10 <sup>-2</sup> Pa or less	
	Capacity	6.2L	
	Maximum heating temperature	250°C	
	Inlet	φ152ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-7027 (1 set)	915-9527 (1 set)
	Magnet	912-7121 (x2) included	
	Weight	25.6kg	

Note 1: Note that the value in the table will change depending on the controller used.

### ● Standard configuration

Pump	Name and Type	60L/s Ion Pump	60L/s Noble Pump
	Components		912-7165
Pump body			x1
Attachment gasket for φ152ICF			x2





## ■ 110L/s Noble Pump•140L/s Ion Pump

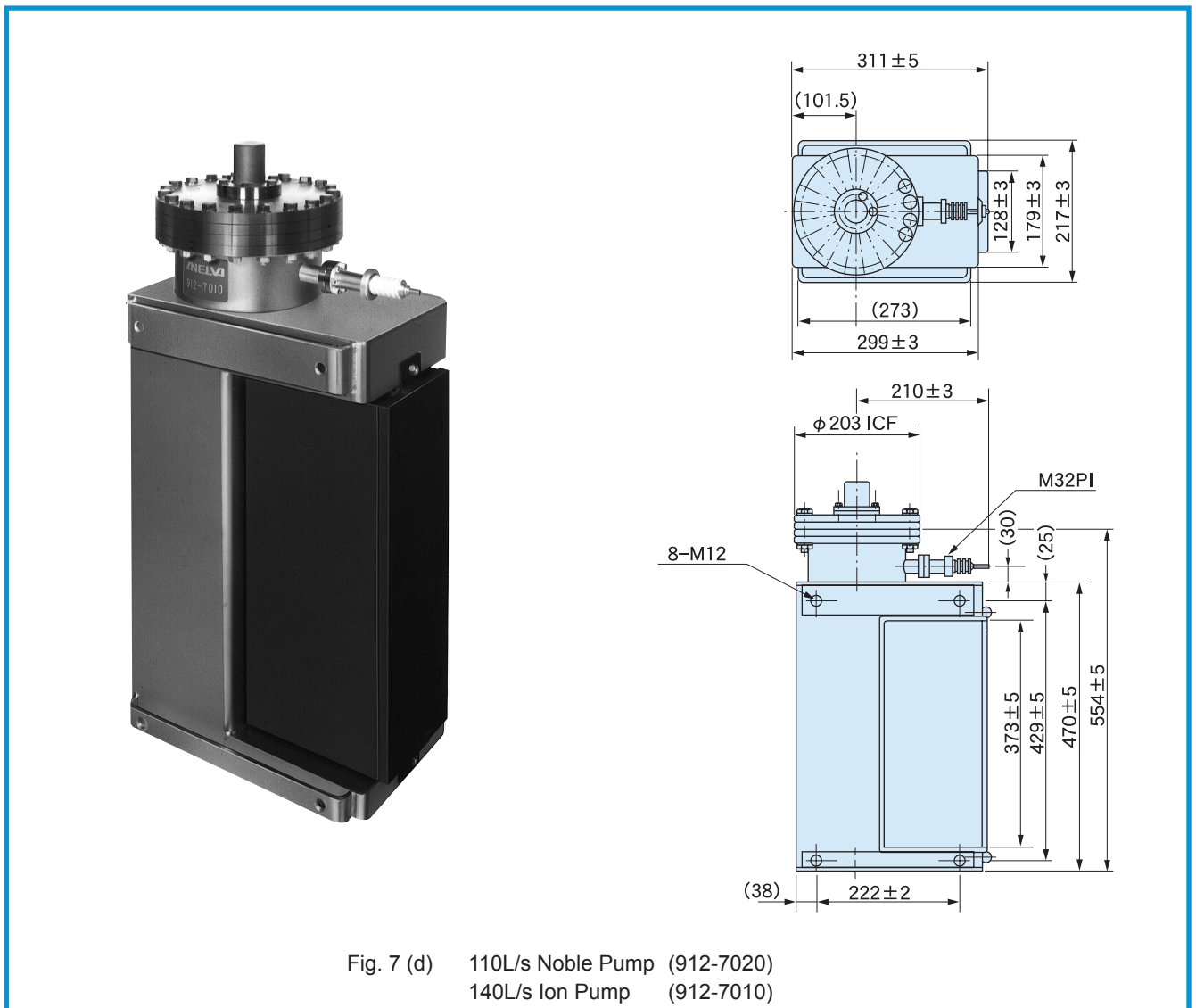
### ● Specifications

Pump	Name	110L/s Noble Pump	140L/s Ion Pump
	Type	912-7020	912-7010
	Pumping speed (N <sub>2</sub> gas)	110L/s	140L/s
	Operating range <sup>(Note 1)</sup>	1 to 10 <sup>-9</sup> Pa	10 <sup>-1</sup> to 10 <sup>-9</sup> Pa
	Ready to start pressure <sup>(Note 1)</sup>	1x10 <sup>-2</sup> Pa or less	
	Capacity	18L	
	Maximum heating temperature	250°C	
	Inlet	φ203ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-9520 (x1)	915-9510 (x1)
	Magnet	912-7001 (x1) included	
	Weight	48kg	

Note 1: Note that the value in the table will change depending on the controller used.

### ● Standard configuration

Pump	Name and Type	110L/s Noble Pump	140L/s Ion Pump
	Components	912-7020	912-7010
	Pump body	x1	
Attachment gasket for φ203ICF	x2		



## ■ 220L/s Noble Pump

### ● Specifications

Pump	Name	220L/s Noble Pump	
	Type	912-7040	912-7041
	Pumping speed (N <sub>2</sub> gas)	220L/s	
	Operating range <sup>(Note 1)</sup>	5x10 <sup>-1</sup> to 10 <sup>-9</sup> Pa	
	Ready to start pressure <sup>(Note 1)</sup>	6x10 <sup>-3</sup> Pa or less	
	Capacity	26L	28L
	Maximum heating temperature	250°C	
	Inlet	φ203ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-9510 (x2)	
	Magnet	912-7002 (x1) included	912-7001 (x2) included
	Weight	85kg	90kg

Note 1: Note that the value in the table will change depending on the controller used.

### ● Standard configuration

Pump	Name and Type	220L/s Noble Pump	220L/s Noble Pump
		912-7040	912-7041
Components			
Pump body		x1	
Attachment gasket for φ203ICF		x2	

## ■ 270L/s Ion Pump

### ● Specifications

Pump	Name	270L/s Ion Pump	
	Type	912-7030	912-7031
	Pumping speed (N <sub>2</sub> gas)	270L/s	
	Operating range <sup>(Note 1)</sup>	5x10 <sup>-2</sup> to 10 <sup>-9</sup> Pa	
	Ready to start pressure <sup>(Note 1)</sup>	6x10 <sup>-3</sup> Pa or less	
	Capacity	26L	28L
	Maximum heating temperature	250°C	
	Inlet	φ203ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-9510 (x2)	
	Magnet	912-7002 (x1) included	912-7001 (x2) included
	Weight	85kg	90kg

Note 1: Note that the value in the table will change depending on the controller used.

### ● Standard configuration

Pump	Name and Type	270L/s Ion Pump	270L/s Ion Pump
		912-7030	912-7031
Components			
Pump body		x1	
Attachment gasket for φ203ICF		x2	

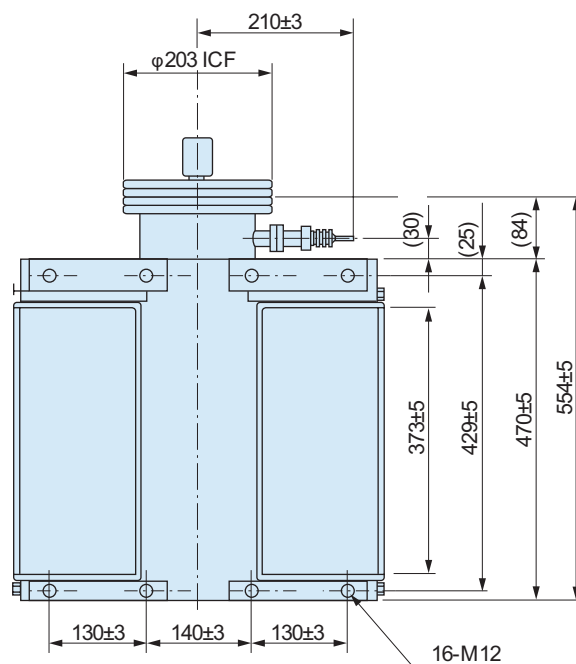
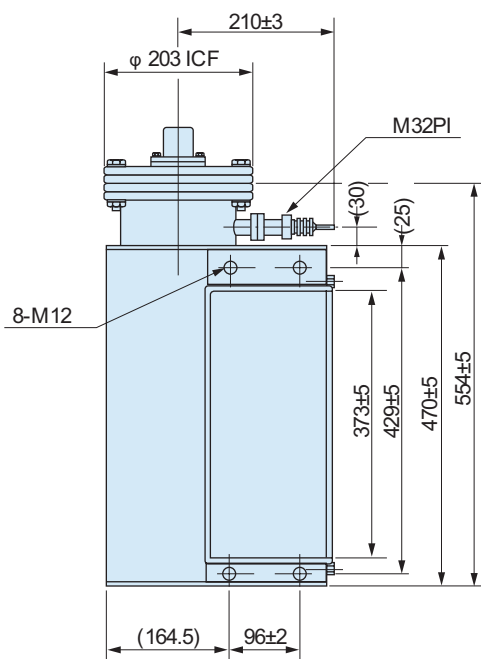
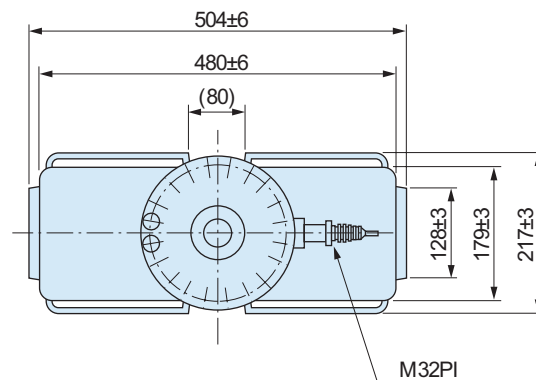
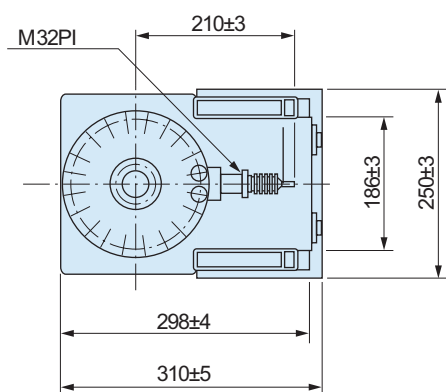


Fig. 7 (e) 220L/s Noble Pump (912-7040)  
270L/s Ion Pump (912-7030)

Fig. 7 (f) 220L/s Noble Pump (912-7041)  
270L/s Ion Pump (912-7031)

## ■ 400L/s Noble Pump•500L/s Ion Pump

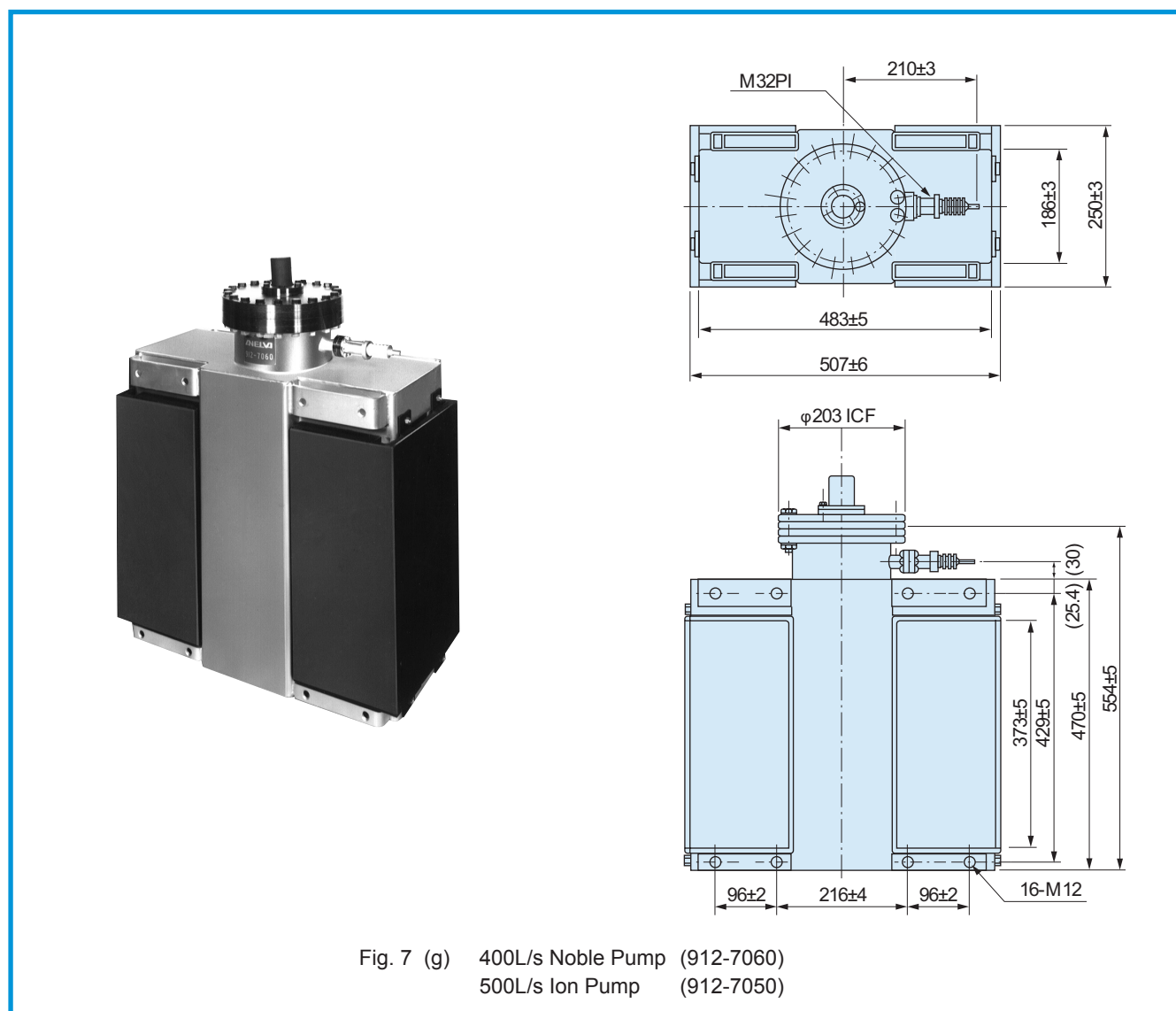
### ● Specifications

Pump	Name	400L/s Noble Pump	500L/s Ion Pump
	Type	912-7060	912-7050
	Pumping speed (N <sub>2</sub> gas)	400L/s	500L/s
	Operating range <sup>(Note 1)</sup>	1 to 10 <sup>-9</sup> Pa	10 <sup>-1</sup> to 10 <sup>-9</sup> Pa
	Ready to start pressure <sup>(Note 1)</sup>	3x10 <sup>-3</sup> Pa or less	
	Capacity	38L	
	Maximum heating temperature	250°C	
	Inlet	φ203ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-9520 (x4)	915-9510 (x4)
	Magnet	912-7002 (x2) included	
	Weight	120kg	

Note 1: Note that the value in the table will change depending on the controller used.

### ● Standard configuration

Pump	Name and Type	400L/s Noble Pump	500L/s Ion Pump
	Components		912-7060
Pump body			x1
Attachment gasket for φ203ICF			x2



## ■ 800L/s Noble Pump•1000L/s Ion Pump

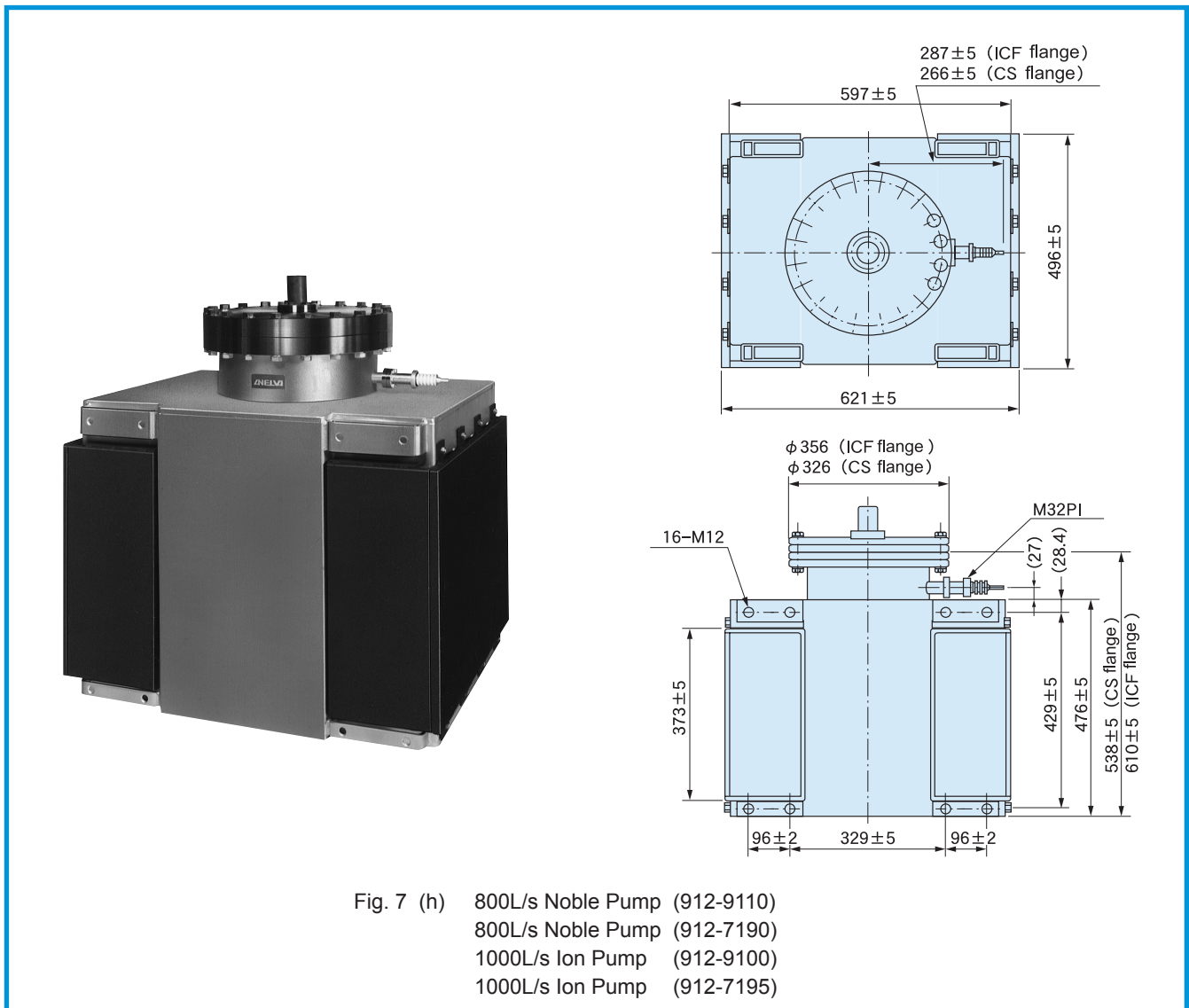
### ● Specifications

Pump	Name	800L/s Noble Pump		1000L/s Ion Pump	
	Type	912-9110	912-7190	912-9100	912-7195
	Pumping speed (N <sub>2</sub> gas)	800L/s		1000L/s	
	Operating range <sup>(Note 1)</sup>	10 <sup>-2</sup> to 10 <sup>-9</sup> Pa		10 <sup>-3</sup> to 10 <sup>-9</sup> Pa	
	Ready to start pressure <sup>(Note 1)</sup>	2x10 <sup>-3</sup> Pa or less			
	Capacity	106L			
	Maximum heating temperature	250°C			
	Inlet	φ326CS flange	φ356ICF	φ326CS flange	φ356ICF
	Current input terminal	954-7281			
	Element (replaceable)	912-9520 (x8)		915-9510 (x8)	
	Magnet	912-7003 (x2) included			
	Weight	257kg			

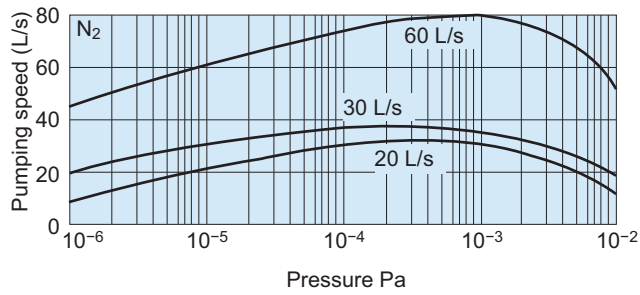
Note 1: Note that the value in the table will change depending on the controller used.

### ● Standard configuration

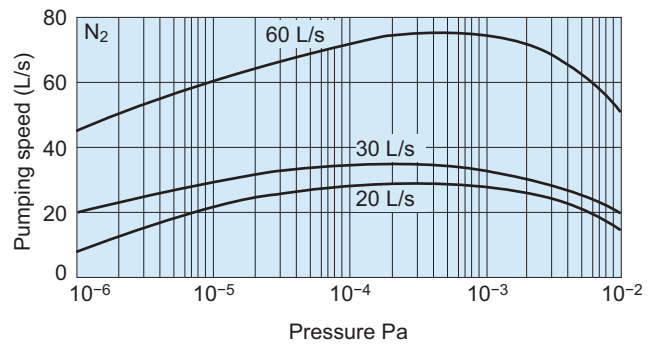
Pump	Name and Type	800L/s Noble Pump 912-9110	800L/s Noble Pump 912-7190	1000L/s Ion Pump 912-9100	1000L/s Ion Pump 912-7195
	Components		912-9110	912-7190	912-9100
Pump body		x1			
Attachment gasket		x3 (gasket for φ326CS flange)	x3 (gasket for φ356ICF)	x3 (gasket for φ326CS flange)	x3 (gasket for φ356ICF)



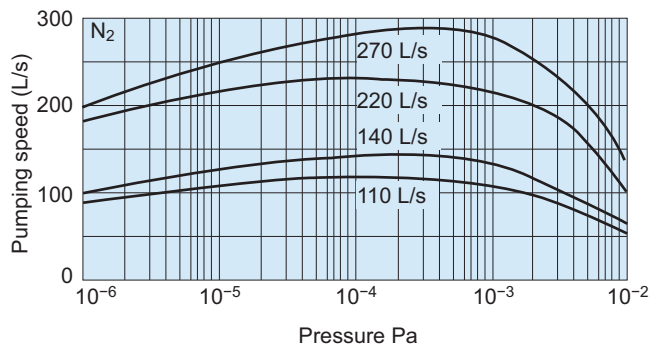
■ Pumping speed - pressure characteristics (Fig. 8)



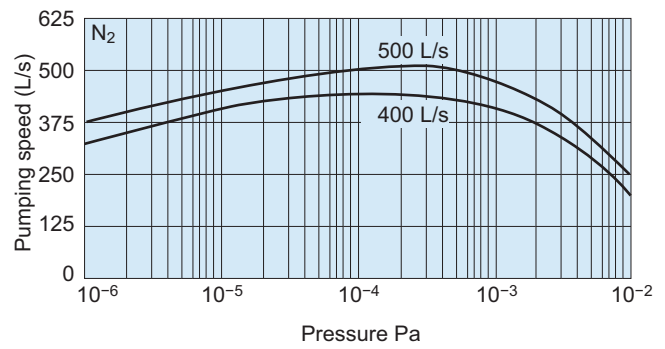
20L/s•30L/s•60L/s Ion Pump



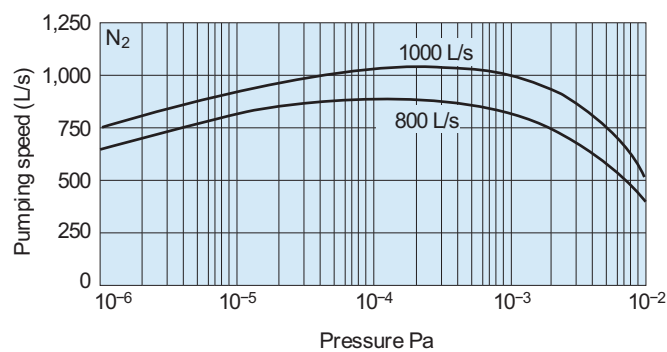
20L/s•30L/s•60L/s Noble Pump



110L/s Noble Pump•140L/s Ion Pump  
220L/s Noble Pump•270L/s Ion Pump



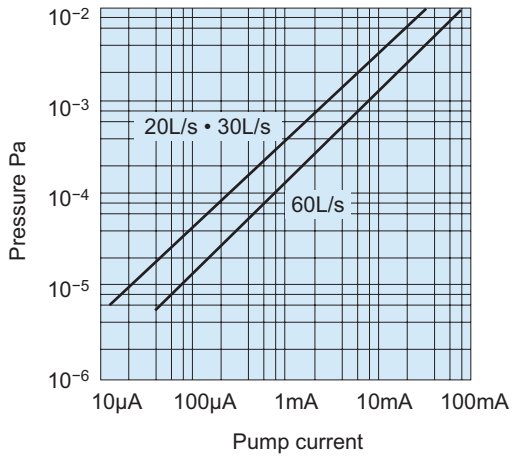
400L/s Noble Pump•500L/s Ion Pump



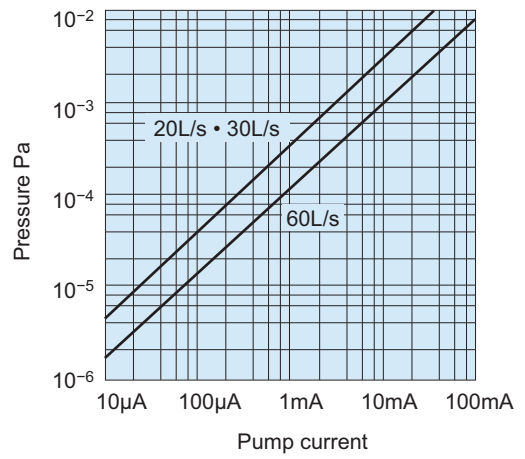
800L/s Noble Pump•1000L/s Ion Pump

Pumps

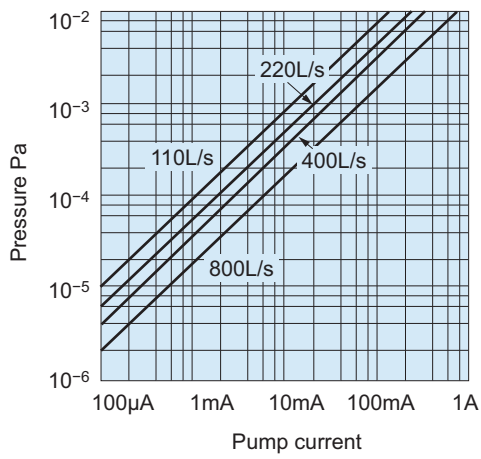
■ Pressure - pump current characteristics (Fig. 9)



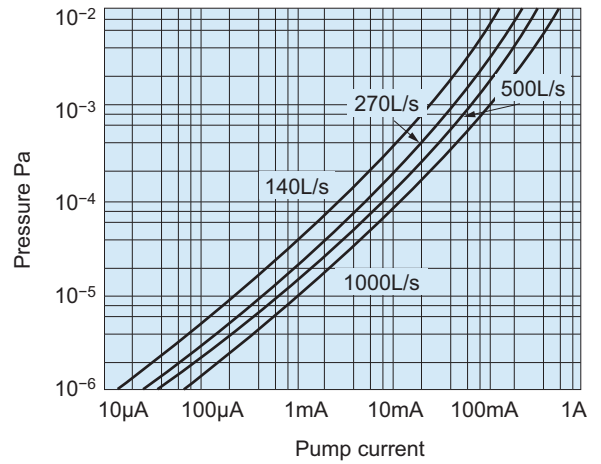
20L/s•30L/s•60L/s Ion Pump



20L/s•30L/s•60L/s Noble Pump

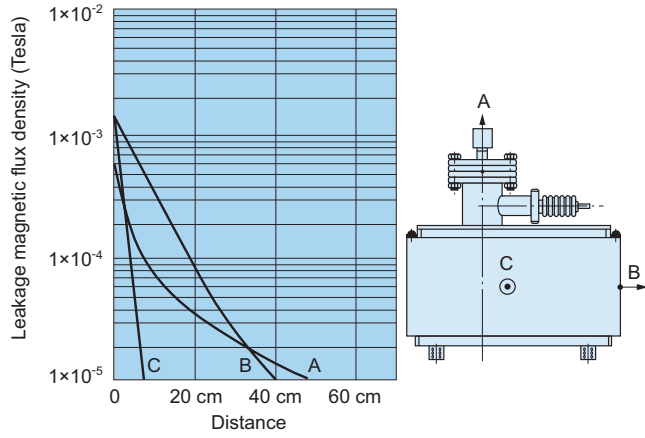


110L/s•220L/s•400L/s•800L/s Noble Pump

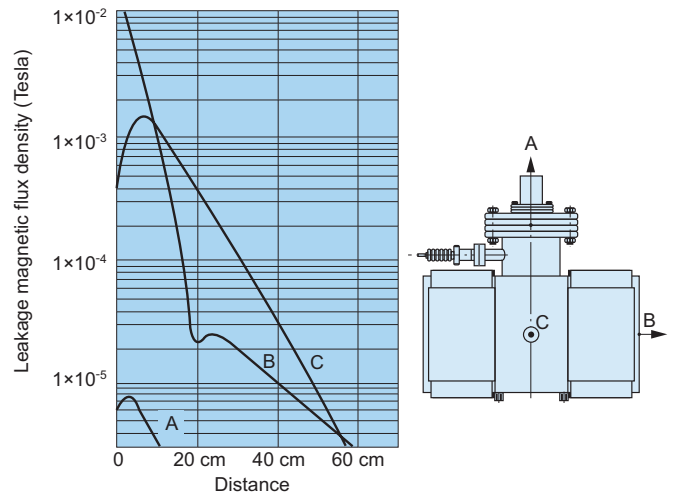


140L/s•270L/s•500L/s•1000L/s Ion Pump

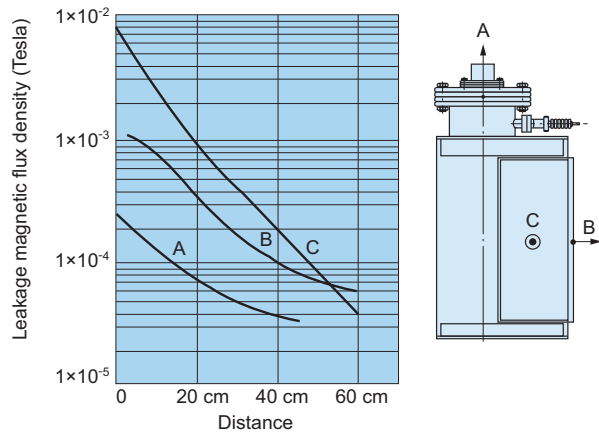
■ Leakage magnetic flux characteristics (Fig. 10)



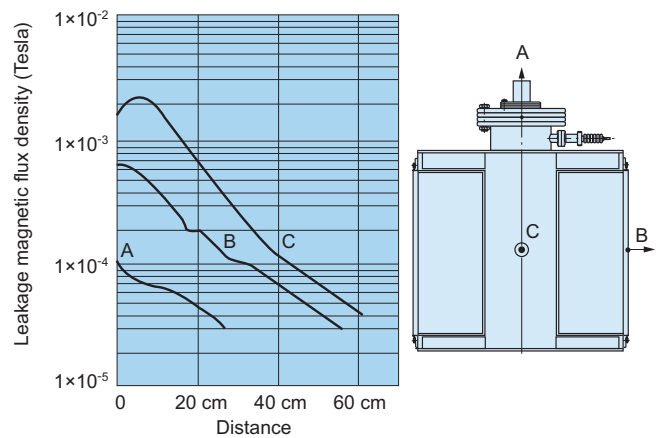
20L/s Noble Pump  
20L/s Ion Pump



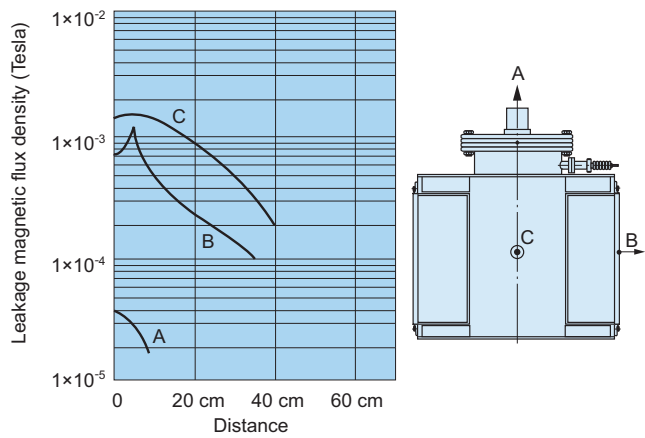
60L/s Noble Pump  
60L/s Ion Pump



110L/s Noble Pump  
140L/s Ion Pump



400L/s Noble Pump  
500L/s Ion Pump



800L/s Noble Pump  
1000L/s Ion Pump



## ■ Options

### ● Output cable assembly

The following options are available as an output cable assembly in addition to the standard 3m. Please specify when ordering controllers. Refer to the following notes when ordering. B type output plug is included.

Length	Type	Applicable pump	Applicable controller
3m	954-7403	20L/s to 1,000L/s Ion Pump and Noble Pump 125L/s Excel Pump	P-500 series Ion Pump controller Noble Pump controller
5m	954-7405		
7m	954-7407		
9m	954-7409		



954-7403, 7405, 7407, 7409 output cable assembly

● Maintenance/consumable parts

**Replacement element**

For ion and noble pumps of 60L/s or more, the element must be replaced at the end of its product life. Refer to the ordering information for the element type and quantity.

Depending on the degree of contamination of the pump, simply replacing the element may not be enough to sufficiently restore the characteristics. In this case, the container must be cleaned and heat pumped. Please contact us for details. (Refer to the section on application.) For pumps of 30L/s or less, the entire pump unit excluding the magnet must be replaced because it cannot be renewed.

■ Application

When using an ion pump to create an ultra-high vacuum, the selection of the components of the vacuum system and internal processing of the vacuum chamber are also very important in addition to the ion

pump selection. If the appropriate components and pump are not selected carefully, the intended performance of the ion pump may not be able to be achieved. Please contact us when designing the vacuum system. Generally, the following pumping system configurations are recommended

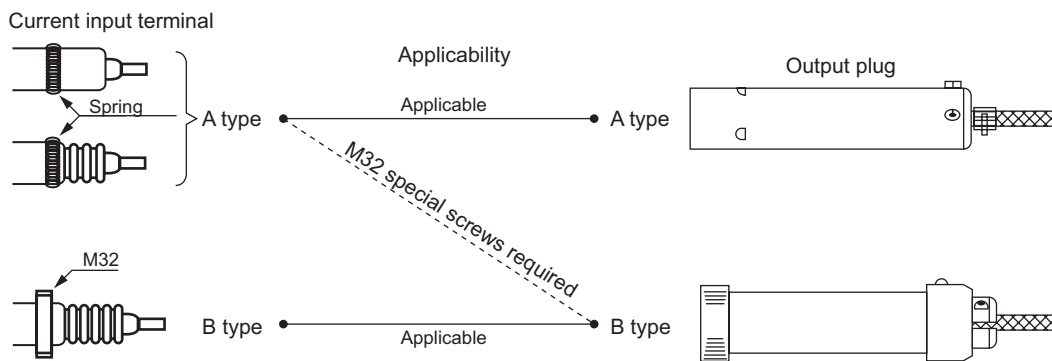
**Current input terminal**

The current input terminal can be replaced for 30L/s or more pumps. Refer to the section on current input terminal.

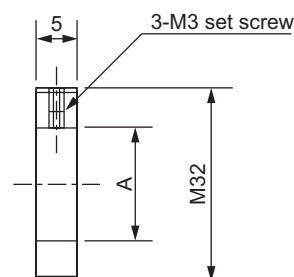
**Precautions before ordering**

If you already have a controller and are only ordering a pump or you already have a pump and are only ordering a controller, check the compatibility of the pump side current input terminal with the controller

side output plug. When newly purchasing, the controller comes with B type output plug and the pump comes with B type current input terminal.



- The B type current input terminal does not match the A type output plug. If you have an old controller with A type output plug and are ordering a pump with B type current input terminal, be sure to also order an output cable assembly with B type output plug.
- The A type current input terminal can be made compatible with the B type output plug by using an M32 special screw. If you have a pump with A type current input terminal and are ordering a controller with B type output plug, be sure to also order an M32 special screw. (Please specify according to the pump type.)



**M32 special screw**

Type	Name	Applicable	Dimension A
915-7020	M32 special screw (1)	110L/s, 140L/s, 220L/s, 270L/s, 400L/s, 500L/s, 800L/s, 1000L/s pump	φ20.2
915-7019	M32 special screw (2)	1L/s, 8L/s, 20L/s, 60L/s, pump	φ19.3

• Usage example

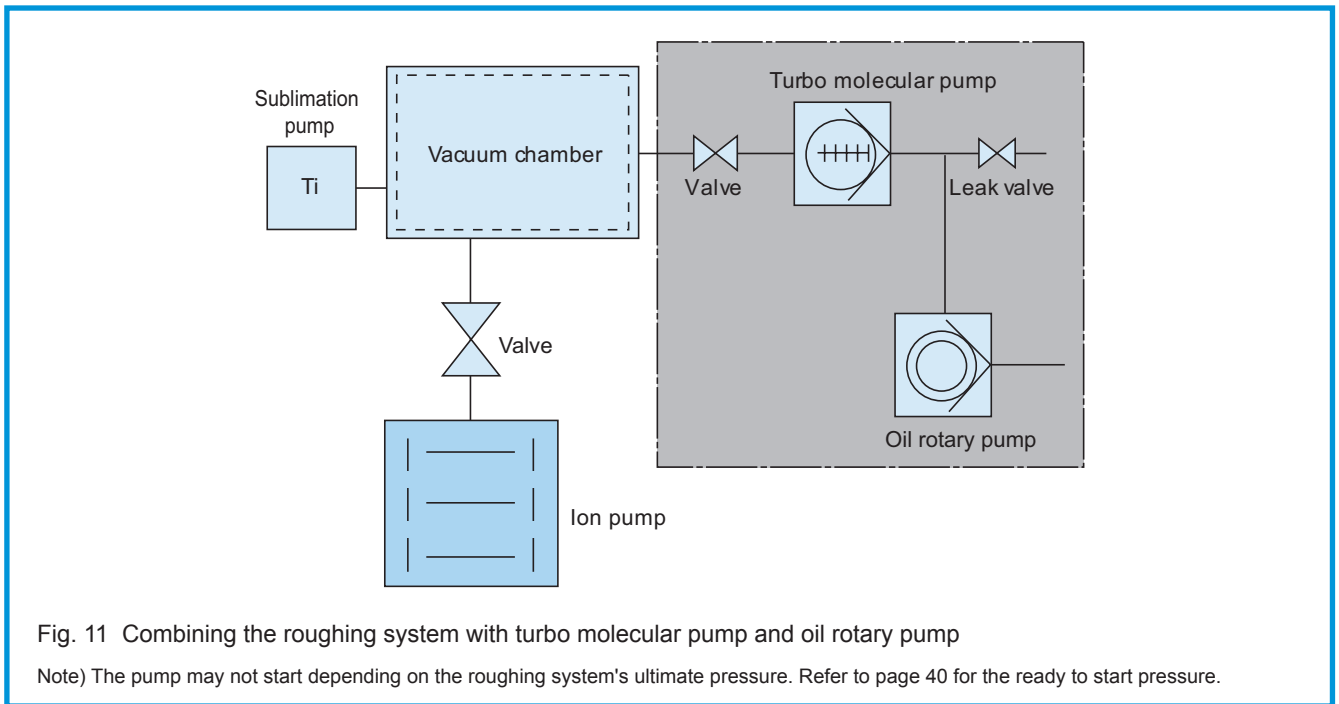


Fig. 11 Combining the roughing system with turbo molecular pump and oil rotary pump

Note) The pump may not start depending on the roughing system's ultimate pressure. Refer to page 40 for the ready to start pressure.

• To activate the ion/noble pump

Roughing must be performed with other pumps at atmosphere to 6.7Pa or at  $1.1 \times 10^{-4}$ Pa or less depending on the pump and the controller. The following system is recommended as the roughing pump.

• System combining the turbo molecular pump and oil rotary pump (Fig. 11)

Currently, this is the most common method. Any ion pump/noble pump and controller can be used because the ultimate pressure of the roughing system is favorable. This is well suited for roughing of large capacity systems or ultra-high vacuum systems when low ultimate pressure is necessary because oil free roughing is possible.

• When there is a large amount of gas emission

Use in combination with our titanium sublimation pump (956-7015) is recommended. Even when there is a large amount of gas emission, quick and safe pumping is possible and ultra-high vacuum can be obtained quicker than with an ion pump alone. It is also oil-free.

• To obtain ultra-high vacuum

Use in combination with our titanium sublimation pump (956-7015) or use of an excel pump with the NEG module is recommended. (Refer to the excel pump application for details)

• Overhaul

The life of the ion pump and noble pump varies greatly with the condition of use. Normally, however, it is about 30,000 to 40,000 hours at  $1 \times 10^{-4}$ Pa. The life will decrease in inverse proportion to the working pressure. In general, the end of product life should be assumed when the ultimate pressure drops or when the startup time increases. The following overhaul methods are available when the end of product life is reached.

• Replace or restore the element

The most simple restoration method is sufficient to restore the characteristics if the required ultimate pressure is not so high. In addition, clean the pump container with acetone. Please contact us for details on restoring the element.

• Replace the element and current terminal, clean and heat pump the pump container.

Please specify under the name overhaul A. We will pick up the pump set and perform the above-mentioned overhaul. The pump characteristics will be restored to as good as new. Periodic inspection of the power supply is recommended as well.

[Notes on use]

If you pump special gas specified in the "Ordinance on Prevention of Hazards Due to Specified Chemical Substances", the pump may cease to operate or overhaul may not be possible. Please contact us in advance.

# Excel Pump

## Extreme high vacuum compatible ion pump

### ■ Summary

In recent years, there has been an increasing demand for compact ion pumps with high pumping performance in the extreme high vacuum (XHV) range in the state-of-the-art fields such as accelerators, quantum effect devices for semiconductors, and single atom manipulation.

The excel pump is an ion pump that can achieve XHV using a newly developed noble element with improved discharge characteristics in the low pressure range, a built-in heater (option) for efficient baking, and an integrated NEG pump module (option).



### ■ Features

#### 1. High pumping performance in the UHV and XHV range

For practical use, approximately  $10^{-10}$ Pa is realized using a newly developed pump element with improved discharge characteristics in the low pressure range and an NEG module (option).

#### 2. Compact and light weight

Compared to conventional 110L/s noble pumps, the size is reduced by 40% (125L/s excel pump).

The intake flange is also reduced to  $\phi 152$ ICF ( $\phi 4''$ ).

#### 3. Highly efficient baking

The built-in baking heater (option) and standard cover with thermal insulation function enables efficient baking with low power requirements.

#### 4. Support for clean room

Smooth surface heat-resistant paint is used for the cover and magnet.

## ■ 125L/s Excel Pump

### ● Specifications

Pump	Name	125L/s Excel Pump
	Type	912-7100
	Pumping speed (N <sub>2</sub> gas)	125L/s
	Operating range <sup>(Note 1)</sup>	10 <sup>-3</sup> to 10 <sup>-10</sup> Pa *NEG module installed
	Ready to start pressure <sup>(Note 1)</sup>	1x10 <sup>-2</sup> Pa or less
	Capacity	Approx. 10L
	Maximum heating temperature	250°C (pump shell with magnet removed may be baked up to 400°C)
	Inlet	φ152ICF
	Current input terminal	954-7281
	Element (replaceable)	915-7070 excel element (x2)
	Magnet	912-7005 (x1) included in main unit
	Weight	Approx. 48kg

Note 1: Note that the value in the table will change depending on the controller used.  
This specification shows the case using the P-521NP controller.

### ● Standard configuration

Pump	Name and Type	
	Components	912-7100 125L/s Excel Pump
Pump body	x1	
Magnet	1 set	
Cover	1 set	
Attachment gasket for φ152ICF	x2	

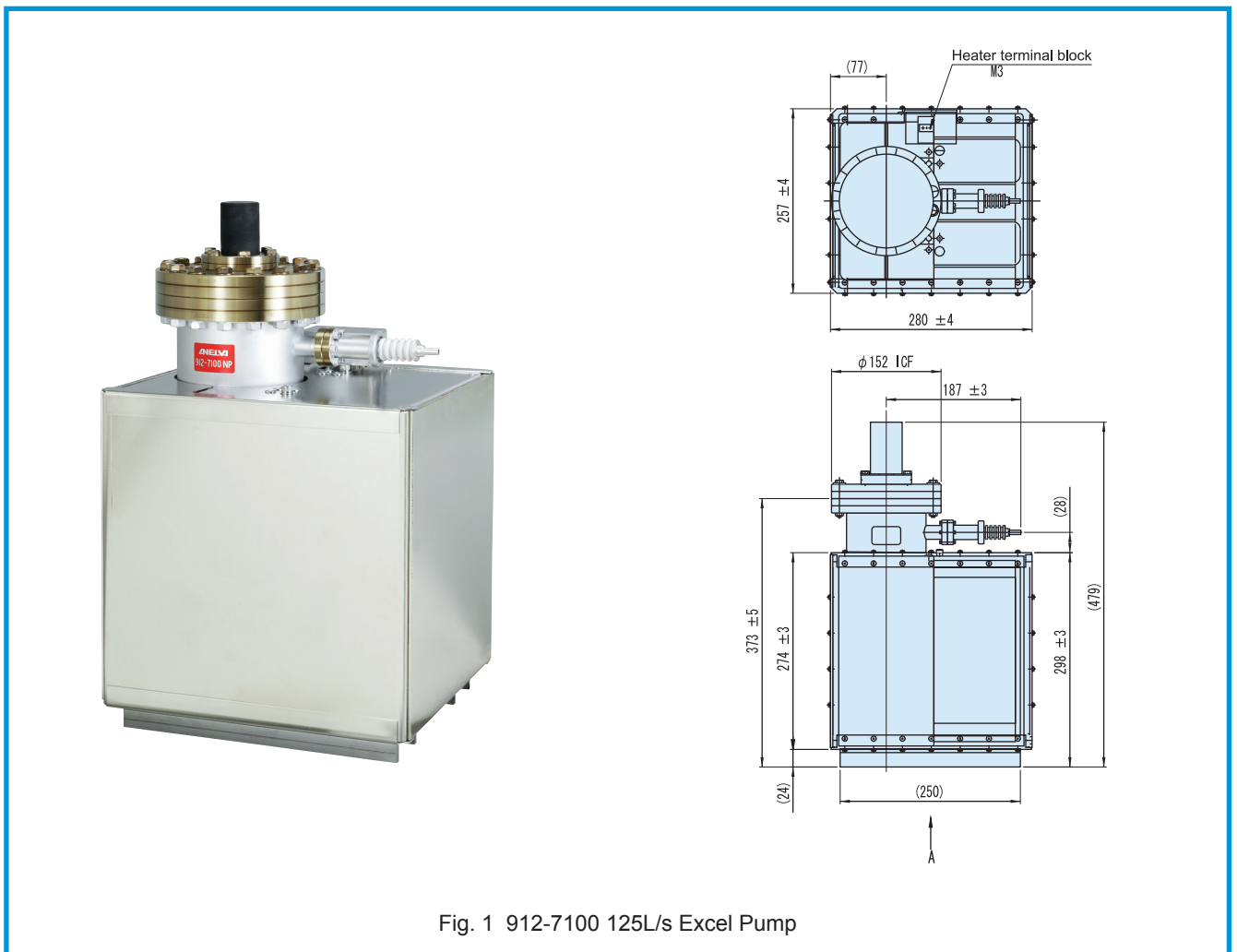
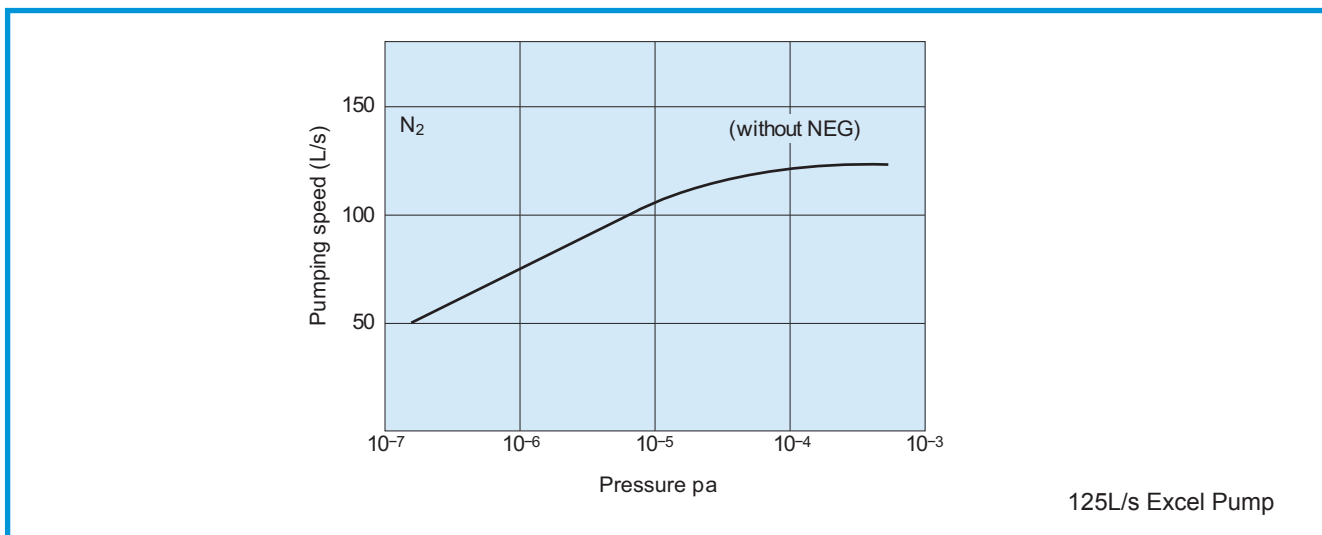
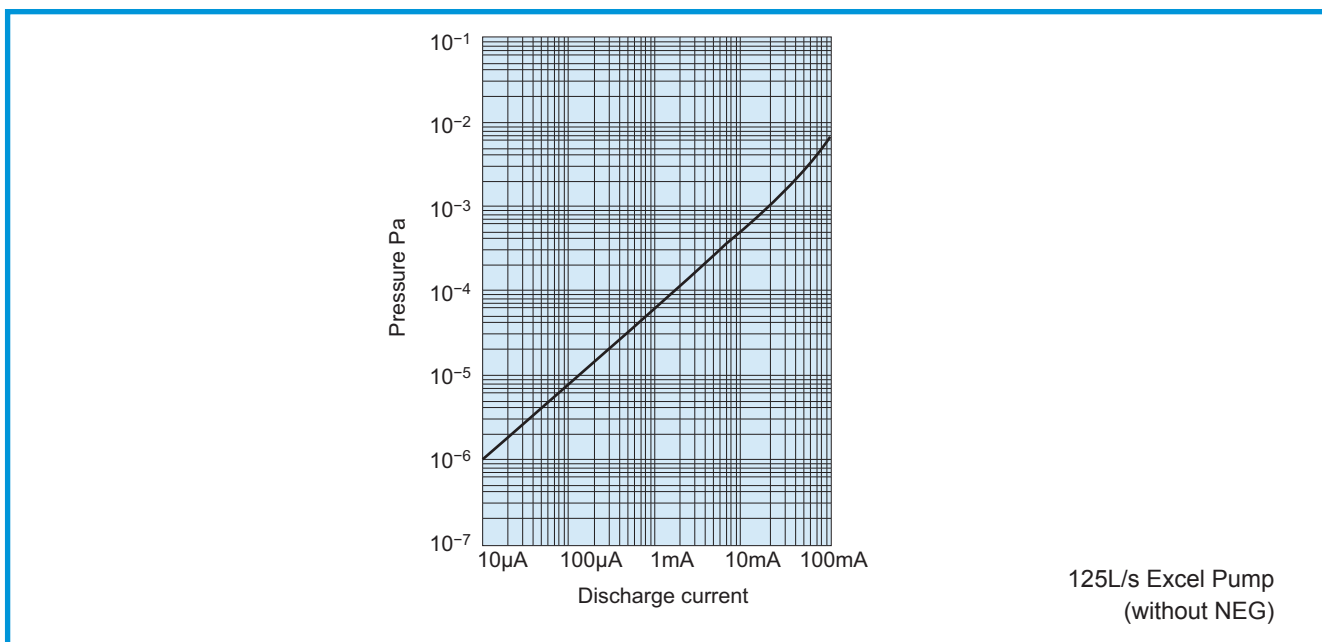


Fig. 1 912-7100 125L/s Excel Pump

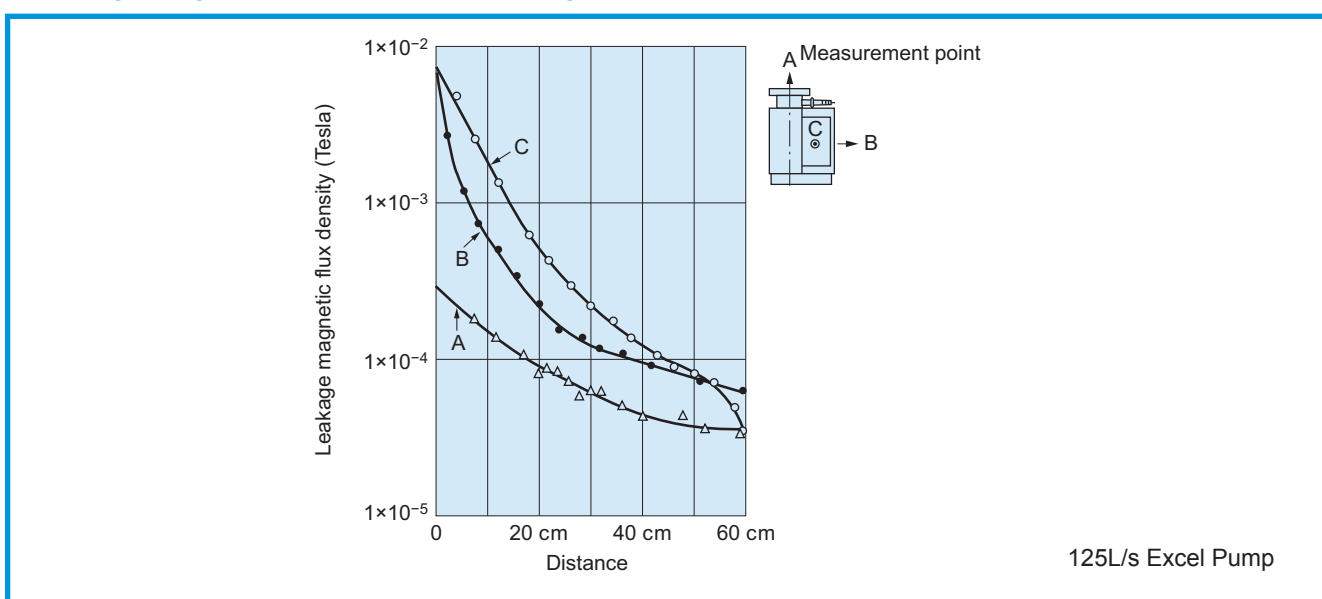
■ Pumping speed - pressure characteristics (Fig. 2)



■ Pressure - pump current characteristics (Fig. 3)



■ Leakage magnetic flux characteristics (Fig. 4)



## ■ Options

### ● Excel Pump heater kit

In order to obtain an ultra-high vacuum or extreme high vacuum with the ion pump, baking of the vacuum container as well as the pump body is essential. Since this heater kit has a structure incorporating a heater between the magnet and excel pump body, highly efficient baking is possible compared to conventional sheath heaters.

In addition, the NEG module (option) can be activated easily while baking the excel pump because it is also used as an activation heater for the NEG module (option).

### ■ NEG module

This is an optional module that is integrated with the excel pump to increase the pumping speed of active gas, especially hydrogen in the ultra-high vacuum (UHV) to extreme high vacuum (XHV) range to easily obtain XHV.

It is attached inside the excel pump container and functions as a pump through activating by baking. Indirect heating using a plate heater attached to the outside of the excel pump container enables easy activation along with baking of the excel pump.

### Features

#### • High pumping performance at UHV and XHV range

The pumping speed of hydrogen, which is the main residual component in the UHV to XHV range, is high. This increases the hydrogen pumping speed by several factors enabling XHV to be obtained easily.

#### • Small, light weight, and easy to mount

It can be easily attached inside the excel pump with a single fixing bolt.

#### • Easy reactivation

- 1) The built-in baking heater (option) and the standard cover with thermal insulation function enable efficient activation with low power consumption.
- 2) The heater capacity is optimized and only rated voltage is necessary to bake at optimum temperature without special temperature control.

### ● Specifications

Type	915-7130	
Name	Heater kit for 125L/s Excel Pump	
Power requirements	920W	
Input voltage	1φ 100V AC	
Contents	Plate heater (400W)	1 set
	Rubber heater (260W)	2 sets
	Heater mount	1 set
Temperature distribution	At approx. 4 hours after turning on heater Temperature near NEG 350°C Temperature near element 260°C Magnet surface temperature 150°C	

Note) This heater kit does not have a temperature control function. It is designed to obtain the optimum temperature distribution approximately four hours after the heater is turned on.





## • Specifications

Type	915-7090
Name	A90 NEG module
NEG material	ST707 (Italy, SAES Getters Inc.) Zr (70%) -V (24.6%) -Fe (5.6%) alloy
Pumping speed <sup>(Note 1)</sup>	H <sub>2</sub> : Approx. 300L/s N <sub>2</sub> : Approx. 45L/s
Displacement <sup>(Note 2)</sup>	H <sub>2</sub> : Approx. 240000Pa·L N <sub>2</sub> : Approx. 120Pa·L
Recommended operating pressure range	≤2×10 <sup>-6</sup> Pa * While being exposed to high pressure for a short time is inevitable during activation and while pumping, the NEG must be reactivated within a short time if it is used constantly at high pressure. (Reference) Example of reactivation interval <sup>(Note 3)</sup> Continuous use at 1.3 × 10 <sup>-6</sup> Pa: Per approx. 500h Continuous use at 1.3 × 10 <sup>-7</sup> Pa: Per approx. 5000h

Note 1 Shows the pumping speed at pump outlet at NEG room temperature immediately after activation when a 125L/s excel pump is built-in.

Note 2 Shows the pumping capacity at room temperature after a single activation. Note that this H<sub>2</sub> gas pumping capacity shows the maximum possible pumping capacity. Actually, it is determined by the H<sub>2</sub> gas partial pressure of the NEG environment.

Note 3 The activation interval assumes residual gas in a typical UHV range containing H<sub>2</sub>O, CO, CO<sub>2</sub>, etc. with hydrogen as the main component. In addition, activation is necessary after each exposure to atmosphere.

## • What is NEG

NEG pump: Non Evaporable Getter Pump

- A pump that pumps gas by surface sorption followed by internal bulk diffusion using chemically active materials. Similar to TSP, it is used for pumping active gases such as hydrogen, oxygen, nitrogen, and CO.
  - \* It cannot pump inactive gases such as helium or argon, or methane.
- Getter materials such as titanium, 84%Zr-16%AL alloy (SAES Getters Inc., St101), 70%Zr-24.6%V-5.6%Fe (SAES Getters Inc., St707) are available.

## • Precautions before ordering

When newly purchasing a pump

- Order together with the heater kit for 915-7130 excel pump.
- The heater kit is shipped attached to the excel pump.
- The NEG module is attached to the pump filled with nitrogen. Mount inside the pump when attaching the pump to the target vacuum system.

When replacing due to end of life of the NEG module

- Only the NEG module is shipped filled with nitrogen. Please mount it inside the pump at your site.

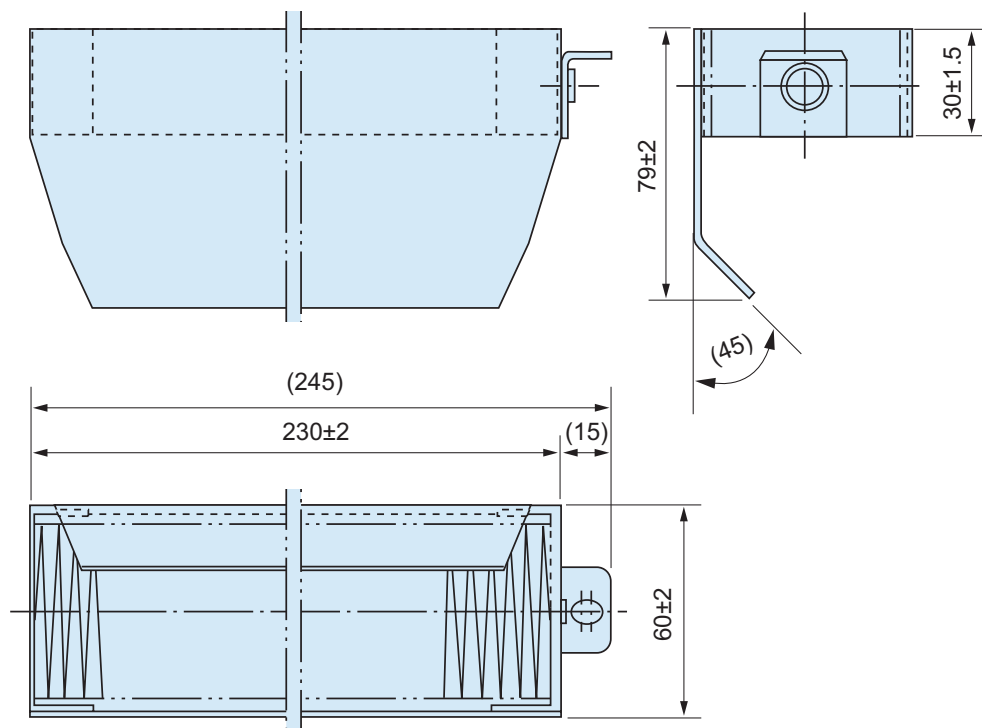


Fig. 5 NEG module



● **Maintenance/consumable parts**

• **Replacement element NEG module**

The excel pump element and NEG module can be replaced at the end of their product life. Refer to the ordering information for the type and quantity. Depending on how contaminated the pump is, simply replacing the element may not be enough to sufficiently restore its characteristics. In this case, the container must be cleaned and heat pumped. Please contact us for details.

• **Current input terminal**

The current input terminal can be replaced. Refer to the ordering information for the type.

• **Output cable assembly**

The following output cable assemblies are available. Please specify when ordering the controller. Note that the output cable assembly is the same as the P-500 series.

Length	Type
3m	954-7403
5m	954-7405
7m	954-7407
9m	954-7409

■ **Application**

● **Usage example**

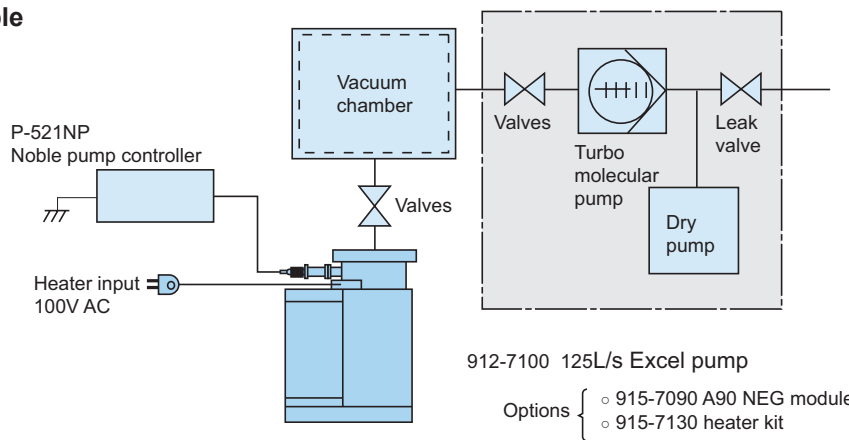


Fig. 6 Extreme high vacuum system combining excel pump with oil-free roughing system

— Pumping system and connection method —

The above pumping system is recommended as an extreme high vacuum system using the excel pump. In addition, you can use an oil rotary pump and a foreline trap combination instead of the dry pump.

— Pumping method —

- (1) Pump the vacuum chamber and excel pump to approximately  $10^{-5}$ Pa with a turbo molecular pump.
- (2) Activate the NEG module and bake the excel pump and vacuum chamber. Note that the NEG module can be activated by baking it together with the excel pump main unit using the 915-7130 heater kit (option).
- (3) After baking, start the excel pump, close the turbo molecular pump side valve and pump to extreme high vacuum range with the excel pump and the activated NEG module.

— Activation method —

- Activation is possible simply by baking together with the excel pump main unit using a dedicated heater kit (915-7130 125L/s heater kit for excel pump).

- Baking conditions (activation conditions)
  - Pump pressure during baking:  $1 \times 10^{-3}$ Pa or less
  - Baking time: 8hr or more (including warm-up time)
- Baking while pumping
 

Baking while pumping with a high vacuum pump such as TMP is ideal. If the gas load is small, however, baking while self-pumping with the excel pump is also possible. In this case, the following conditions is recommended.

  - Pump pressure during baking:  $1 \times 10^{-5}$ Pa or less

● **Life expectancy**

- Replacement of the NEG module is recommended after 30 atmospheric exposures or equivalent load.
- Performance for hydrogen drops to approximately 40% of initial pumping speed after 30 atmospheric exposures. However, if nitrogen purge is performed, the drop in performance can be reduced to approximately 90% of the initial pumping speed even after 30 exposures.

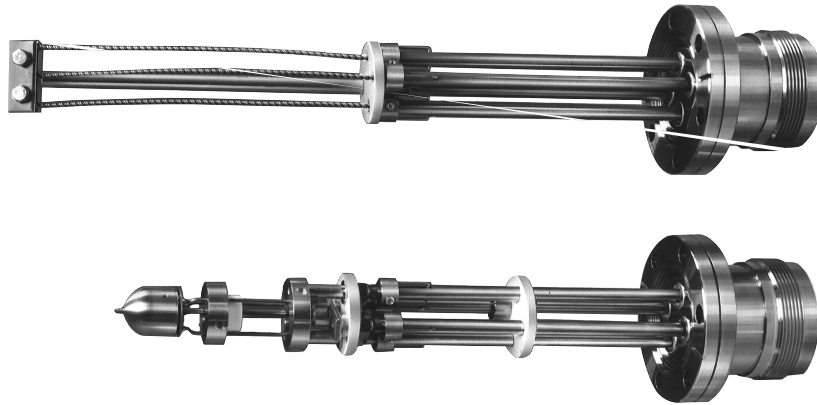
## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
2-110015	912-7125	20L/s Ion Pump	With $\phi$ 70ICF	10020
0111-19171	912-7127	20L/s Ion pump	With $\phi$ 70ICF without magnet	10021
0111-19553	912-7135	30L/s Ion Pump	With $\phi$ 114ICF	10022
0111-79286M	912-7137	30L/s Ion Pump	With $\phi$ 114ICF without magnet	10023
2-110016	912-7165	60L/s Ion Pump	With $\phi$ 152ICF	10030
0111-24443M	912-7010	140L/s Ion Pump	With $\phi$ 203ICF	10040
0111-24841	912-7030	270L/s Ion Pump	With $\phi$ 203ICF	10042
0111-19545M	912-7031	270L/s Ion Pump	With $\phi$ 203ICF, left-right symmetric	10043
1-110008	912-7050	500L/s Ion Pump	With $\phi$ 203ICF	10050
P21-04273	912-9100	1000L/s Ion Pump	With $\phi$ 326CS flange	10060
P21-03919	912-7195	1000L/s Ion Pump	With $\phi$ 356ICF	10062
2-310186	912-7120	20L/s Noble Pump	With $\phi$ 70ICF	10120
0111-17909	912-7122	20L/s Noble Pump	With $\phi$ 70ICF without magnet	10121
0111-15664	912-7130	30L/s Noble Pump	With $\phi$ 114ICF	10122
0111-55957	912-7132	30L/s Noble Pump	With $\phi$ 114ICF without magnet	10123
2-310167	912-7160	60L/s Noble Pump	With $\phi$ 152ICF	10130
1-110006	912-7020	110L/s Noble Pump	With $\phi$ 203ICF	10140
0111-24566	912-7040	220L/s Noble Pump	With $\phi$ 203ICF	10142
0111-24809	912-7041	220L/s Noble Pump	With $\phi$ 203ICF, left-right symmetric	10143
1-110007	912-7060	400L/s Noble Pump	With $\phi$ 203ICF	10150
VMT-580	912-9110	800L/s Noble Pump	With $\phi$ 326CS flange	10160
P25-03037	912-7190	800L/s Noble Pump	With $\phi$ 356ICF	10162
P25-04001	912-7100	125L/s Excel Pump	$\phi$ 152ICF, with cover, with heater kit	10651
833-4448	954-7403	Output Cable assembly(3m)	For 20L/s-1000L/s IP/NP (3m)	10548
VMT-4784	954-7405	Output Cable assembly(5m)	For 20L/s-1000L/s IP/NP (5m)	10549
0111-14422	954-7407	Output Cable assembly(7m)	For 20L/s-1000L/s IP/NP (7m)	10550
0111-14430	954-7409	Output Cable assembly(9m)	For 20L/s-1000L/s IP/NP (9m)	10551

Note) Contact us for more information about CE (RoHS).

*Memorandum*

# Titanium Sublimation Pump/Ti-Vac Pump



## ■ Summary

The titanium sublimation pump and ti-Vac pump are getter pumps that heat and sublime titanium within a vacuum to form a titanium evaporated film (getter surface) on the surrounding walls and use the getter effect of metal to absorb and discharge gas.

## ■ Features

### 1. Oil-free ultra-high vacuum

An oil-free ultra-high vacuum can be achieved when used together with an ion pump.

### 2. Economical

When used together with an ion pump, turbo molecular pump, or cryopump, the pumping rate and ultimate pressure can be improved significantly making it extremely economical compared to a single large pump.

### 3. Compact design

The compact light weight design makes it possible to install the pump anywhere.

### 4. Excellent control function

The controller uses a unique control method that prevents the filament life from being reduced due to frequent ON-OFF.

### 5. Simple attachment and removal

The controller is connected to the pump with a connector to facilitate attachment and removal.

### 6. Easy replacement

The evaporation sources (titanium filament, Ti-Vac head) can be replaced easily.

## ■ Applications

Effective in reducing the pumping time and increasing the ultimate pressure and pumping capacity of your current vacuum pump systems (ion pump, cryopump, turbo molecular pump).

Effective when there is a large amount of gas emission while processing using equipment requiring an ultra-high vacuum such as deposition, annealing, or tube pumping equipment.

## ■ Specifications

### ● Pump body

Name	Titanium Sublimation Pump	Ti-Vac Pump
Type	956-7015	956-7040
Operating pressure	3 Pa or less	
Effective amount of titanium	Approx. 1g/pump	Approx. 15g
Number of filaments	×3	-
Amount of titanium evaporation	Approx. 0.07g/h (per pump) at 45A power	Average 0.35g/h at 48A power
Used flange	φ70ICF flange	
Weight	Approx. 580g	Approx. 680g
Dimensions	See Fig. 1	See Fig. 2

### ● Controller

Name	Sublimation controller
Type	922-9119
Input	200V AC±20V 1φ 2A 50/60Hz
Output	Voltage: 2.8 to 10.8V AC (with output open) Variable with slider Current: Up to 50A Power: Up to 430W
Control method	Evaporation - preheating control with two independent timers Output voltage during evaporation: Variable with slider Output voltage during preheating: Fixed at approx. 3.8V Timer setting: Both evaporation and preheating time can be set to 0 or from 1 to 10 minutes Operation: Evaporation > preheating > OFF (not repeated)
Weight	Approx. 20.5kg
Input cable	Length outside equipment Approx. 2m
Output Cable	Length 2m
Dimensions	See figure

• Standard configuration

**Titanium sublimation pump (TSP)**

Name		Configuration
956-7015TSP cartridge (Titanium filament not attached)		x1
Attachments	956-0010 titanium filament	x12 (1 pack)
	953-5014 gasket for $\phi 70$ ICF flange	x5 (1 pack)
	10x10 combination wrench	x1
	7x8 both opening spanner	x1
	Dimension 2 hexagonal wrench	x1
	Moly paste (lubricant)	x1 (tube)
	M4x4 set screws (spare)	x4

**Controller (for both TSP and Ti-Vac pump)**

Name		Configuration
Controller body		x1
4P plug with output cable (2m)		x1
Attachments	Outlet for 200V	x1
	5A fuse	x2
	50A fuse with tab	x1

Note) Cable connector heat-resistant temperature 125°C

**Ti-Vac Pump**

Name		Configuration
956-7030 Ti-Vac holder		x1
956-7035 Ti-Vac head		x1
Attachments	Support fitting (included with ti-Vac holder)	x1
	Insulation spacer (included with ti-Vac head)	x1
	953-5014 gasket for $\phi 70$ ICF flange	x5 (1 pack)
	10x10 combination wrench	x1
	Dimension 2 hexagonal wrench	x2
	Moly paste (lubricant)	x1 (tube)
M4x4 set screws (spare)		x6



Sublimation pump controller

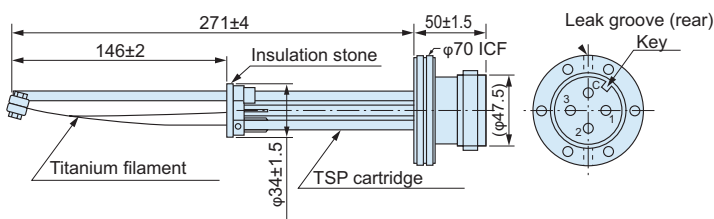


Fig. 1 Titanium sublimation pump

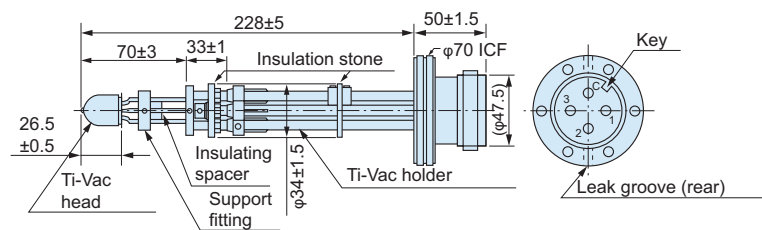
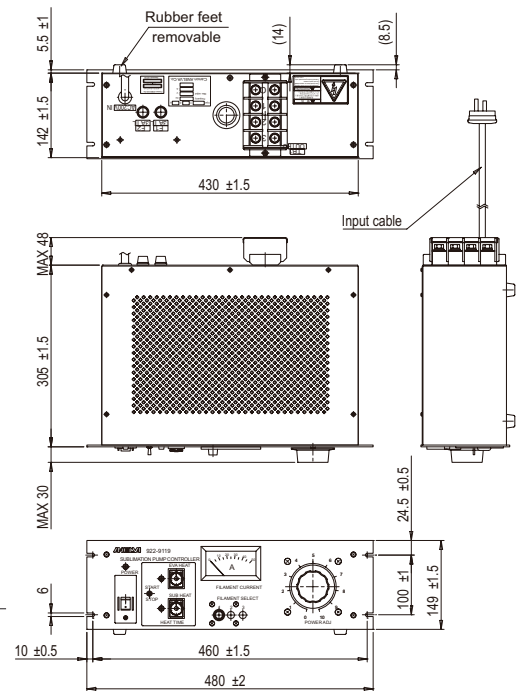


Fig. 2 Ti-Vac pump

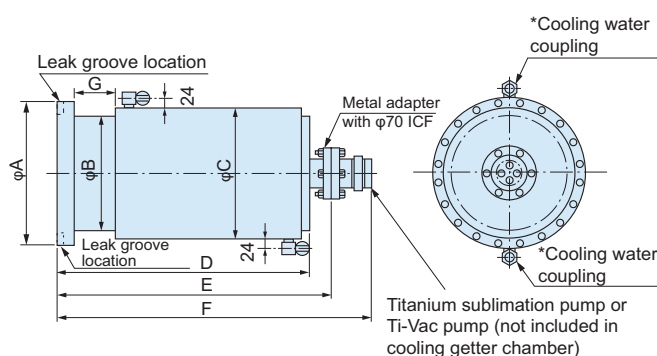


Sublimation pump controller

## Options

### Water-cooled getter chamber

Description	400L/s Getter chamber	800L/s Getter chamber	1600L/s Getter chamber
φA	φ152ICF	φ203ICF	φ253ICF
φB	φ101.6	φ160	φ203
φC	φ120	φ180	φ221
D	300	350	400
E	330	380	430
F	380	430	480
G	60	58	65
Weight	Approx. 5.5kg	Approx. 10kg	Approx. 15kg



\* This coupling is for 8mm outer diameter SUS pipe (bright annealed austenitic stainless steel) or copper pipe.

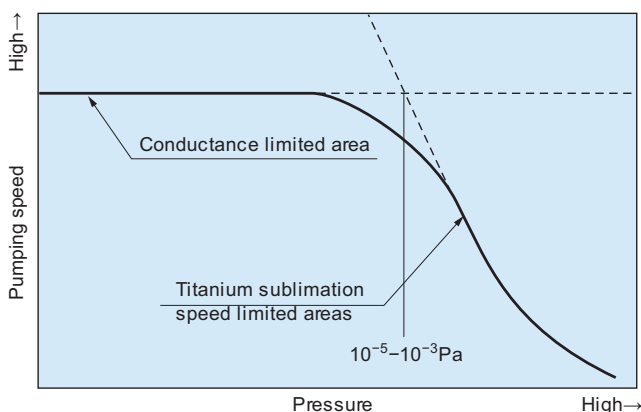
### Application

The pumping speed of the getter pump (ti-Vac pump and titanium sublimation pump) drops significantly at  $10^{-2}$ Pa pressure and above.

Normally, it should be used at a pressure not exceeding  $10^{-2}$ Pa.

When using it together with an ion pump, operating together with the ion pump at 1 to  $10^{-1}$ Pa pressure or less is effective in reducing the startup time of the ion pump.

### Pressure/pumping speed characteristics



### Pumping speed per unit area of clean getter surface

(Unit: L/sec, cm<sup>2</sup>)

Type of gas	H <sub>2</sub>	N <sub>2</sub>	O <sub>2</sub>	CO	CO <sub>2</sub>	H <sub>2</sub> O	Inert gas	Methane
Getter surface temperature								
20°C	2.6	3.5	8.8	8.3	4.7	7.3	0	0
-195°C	17.6	8.3	11.0	11.2	-	-	0	0

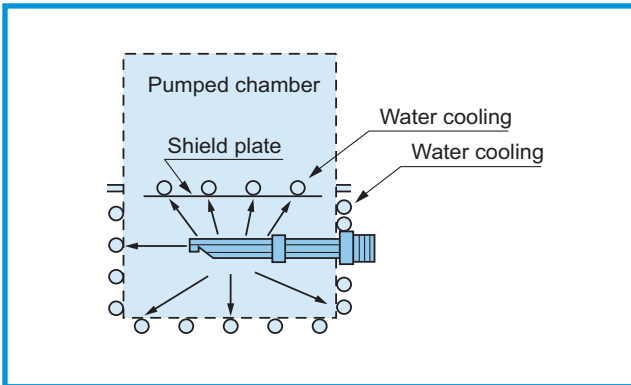
As shown above, the pumping speed of the getter pump varies significantly according to the pressure at the conductance limited area and titanium sublimation speed limited area.

The pumping speed at the conductance limited area is as shown above when the supply of titanium to the getter surface is sufficient and a clean getter surface is maintained.

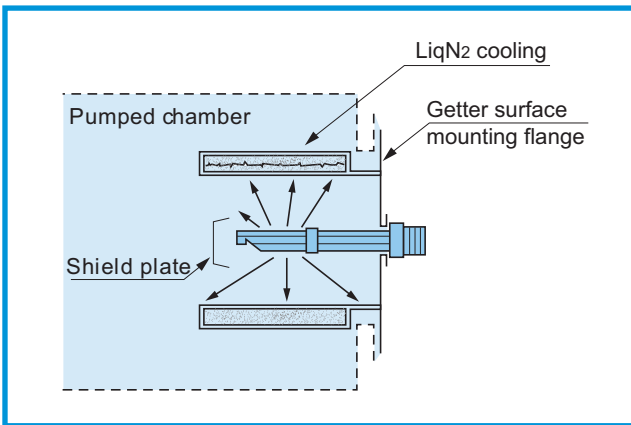
Therefore, the pumping speed at that area is determined by the getter area and the conductance from the pumped chamber to the getter surface. At the titanium sublimation limited area, titanium collides with gas molecules before it reaches the getter surface and combines chemically because the pressure is high. As a result, a clean getter surface cannot be obtained and the pumping speed will be inversely proportional to the pressure and proportional to the sublimation rate of titanium.

The following methods are available when using the getter pump.

- Using the inside wall of the pumped chamber as the getter surface  
(In order to obtain high pumping speed)

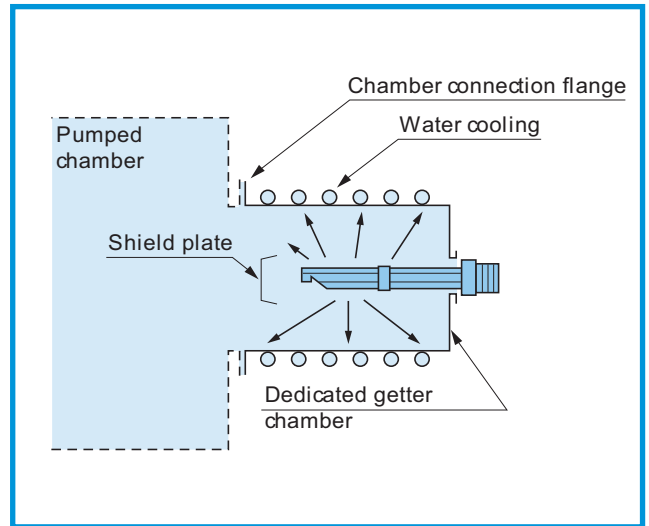


- Creating a dedicated getter surface inside the pumped chamber  
(Effective when pumping hydrogen to obtain an ultra-high vacuum)



- Installing a dedicated getter chamber inside the pumped chamber  
(Effective when pumping without contaminating the pumped chamber)

Three types of water cooled getter chambers are available when using this method.



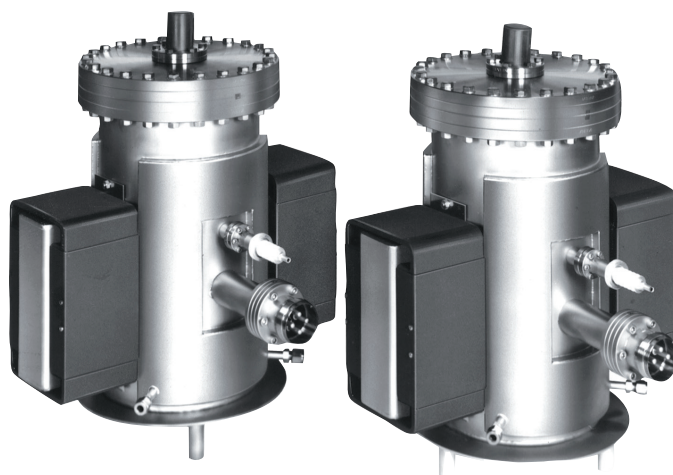
## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0111-16547	956-7040	Ti-Vac Pump	With $\phi 70$ ICF, ti-Vac head x1	10720
H23-01049	956-7035	Ti-Vac Head	Ti Head	10730
743-1277	956-7015	TSP Cartridge	With $\phi 70$ ICF, with filament/gasket/attachment tool	10700
MOD-41604	956-0010	TSP Filament	x12	10711
VMT-8089	956-7030	Ti-Vac Holder		10731
0112-10901	922-9119	Sublimation Pump Control Unit	200V AC/1 $\phi$ , for both TSP and ti-Vac pump	10772
VMT-7107		TSP Output Cable (2m)	2m	10780
VMT-6485		TSP Output Cable (3m)	3m	10781
A23-08968		TSP Output Cable (5m)	5m	10782
VMT-6487		TSP Output Cable (7m)	7m	10783
VMT-8093	941-7104	400L/s Getter Chamber	With $\phi 152$ ICF	10752
VMT-8095	941-7108	800L/s Getter Chamber	With $\phi 203$ ICF	10753
FMT-9017	941-7116	1600L/s Getter Chamber	With $\phi 253$ ICF	10754

Note) Contact us for more information about CE (RoHS).



# Combination Pump



[1600L/s Combination Pump]

## ■ Summary

The combination pump combines a titanium sublimation pump and triode ion pump (noble pump) to achieve a fast pumping speed at very low cost, taking advantage of the ion pump features that enable a clean ultra-high vacuum to be achieved easily.

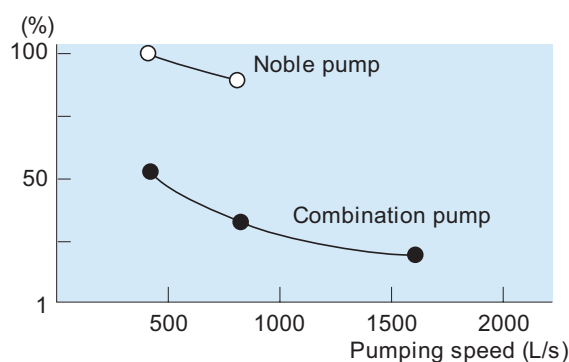


Fig. 1 Price to pumping speed ratio (Assuming 400L/s noble pump is 100%)

## ■ Features

### 1. Increased pumping speed

Compared to ion pumps, the cost (including the cost of the control equipment) per pumping speed of 1L/s is approximately 1/2 to 1/3.

### 2. Light weight and compact

Compared to ion pumps with the same pumping speed, the volume and weight are reduced to 1/5 to 1/10. Therefore, it can be easily attached/removed to/from the pumped system to achieve a fast pumping speed with minimum space.

### 3. Safety design

A connector is used to connect the power supply for the sublimation pump to enable simple and secure connection. Flareless fitting is used for the cooling water inlet/outlet so that the metal tube can be connected easily without having to worry about water leaking.

### 4. Clean ultra-high vacuum

An oil-free clean ultra-high vacuum can be obtained because no organic materials are used.

### 5. No liquid nitrogen required

No trap is used. Runs on cooling water and AC power.

### 6. Easy operation and maintenance

Simple operation enabling unattended operation even during a power failure.

### 7. Pump element replaceable

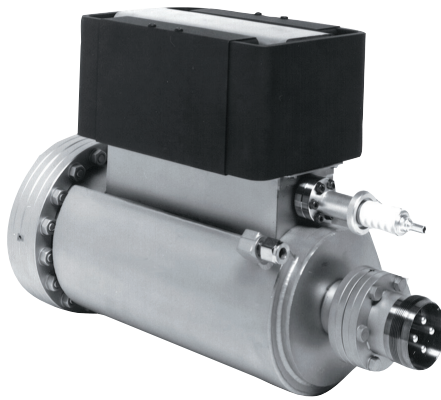
All models use a replaceable titanium evaporation source and noble pump element.

## ■ Applications

Deposition equipment, electron microscopes, mass spectrometers, vacuum furnaces, various analysis equipment, experimental equipment, pumping equipment and other ultra-high vacuum systems with large gas emission.



■ 400L/s Combination Pump



● Specifications

Pumping rate/ Pumping flow	See Fig. 2
Operating pressure range	10 <sup>-1</sup> Pa to 10 <sup>-9</sup> Pa
Baking temperature	MAX 250°C
Weight	Approx. 15kg
Intake flange	φ152ICF flange
Capacity	Approx. 4.5L
Dimensions	See Fig. 3
Applicable controller	922-9119 Sublimation Pump Controller and P-511NP or P-521NP Noble Pump Controller

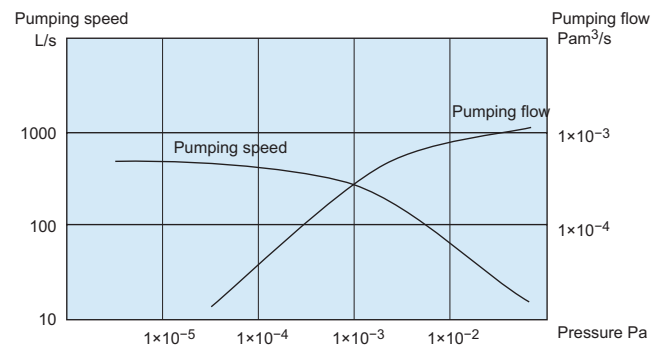


Fig. 2 Pumping speed/pumping flow - pressure characteristics

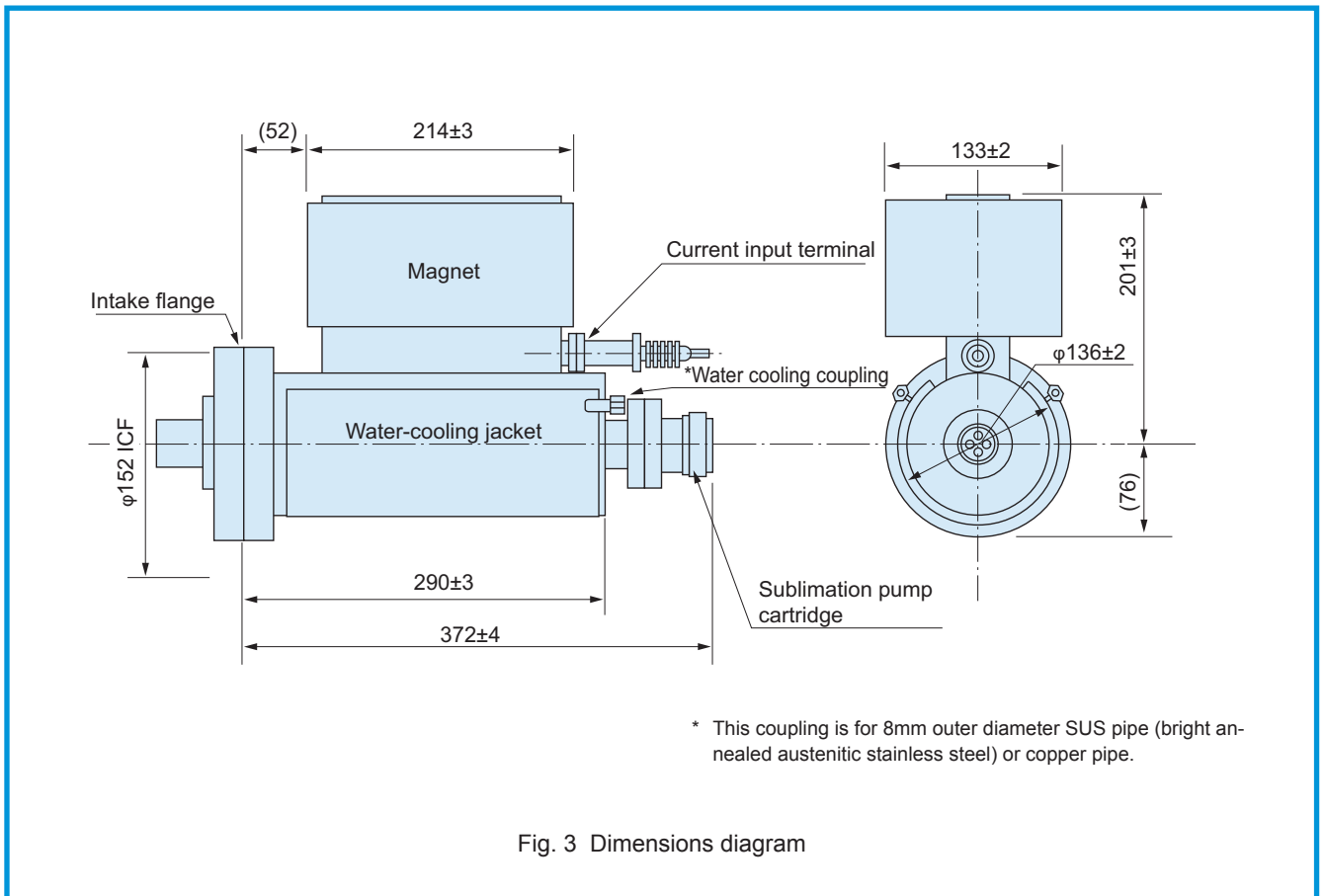
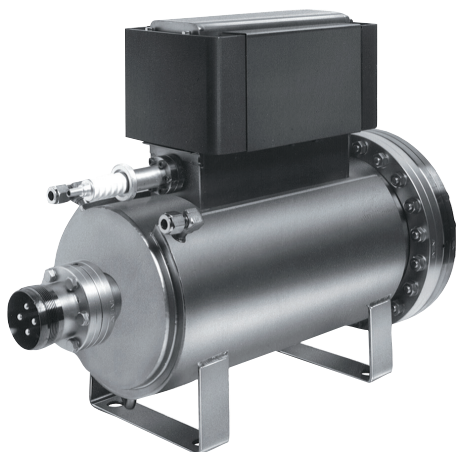


Fig. 3 Dimensions diagram

## ■ 800L/s Combination Pump



### ● Specifications

Pumping rate/ Pumping flow	See Fig. 4
Operating pressure range	$10^{-1}$ Pa to $10^{-9}$ Pa
Baking temperature	MAX 250°C
Weight	Approx. 25kg
Intake flange	$\phi 203$ ICF flange
Capacity	Approx. 7.5L
Dimensions	See Fig. 5
Applicable controller	922-9119 Sublimation Pump Controller and P-511NP or P-521NP Noble Pump Controller

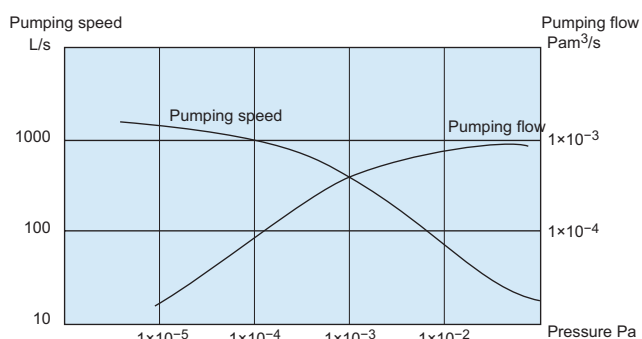


Fig. 4 Pumping speed/pumping flow - pressure characteristics

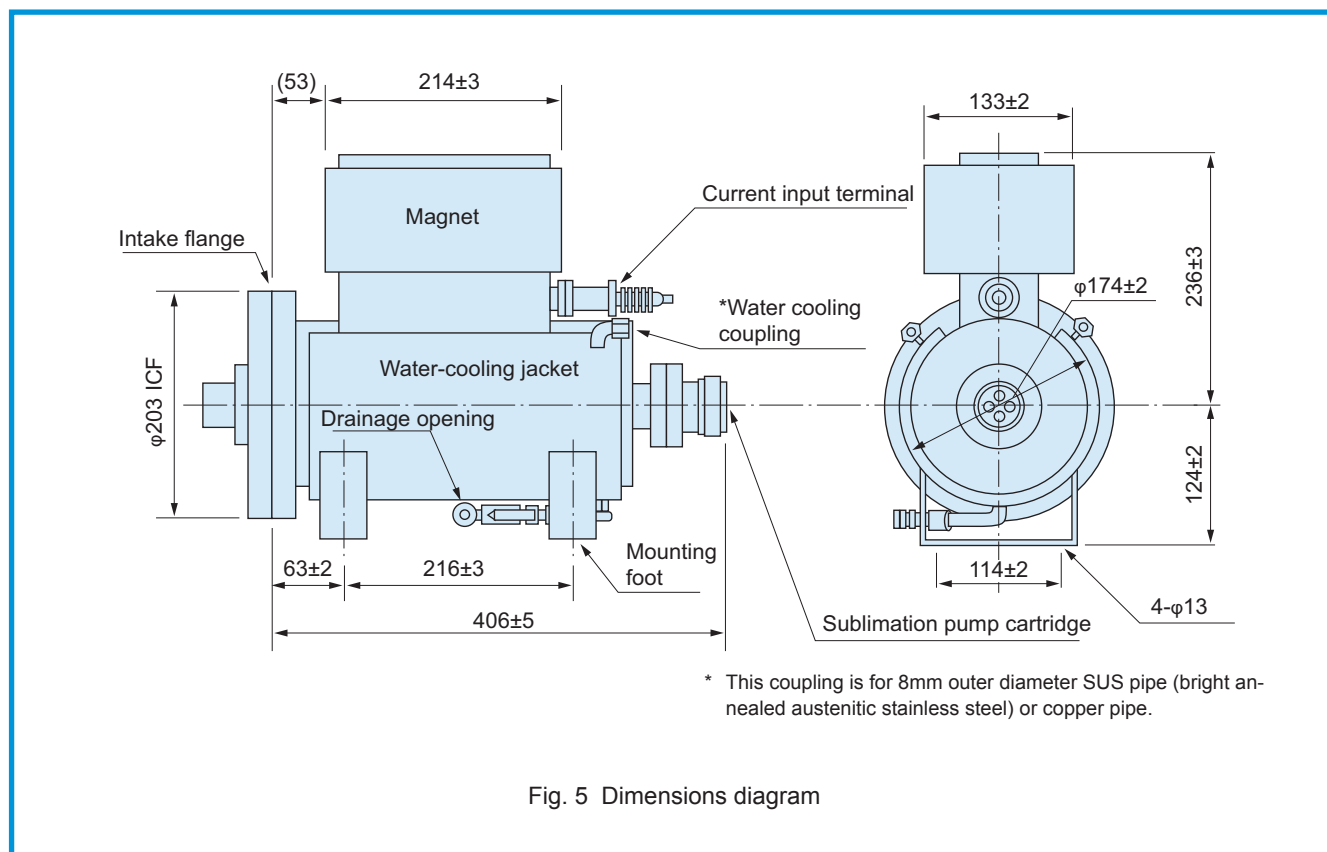
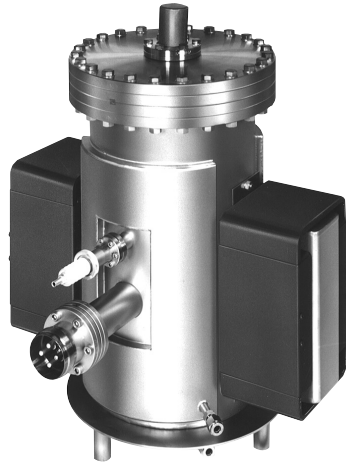


Fig. 5 Dimensions diagram

■ 1600L/s Combination Pump



● Specifications

Pumping rate/ Pumping flow	See Fig. 6
Operating pressure range	$10^{-1}$ Pa to $10^{-9}$ Pa
Baking temperature	MAX 250°C
Weight	Approx. 35kg
Intake flange	$\phi 253$ ICF flange
Capacity	Approx. 15.5L
Dimensions	See Fig. 7
Applicable controller	922-9119 Sublimation Pump Controller and P-511NP or P-521NP Noble Pump Controller

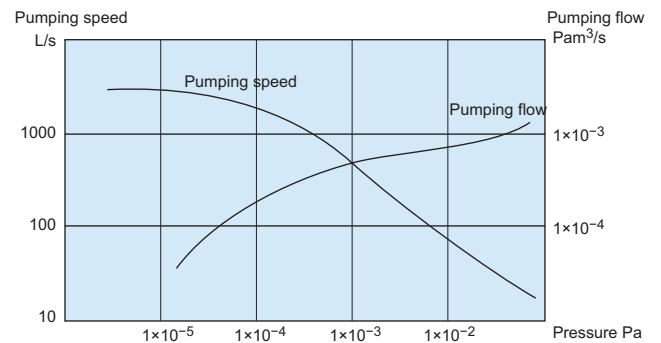


Fig. 6 Pumping speed/pumping flow - pressure characteristics

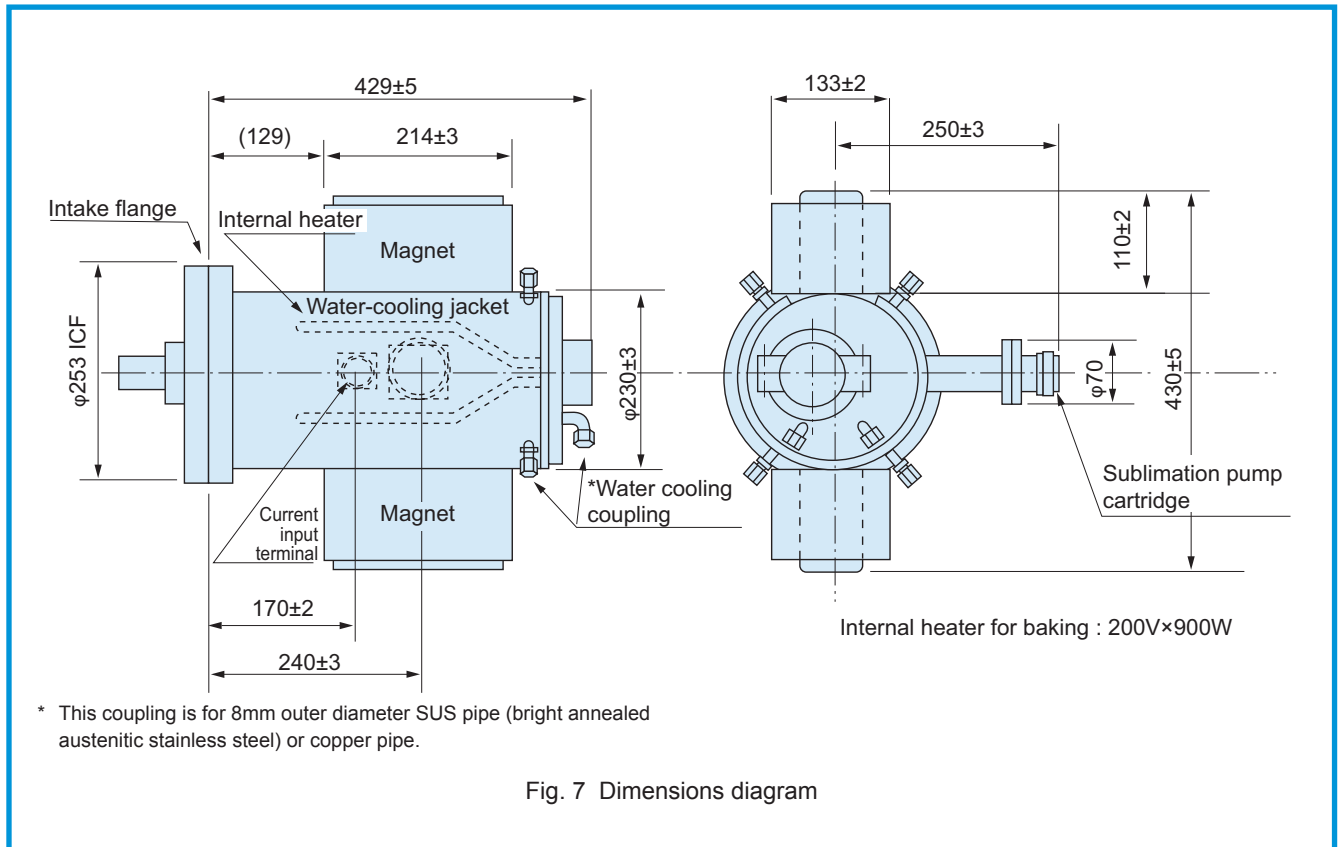
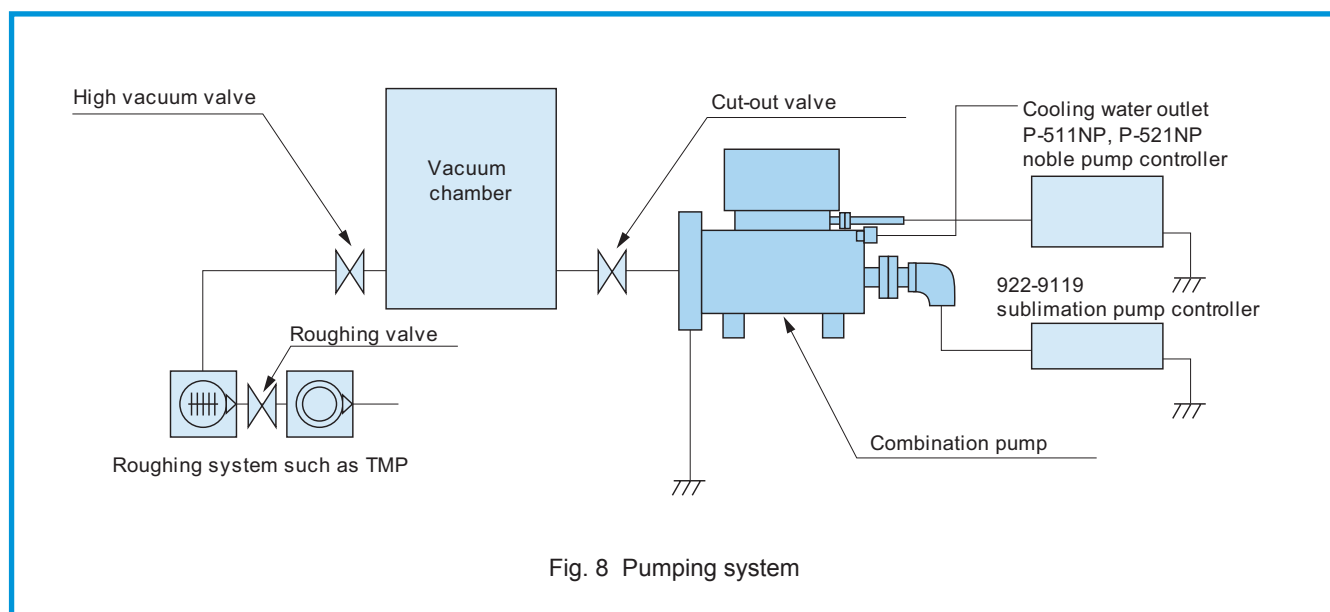


Fig. 7 Dimensions diagram

## Options (maintenance and consumable parts)

Description		Type	Configuration	Remarks
Set filament		956-0010	1 set	For titanium sublimation pump, x12
Combination pump element	400L/s	913-7000	1 set	Connecting lines included
	800L/s	913-7001	1 set	
	1600L/s	913-7002	1 set	
Current input terminal		954-7281	x1	With $\phi 34$ mini flange, for ion pump
Ti-Vac pump		956-7040	1 set	Can be combined with a ti-Vac pump as an option.

## Application



### • Pumping system and connection method

A pumping system similar to the one shown above is recommended. An oil rotary pump and foreline trap combination can also be used instead of the adsorption pump. A turbo molecular pump and oil rotary pump combination is also popular.

The cutout valve may be omitted on systems not frequently exposed to atmosphere.

Connect the cooling water by inserting a  $\phi 8$ mm metal tube (bright annealed austenitic stainless steel or copper) into the cooling water inlet and turning it  $5/4$  turns with a wrench.

### • Pump element replacement

The sublimation pump filament can be replaced without removing the pump from the pumping system.

Remove just the cartridge.

The noble pump element can be removed simply by removing the pump from the pumping system.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0111-21039	913-7000	400L/s Combination Pump	With $\phi$ 152ICF, with TSP•NP	10600
0111-17721	913-7001	800L/s Combination Pump	With $\phi$ 203ICF, with TSP•NP	10610
0111-26071	913-7002	1600L/s Combination Pump	With $\phi$ 253ICF, with TSP•NP	10620
MOD-41604	956-0010	TSP Filament	x12	10711
0111-16547	956-7040	Ti-Vac Pump	With $\phi$ 70ICF, ti-Vac head x1	10720

Note) Contact us for more information about CE (RoHS).

# Cryopump POWER/POWER<sup>Eco</sup> Series



## ■ Selection guide

### ● Selection by various characteristics

Taking into consideration the size and use of the vacuum equipment, select the model in terms of performance such as pumping speed (nitrogen, argon, hydrogen), gas load (maximum pumping flow), regeneration cycle (pumping capacity), and start operation pressure (maximum gas instantaneous tolerance).

In general, the higher pump type names have, greater pumping speed and capacity (see the individual specifications).

### ● Selection of the intake flange type

Former JIS flange, ISO (new JIS) flange, ASA flange, and ICF flange are available as intake flanges.

Products with other flanges are also available upon order.

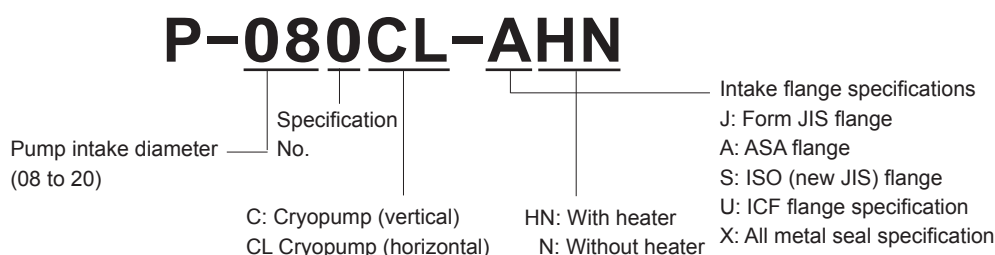
### ● Selection by installation condition

If a vertical cryopump cannot be installed, a horizontal cryopump is available.

Note) There are gases that are not appropriate for pumping with a cryopump or require certain precautions. Refer to the instruction manual for details.

## ■ About the POWER/POWER<sup>Eco</sup> series cryopump model

A product configuration example is shown.



# Cryopump

High performance cryopump  
Intake diameter 8 to 12 inches (small)



## ■ Summary

Gas turns into a liquid when cooled and then into a solid (ice) when cooled further. Cryopumps are vacuum pumps that use this phenomenon to pump vacuum and store gas as a solid (ice) by freezing the gas onto the internal cryogenic surface (pumping surface).

Cryopumps have excellent features such as fast pumping speed and clean vacuum.

However, since cryopumps store the vacuum pumped gas internally, the pumping performance will drop after a certain amount of gas has been pumped and must be restored.

This operation is called regeneration. Specifically, the temperature of the cryogenic surface (pumping surface) is increased to normal temperature and the gas stored as a solid (ice) is re-vaporized and pumped out of the cryopump.

Since vacuum pumping is not possible during regeneration, the speed of regeneration and the amount of gas that can be stored to reduce the frequency of regeneration greatly affects the productivity and utilization of semiconductor or electronic component manufacturing equipment and other vacuum equipment.

The POWER series cryopump solves the above problem by using the world's first self-heating function and our unique pumping panel structure. Furthermore, it provides excellent pumping performance and improved temperature stability during multi-operation.

## ■ Features

### 1. Enables safe, high speed regeneration without a heater

- The self-heating function enables regeneration at high-speed equaling pumps with heaters.
- There is no fear of sparks, electrical discharge, or leakage because no heater is used.

### 2. POWER startup and stability (excellent startup characteristic and temperature stability)

- No significant increase in the start-up time when using only a single pump during multi-operation.
- Change in the startup time due to the cryopump operating environment is kept to a minimum.
- Resistance to unbalanced thermal load penetration into multi-operation pump is improved significantly.
- Fluctuation in temperature between pumps is kept to a minimum.

### 3. Low vibration

Average vibration acceleration is less than 1/10 compared to our previous product.

### 4. POWER pumping capacity (pumping characteristics)

The argon pumping capacity based on conventionally used standards was far outside the range where a cryopump can be used in actual production equipment because these calculation standards were not at a practical level.

The argon pumping capacity shown in our catalog is evaluated based on our own standards, which are much more rigorous than the above conventional standards. It accurately shows the range in which a cryopump can be installed and used in actual production equipment.

Although the pumping performance of a cryopump changes together with the gas storage capacity, the

POWER series keeps that change to a minimum with our unique panel design and maintains excellent pumping performance all the way to the pumping capacity limit.

- Maintains excellent pumping performance all the way to the argon pumping capacity limit.

### ■ What is the self-heating function? (POWER regeneration)

The normal refrigeration cycle cools the stage by repeating adiabatic expansion of high pressure He gas introduced from the outside within the cooling stage. The self-heating function heats the cooling stage by switching the movement of the piston (displacer) creating this space and the He gas introduction timing to perform adiabatic compression of He gas in the space where adiabatic expansion is normally performed. This enables high-speed regeneration without using a heater.

### ■ About the cryopump startup characteristics

The cryopump used in a multi-chamber system is normally used in multi-operation mode where multiple cryopumps are operated with a single compressor.

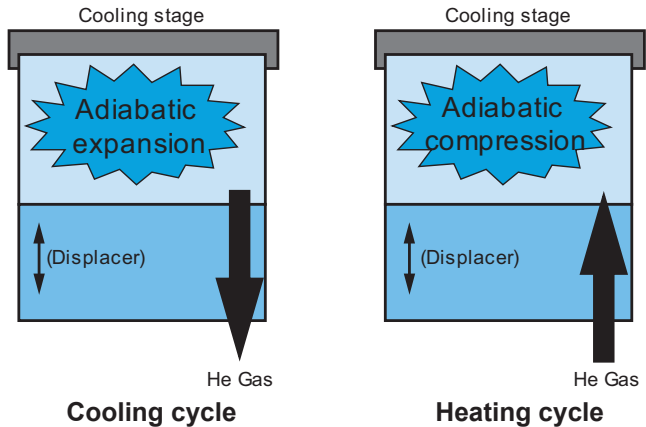
If cryopumps running in multi-operation mode are all regenerated/started at the same time, the startup time will be as specified in the catalog. However, if only a single cryopump is regenerated while running other cryopumps, it will take longer to start. This is because a cryopump operates on the principle where the cooling performance increases as the temperature decreases. Therefore, the cooling performance of higher temperature pumps tends to decrease.

This characteristic may be a problem not only during startup, but also during normal use. This is because when a large thermal load is applied to only one of the cryopumps running in multi-operation mode, the temperature of that pump is more likely to increase further while the other pumps are more likely to cool. As a result, the variation in temperature among the pumps running in multi-operation mode will increase causing imbalanced cooling performance among the pumps.

The POWER series cryopump is significantly improved with respect to these phenomenon.

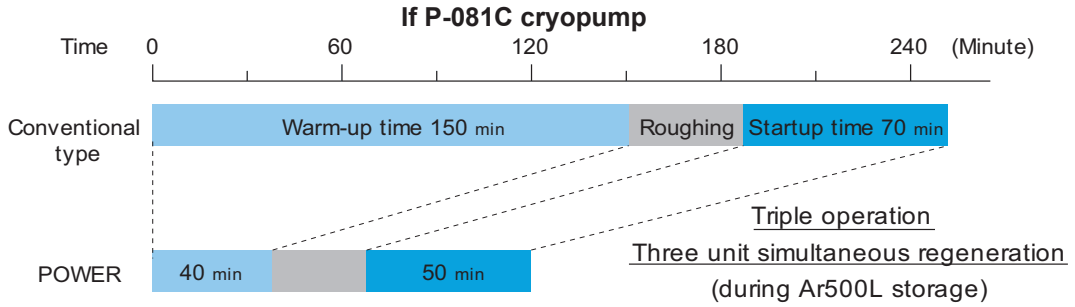
### 5. POWER refrigeration (with sufficient cooling performance)

- Significantly increased cooling performance enables long-lasting, stable hydrogen pumping performance
- Capable of withstanding thermal load enabling more stable operation
- Triple operation is also possible with the 12 inch cryopump.

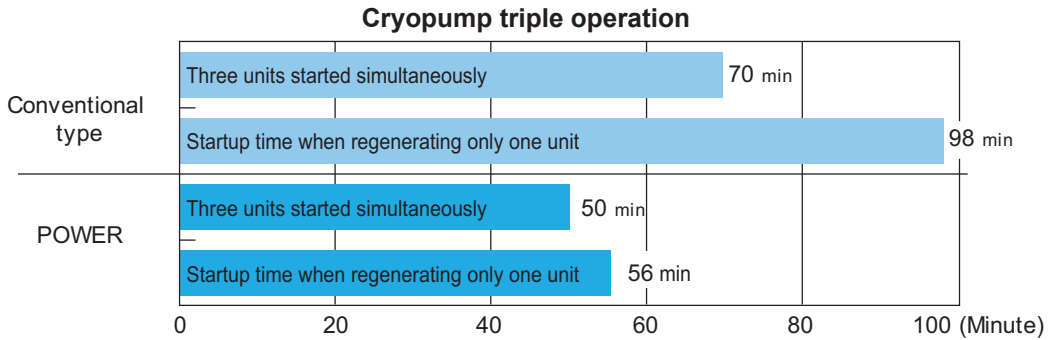




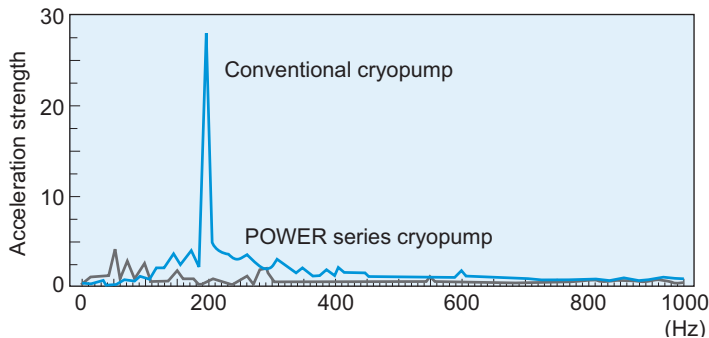
### Cryopump regeneration time comparison



### Startup time comparison by startup method

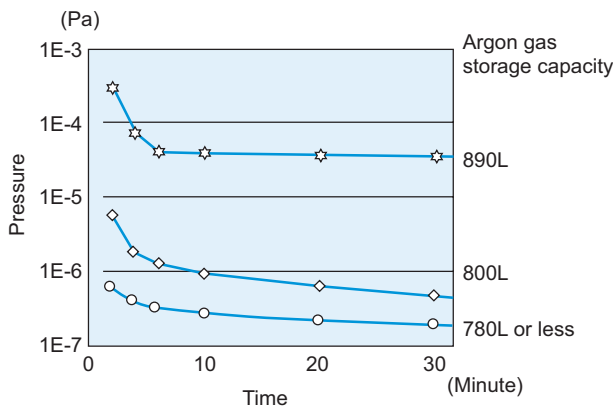


### Cryopump vibration spectrum

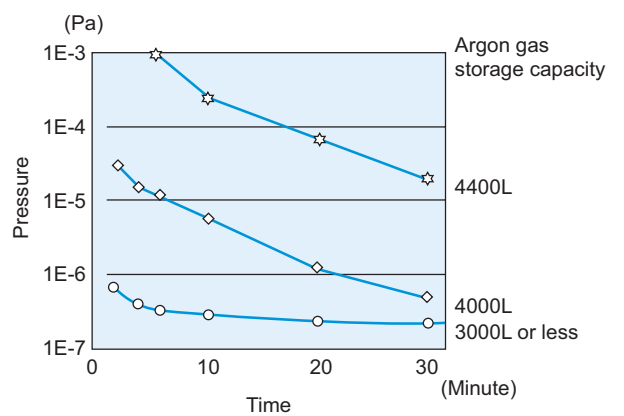


### Argon gas storage capacity and pressure drop characteristics

P-081C Ar pumping capacity 800L

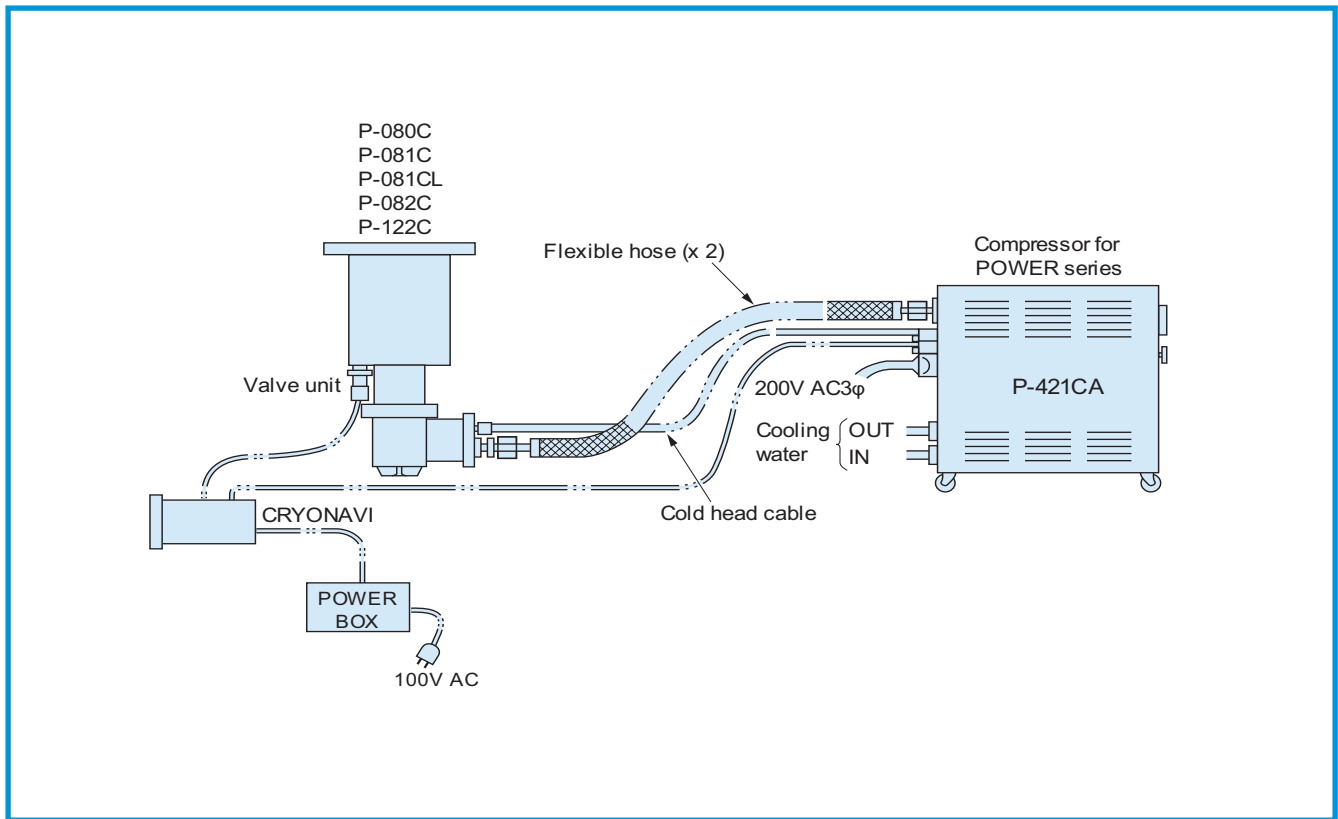


P-122C Ar pumping capacity 4000L

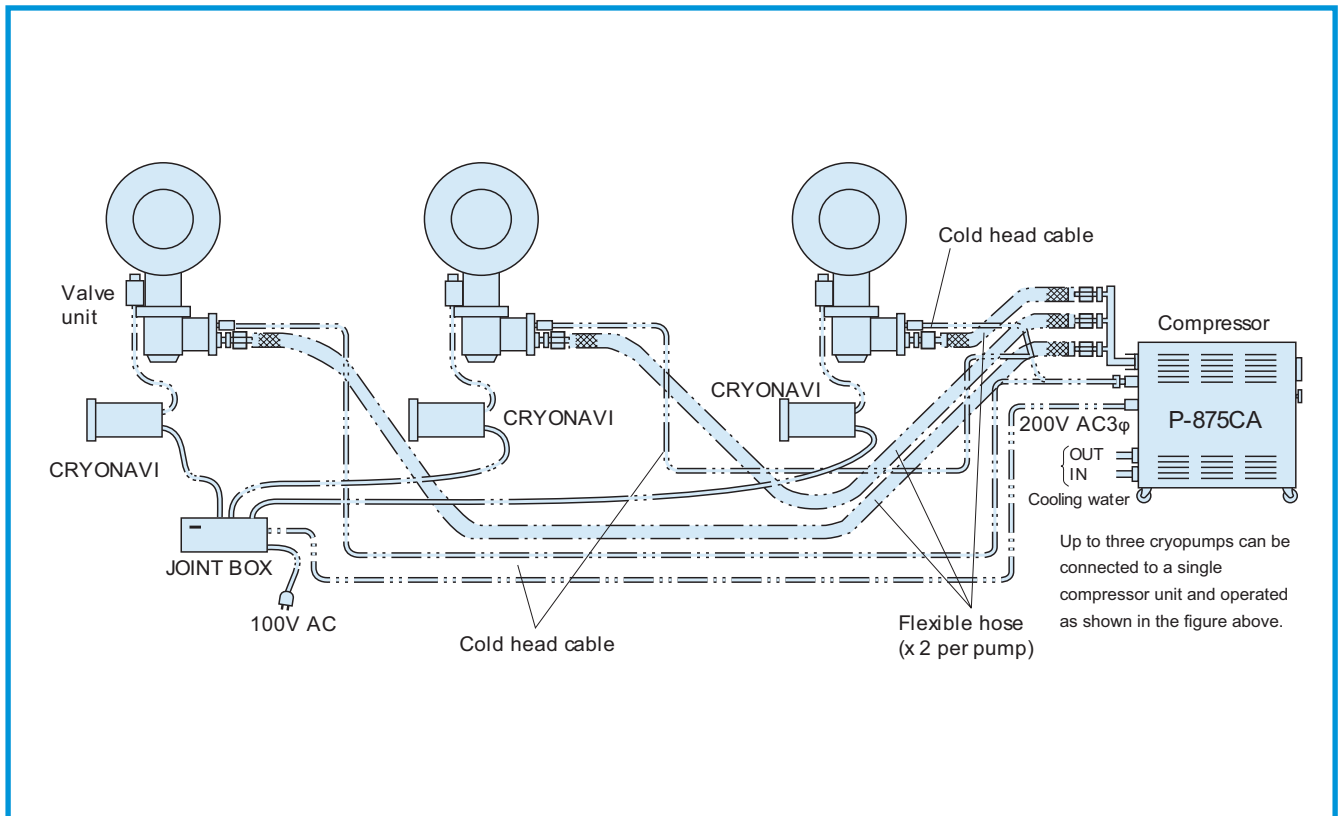


■ POWER series cryopump configuration

Basic Structure



Multi-system configuration example



Note) The P-875CA and cryopump compressor in the Cryopump configuration example are different from the actual product. See P-875CA for the external view and dimensions.

## ■ POWER series cryopump performance specifications

Pump Type		P-080C	P-081C	P-081CL	P-082C	P-083C	P-100C	P-100CL	Remarks
Diameter		8 inch	8 inch	8 inch	8 inch	8 inch	10 inch	10 inch	
Shape		Vertical	Vertical	Horizontal	Vertical	Vertical	Vertical	Horizontal	
Pumping speed (L/s)	Nitrogen	1,500	1,500	1,500	1,500	1,500	2,400	2,400	
	Argon	1,300	1,300	1,300	1,300	1,300	2,000	2,000	
	Hydrogen	1,000	2,500	2,200	1,000	1,000	3,000	3,000	
	Vapor	4,000	4,000	4,000	4,000	4,000	6,400	6,400	
Maximum pumping flow (Pa·m <sup>3</sup> /s)		1.5	1.2	1.2	1.5	1.5	1.0	1.0	
Maximum gas instantaneous tolerance (Pa·m <sup>3</sup> )		18.0	18.0	18.0	18.0	18.0	18.0	18.0	
Startup time (min)		45	50	65	45	50	70	80	*1
Regeneration (warm-up) time (min)		30	30	30	30	35	35	40	*1
Startup regeneration time (min)		75+α	80+α	95+α	75+α	85+α	105+α	120+α	*1
Pumping capacity (Pa·m <sup>3</sup> )	Argon	80,000	80,000	80,000	150,000	190,000	160,000	140,000	*2
	Hydrogen	1,300	1,800	1,600	1,300	1,300	1,600	1,300	
Ultimate temperature (K)		15 or less							
Ultimate pressure (Pa)		Approx. 10 <sup>-7</sup>							
Maximum heating temperature (°C)		70							
Ambient temperature range (°C)		10 to 35							
Recommended maintenance hour (h)		Within 16,000h							
Weight (kg)		20	21	22	23	24	25	27	
Operating units	P-421CA	1	1	1	1	1	1	1	*3
	P-875CA	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3	*3

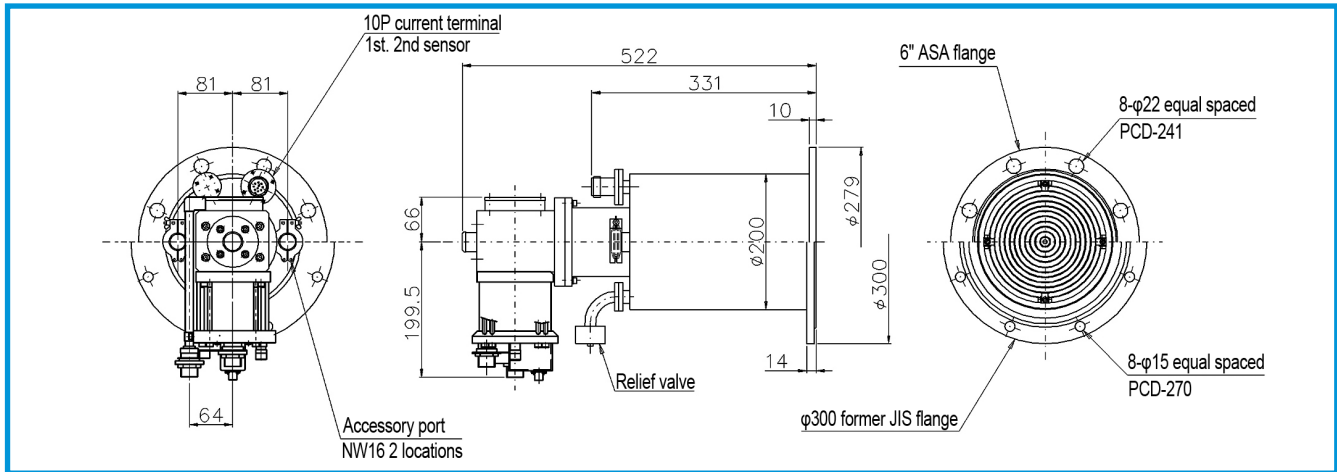
Pump Type		P-101C	P-101CL	P-120C	P-120CL	P-121C	P-121CL	P-122C	Remarks
Diameter		10 inch	10 inch	12 inch	12 inch	12 inch	12 inch	12 inch	
Shape		Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
Pumping speed (L/s)	Nitrogen	2,400	2,400	4,000	4,000	4,000	4,000	4,000	
	Argon	2,000	2,000	3,200	3,200	3,200	3,200	3,200	
	Hydrogen	3,800	3,700	3,600	3,000	6,000	5,000	3,000	
	Vapor	6,400	6,400	9,000	9,000	9,000	9,000	9,000	
Maximum pumping flow (Pa·m <sup>3</sup> /s)		1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Maximum gas instantaneous tolerance (Pa·m <sup>3</sup> )		18.0	18.0	18.0	18.0	18.0	18.0	18.0	
Startup time (min)		70	80	60	90	70	100	60	*1
Regeneration (warm-up) time (min)		35	45	35	40	40	50	30	*1
Startup regeneration time (min)		105+α	125+α	95+α	130+α	110+α	150+α	90+α	*1
Pumping capacity (Pa·m <sup>3</sup> )	Argon	160,000	140,000	260,000	200,000	260,000	200,000	400,000	*2
	Hydrogen	2,000	1,800	1,600	1,400	2,400	2,200	1,600	
Ultimate temperature (K)		15 or less							
Ultimate pressure (Pa)		Approx. 10 <sup>-7</sup>							
Maximum heating temperature (°C)		70							
Ambient temperature range (°C)		10 to 35							
Recommended maintenance hour (h)		Within 16,000h							
Weight (kg)		25	27	29	30	29	30	30	
Operating units	P-421CA	1	1	1	1	1	1	1	*3
	P-875CA	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3	*3

\*1) If the POWER series dedicated control power supply CRYONAVI is not used, the time required for cryopump regeneration such as the warm-up time will increase because the self-heating function cannot be used. Similar to normal type cryopumps, the above regeneration (warm-up) time assumes the use of the self-heating function and no gas such as argon is stored inside the pump. +α is the time required to rough pump the cryopump. (This changes according to the roughing pump type and the amount of moisture in the cryopump.)

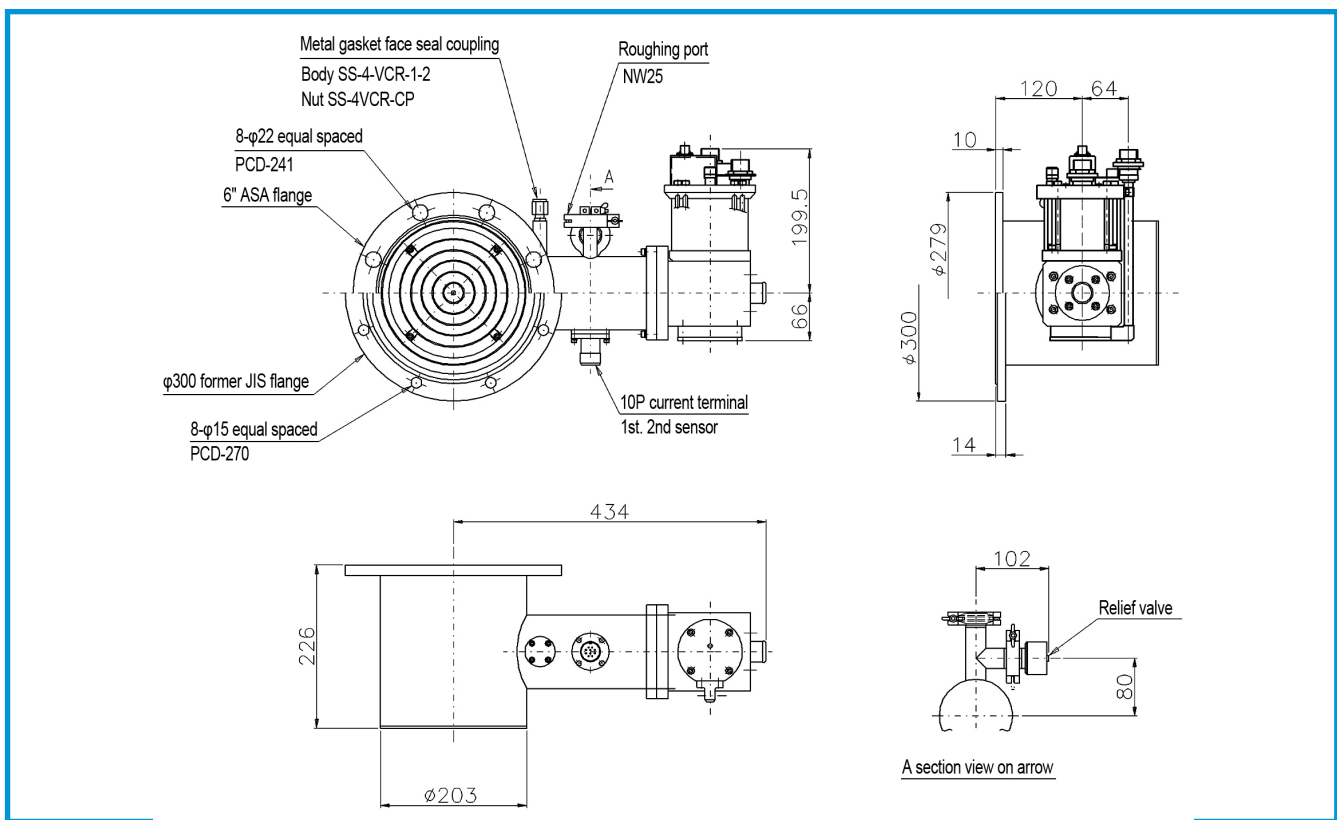
\*2) The pumping capacity is calculated using our unique calculation method and is similar to the value obtained when the cryopump is actually used mounted on the equipment.

\*3) Depending on the gas/thermal load conditions of the cryopump of the vacuum equipment, it may not be possible to run this number of units.

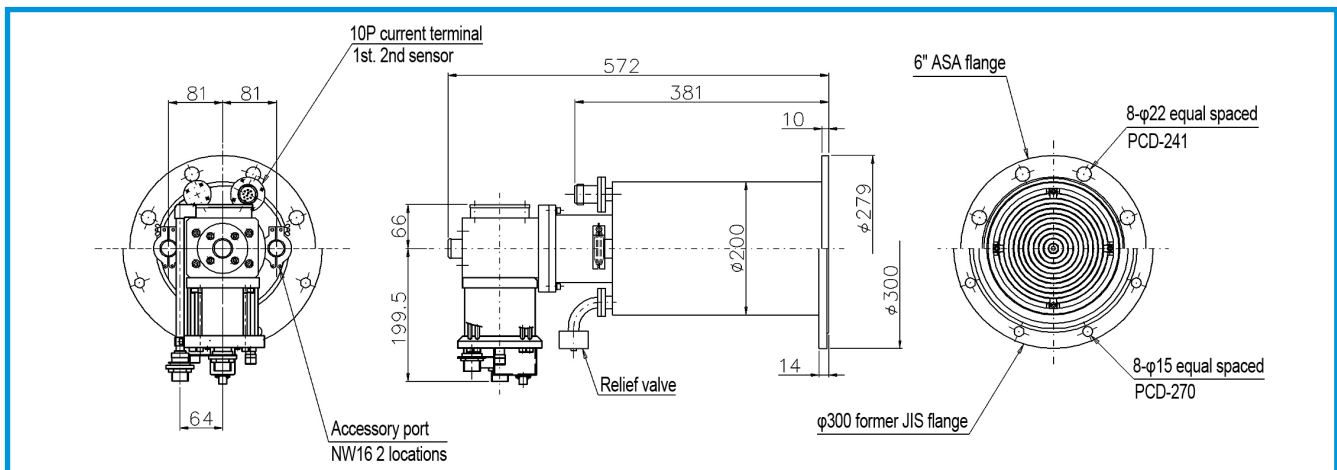
• Dimensions diagram P-080C/P-081C



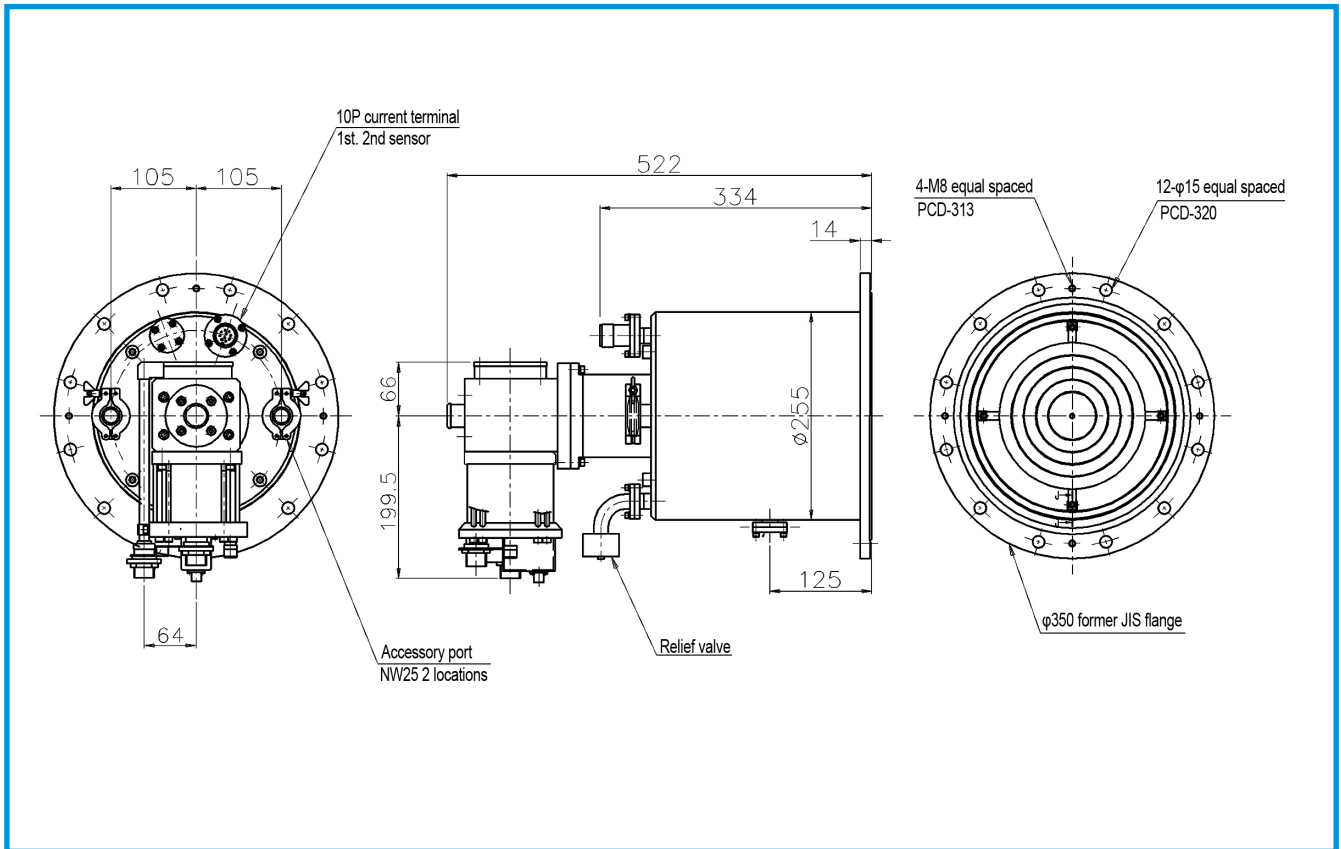
• Dimensions diagram P-081CL



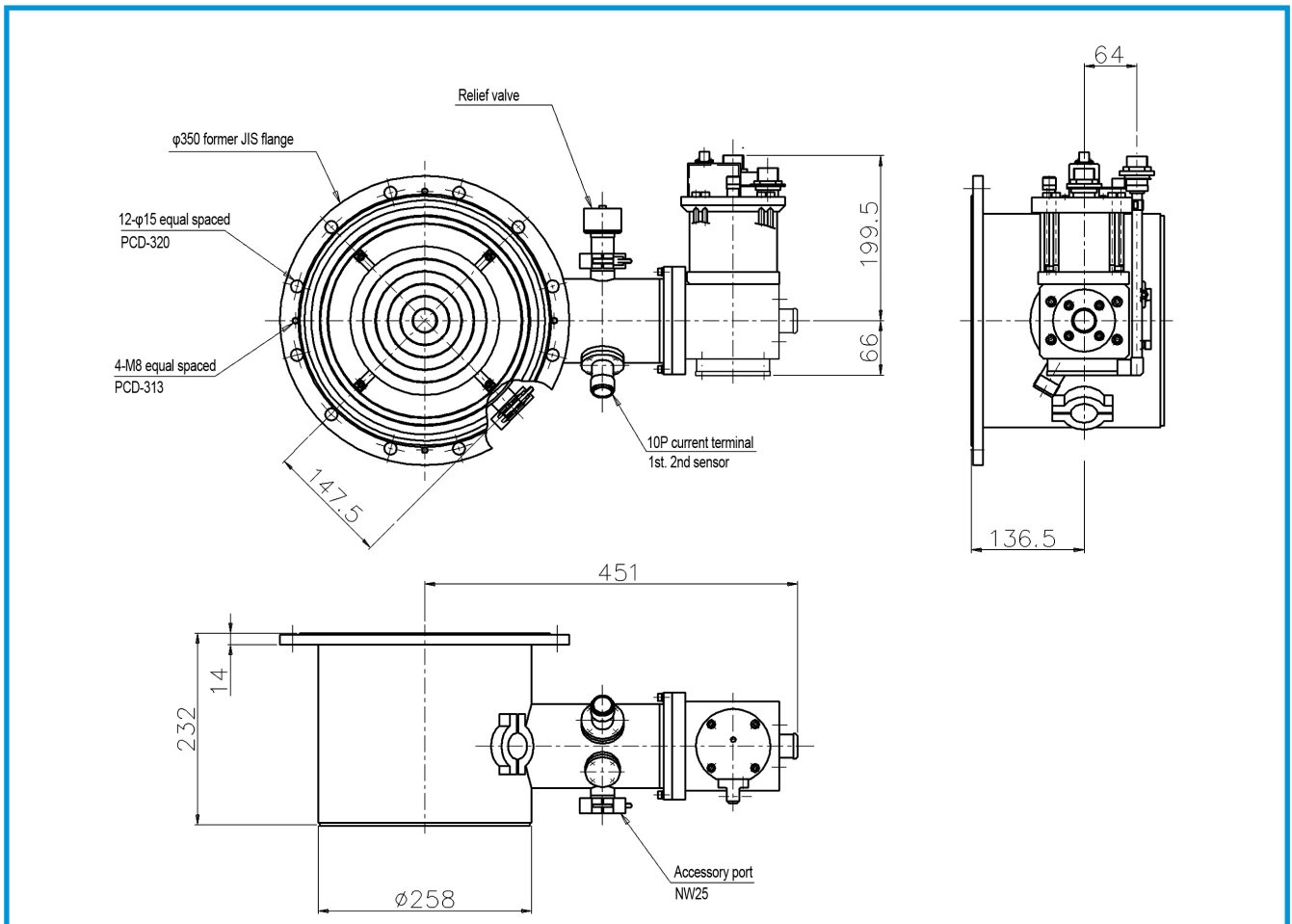
• Dimensions diagram P-082C



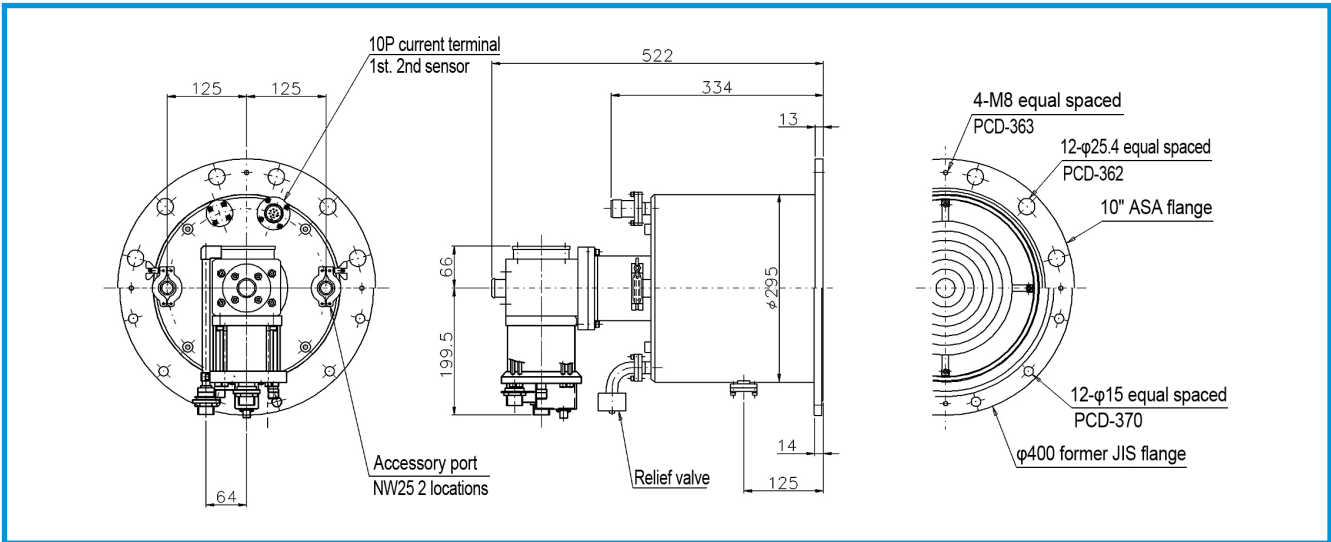
• Dimensions diagram P-101C



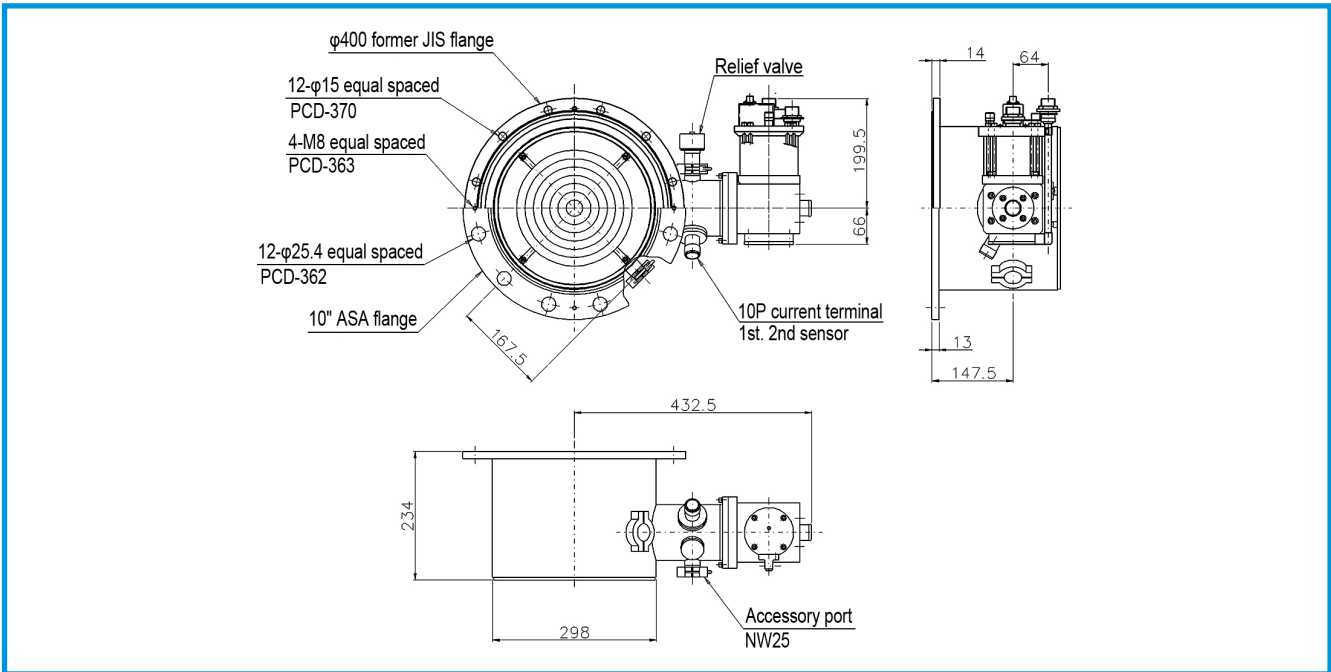
• Dimensions diagram P-100CL/P-101CL



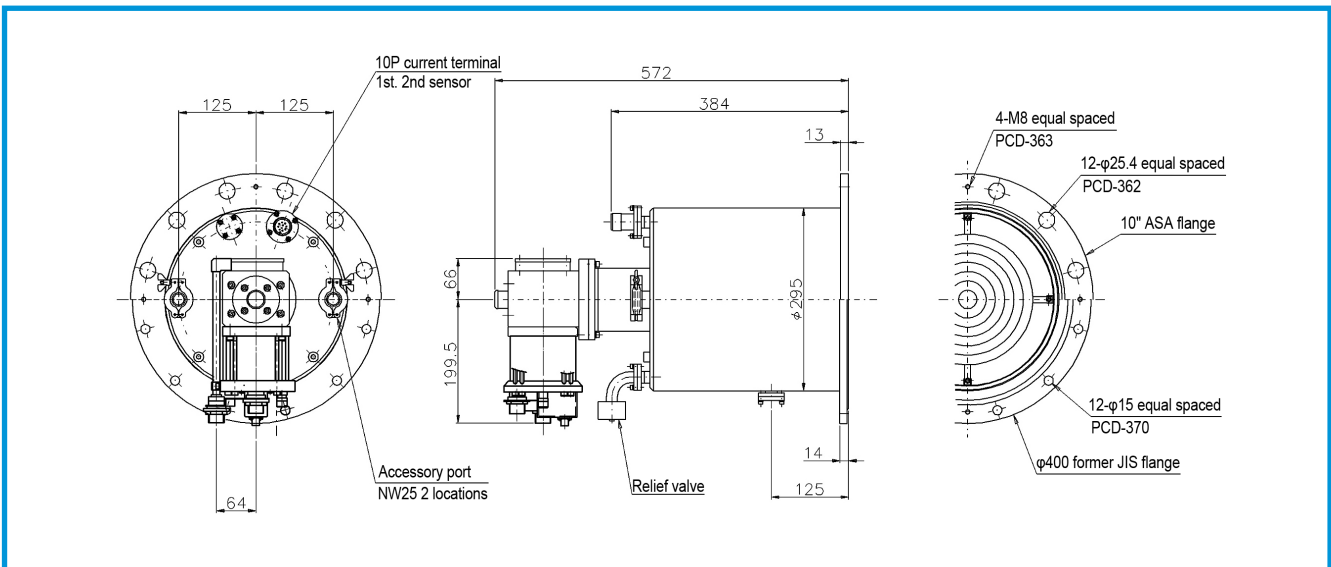
● Dimensions diagram P-120C/P-121C



● Dimensions diagram P-120CL/P-121CL



● Dimensions diagram P-122C



*Memorandum*

# Cryopump

**High-performance energy-efficient cryopump**  
**Intake diameter 8 to 20 inches**

## ■ Summary

The POWER series cryopump reduces regeneration/startup time to help increase vacuum equipment productivity and utilization, and provides high pumping capacity, excellent pumping performance and improved temperature stability during multi-operation. In addition to the features of the POWER series cryopump, the POWER<sup>Eco</sup> series cryopump is a high performance energy saving cryopump designed to reduce power consumption and cooling water flow. Using the same compressor as the POWER series, but with increased refrigerator efficiency, and by using multi-wave control (patent pending), the number of cryopumps that can be operated using a single compressor has been increased resulting in significantly reduced power consumption and cooling water flow per cryopump. For example, a single P-875CA large compressor can accommodate up to five eight inch diameter cryopumps with 1.0 to 1.2kW power consumption per cryopump. With the POWER<sup>Eco</sup> series cryopump, medium and large-sized cryopumps are also available in addition to the small-sized pumps, with significant performance and energy saving advantages compared to conventional medium to large-sized cryopumps.



## ■ Features

### 1. Energy and resource saving

Power consumption and cooling water: Can be reduced by 15% to 70%

### 2. Reduced regeneration/startup time

Less than half that of our previous products.

### 3. Improved pumping performance

Argon pumping capacity substantially increased 1.5 to 4 times that of our previous products.

### 4. Low vibration

Approximately 1/10 or less compared to conventional models.

## ■ Applications

- Semiconductor manufacturing equipment (sputtering equipment, ion implantation equipment)
- Electronic component manufacturing equipment
- Vacuum evaporation systems
- Vacuum furnaces, space chambers
- Accelerators
- Various high vacuum equipment



## ■ Small POWER<sup>Eco</sup> series cryopump performance specifications

Pump Type		P-085C	P-086C	P-086CL	P-087C	P-105C	P-105CL	P-106C	P-106CL	P-107C	Re- marks
Diameter		8 inch	8 inch	8 inch	8 inch	10 inch	10 inch	10 inch	10 inch	10 inch	
Shape		Vertical	Vertical	Horizontal	Vertical	Vertical	Horizontal	Vertical	Horizontal	Vertical	
Pumping speed (L/s)	Nitrogen	1,500	1,500	1,500	1,500	2,400	2,400	2,400	2,400	2,200	
	Argon	1,300	1,300	1,300	1,300	2,000	2,000	2,000	2,000	1,600	
	Hydrogen	1,000	2,500	2,200	1,000	3,000	3,000	3,800	3,700	2,600	
	Vapor	4,000	4,000	4,000	4,000	6,400	6,400	6,400	6,400	6,400	
Maximum pumping flow (Pa·m <sup>3</sup> /s)		1.2	1.2	1.1	1.2	1.0	1.0	1.0	1.0	1.0	
Maximum gas instantaneous tolerance (Pa·m <sup>3</sup> )		18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	
Startup time (min)		60	65	80	60	75	90	85	100	120	*1
Regeneration (heat-up) time (min)		40	40	45	40	45	50	45	50	50	*1
Startup regeneration time (min)		100+α	105+α	125+α	100+α	120+α	140+α	130+α	150+α	170+α	*1
Pumping capacity (Pa·m <sup>3</sup> )	Argon	80,000	80,000	80,000	150,000	160,000	140,000	160,000	140,000	300,000	*2
	Hydrogen	1,300	1,800	1,600	1,300	1,600	1,300	2,000	1,800	1,600	
Ultimate temperature (K)		15 or less									
Ultimate pressure (Pa)		Approx. 10 <sup>-7</sup>									
Maximum heating temperature (°C)		70									
Ambient temperature range (°C)		10 to 35									
Recommended maintenance hour (h)		Within 16,000hr									
Weight (kg)		22	22	22	23	25	27	24	30	25	
Operating units	P-421CA	2	2	2	2	2	2	2	2	2	*3, *4
	P-875CA	4 to 5	4 to 5	4 to 5	4 to 5	3 to 4	3 to 4	3 to 4	3 to 4	3 to 4	*3

Pump Type		P-124C	P-124CL	P-126C	P-126CL	P-127C	Re- marks
Diameter		12 inch	12 inch	12 inch	12 inch	12 inch	
Shape		Vertical	Horizontal	Vertical	Horizontal	Vertical	
Pumping speed (L/s)	Nitrogen	4,000	4,000	4,000	4,000	4,000	
	Argon	3,200	3,200	3,200	3,200	3,200	
	Hydrogen	3,600	3,600	6,000	6,000	3,000	
	Vapor	9,000	9,000	9,000	9,000	9,000	
Maximum pumping flow (Pa·m <sup>3</sup> /s)		0.8	0.8	0.8	0.8	0.8	
Maximum gas instantaneous tolerance (Pa·m <sup>3</sup> )		18.0	18.0	18.0	18.0	18.0	
Startup time (min)		95	105	95	105	70	*1
Regeneration (heat-up) time (min)		45	50	45	50	40	*1
Startup regeneration time (min)		130+α	155+α	140+α	155+α	110+α	*1
Pumping capacity (Pa·m <sup>3</sup> )	Argon	260,000	200,000	260,000	200,000	400,000	*2
	Hydrogen	1,600	1,400	2,400	2,000	1,600	
Ultimate temperature (K)		15 or less					
Ultimate pressure (Pa)		Approx. 10 <sup>-7</sup>					
Maximum heating temperature (°C)		70					
Ambient temperature range (°C)		10 to 35					
Recommended maintenance hour (h)		Within 16,000hr					
Weight (kg)		29	30	29	31	29	
Operating units	P-421CA	2	2	2	2	2	*3, *4
	P-875CA	3 to 4	3 to 4	3 to 4	3 to 4	3 to 4	*3

\*1) If the POWER series dedicated control power supply CRYONAVI is not used, the time required for cryopump regeneration such as the warm-up time will increase because the self-heating function cannot be used. Similar to normal type cryopumps, the above regeneration (warm-up) time assumes the use of the self-heating function and no gas such as argon is stored inside the pump. The +α is the time required to rough pump the cryopump. (This changes according to the roughing pump type and the amount of moisture in the cryopump.)

\*2) The pumping capacity is calculated using our unique calculation method and is similar to the value obtained when the cryopump is actually used mounted on the equipment.

\*3) Depending on the gas/thermal load conditions of the cryopump of the vacuum equipment, it may not be possible to run this number of units.

\*4) A separate Eco unit is required.

■ Medium/large POWER<sup>Eco</sup> series cryopump performance specifications

Pump Type		P-128C	P-128CL	P-160C	P-160CL	P-161C	P-161CL	P-201C	P-206C	Remarks
Diameter		12 inch	12 inch	16 inch	16 inch	16 inch	16 inch	20 inch	20 inch	
Shape		Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Vertical	
Pumping speed (L/s)	Nitrogen	4,000	4,000	8,000	7,400	8,000	7,400	13,000	13,000	
	Argon	3,200	3,200	5,500	5,500	5,500	5,000	9,000	9,000	
	Hydrogen	6,000	5,000	5,500	5,500	11,000	10,000	17,000	17,000	
	Water	9,000	9,000	17,000	17,000	17,000	17,000	28,000	28,000	
Maximum pumping flow (Pa·m <sup>3</sup> /s)		2.2	2.2	2.2	2.2	2.0	2.2	3.0	3.0	
Maximum gas instantaneous tolerance (Pa·m <sup>3</sup> )		40	40	50	50	50	50	80	80	
Startup time (min)		110	115	70	95	90	120	100	100	*1
Regeneration (heat-up) time (min)		70	70	40	60	60	60	70	80	*1
Startup regeneration time (min)		180+α	185+α	110+α	155+α	150+α	180+α	170+α	180+α	*1
Pumping capacity (Pa·m <sup>3</sup> )	Argon	270,000	200,000	400,000	200,000	400,000	200,000	800,000	800,000	*2
	Hydrogen	4,000	3,500	1,600	1,400	3,400	3,000	4,500	7,500	
Ultimate temperature (K)		15 or less								
Ultimate pressure (Pa)		Approx. 10 <sup>-7</sup>								
Maximum heating temperature (°C)		70								
Ambient temperature range (°C)		10 to 35								
Recommended maintenance hour (h)		Minimum every 16,000h								
Weight (kg)		37	39	50	62	50	62	66	66	
Operating units	P-421CA	1	1	1	1	1	1	-	-	*3, *4
	P-875CA	2	2	1 to 2	1 to 2	1 to 2	1 to 2	1	1	*3

\*1) If the POWER series dedicated control power supply CRYONAVI is not used, the time required for cryopump regeneration such as the warm-up time will increase because the self-heating function cannot be used. Similar to normal type cryopumps, the above regeneration (warm-up) time assumes the use of the self-heating function and no gas such as argon is stored inside the pump. The +α is the time required to rough pump the cryopump. (This changes according to the roughing pump type and the amount of moisture in the cryopump.)

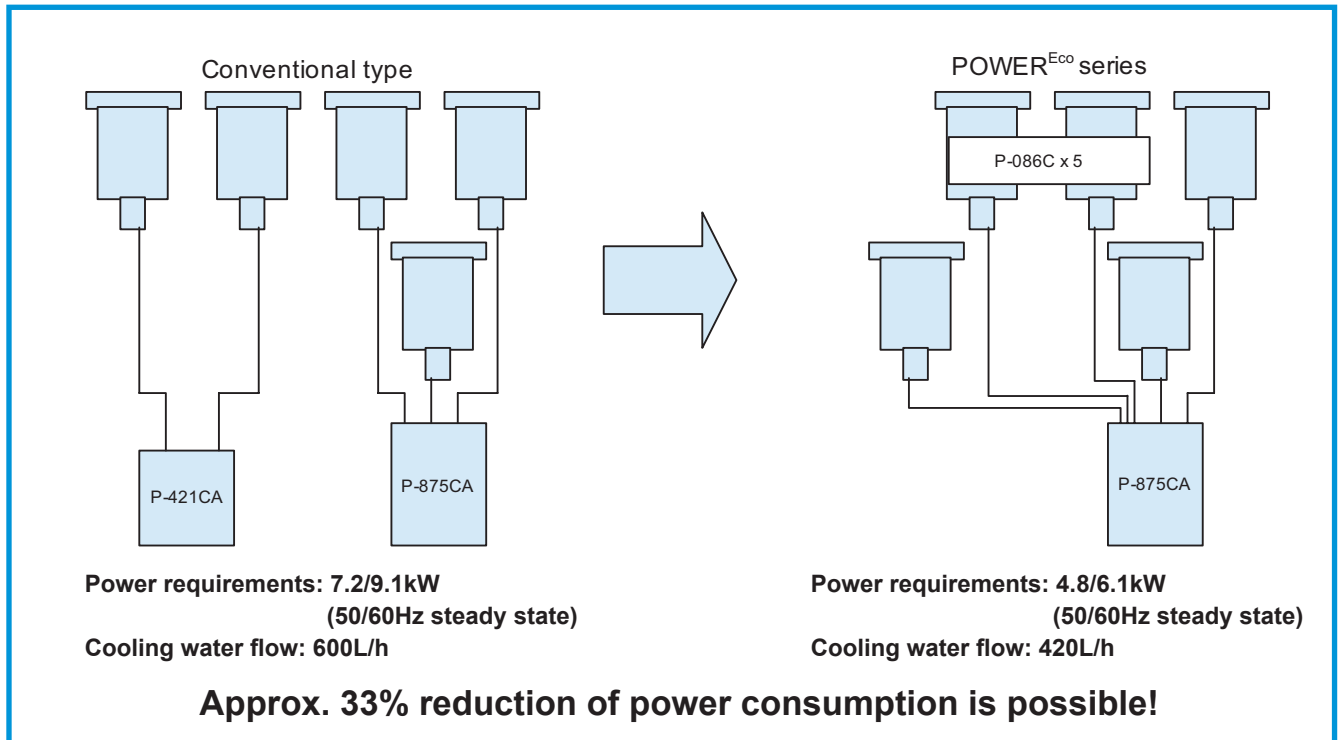
\*2) The pumping capacity is calculated using our unique calculation method and is similar to the value obtained when the cryopump is actually used mounted on the equipment.

\*3) Depending on the gas/thermal load conditions of the cryopump of the vacuum equipment, it may not be possible to run this number of units.

\*4) A separate Eco unit is required.

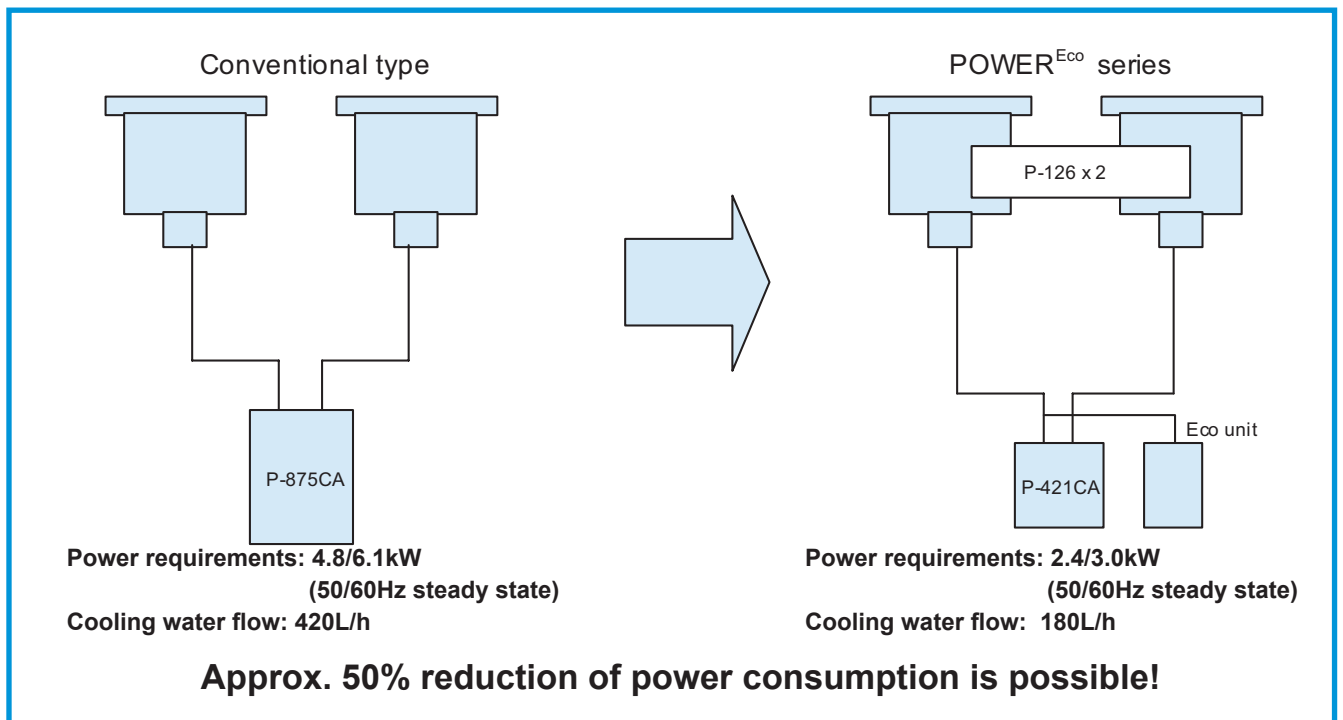
■ Utility comparison (energy-saving effect)

When using five 8 inch cryopumps

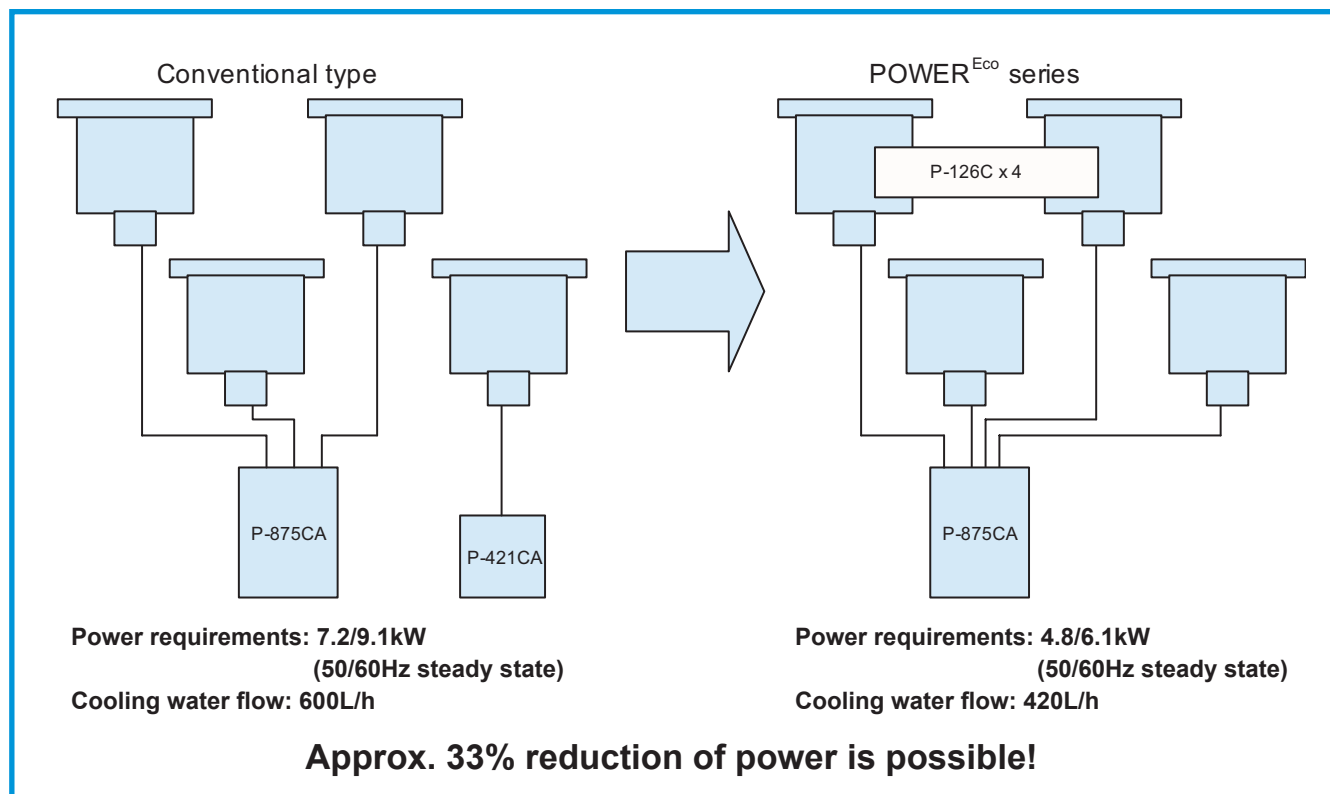


Pumps

When using two small 12 inch cryopumps

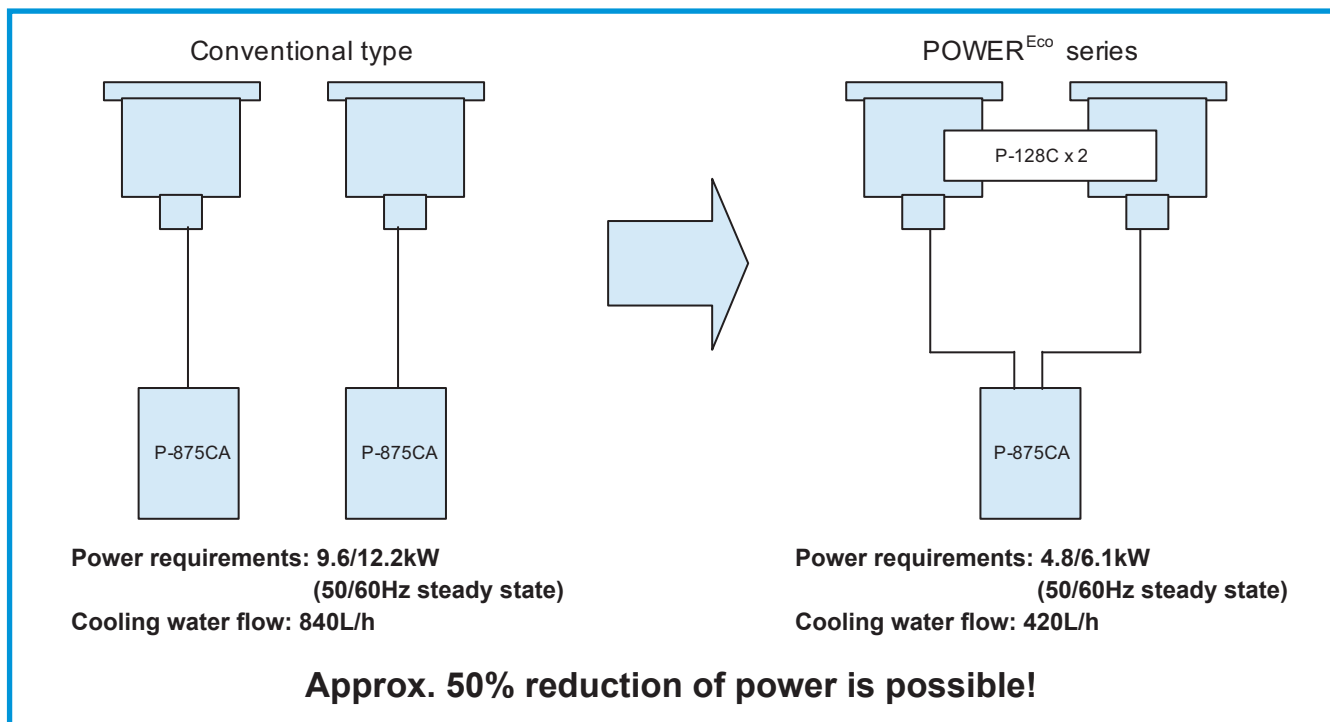


### When using four 12 inch cryopumps



The energy saving performance depends on the configuration of the pump used in the equipment. Please contact our sales offices for details.

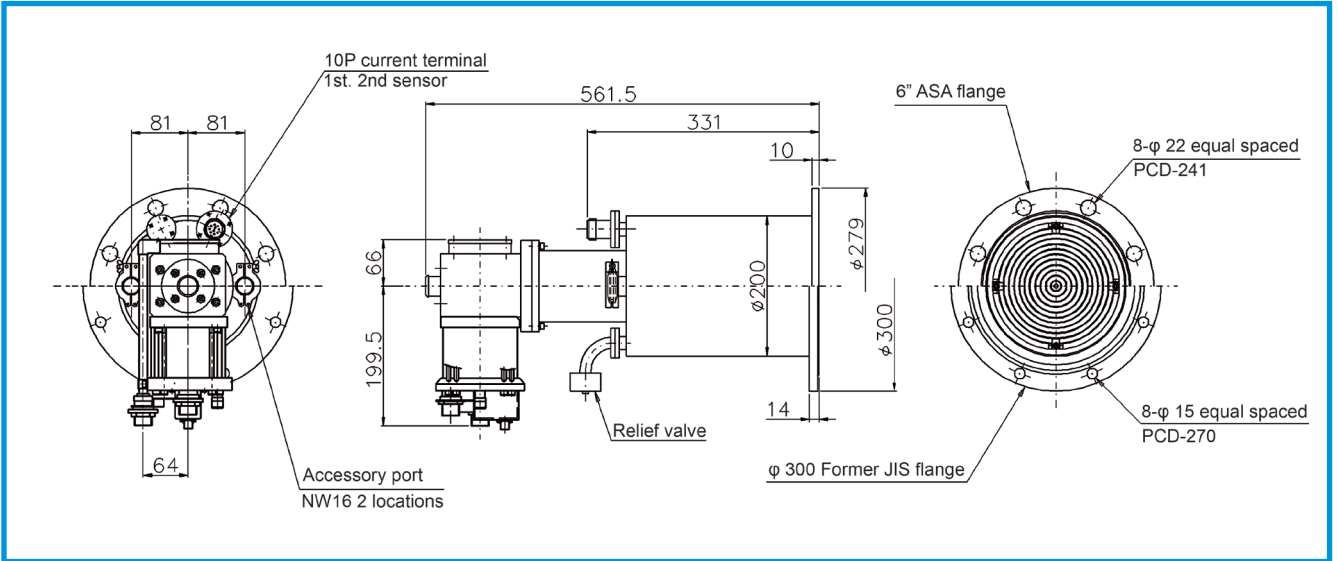
### When using two medium 12 inch cryopumps



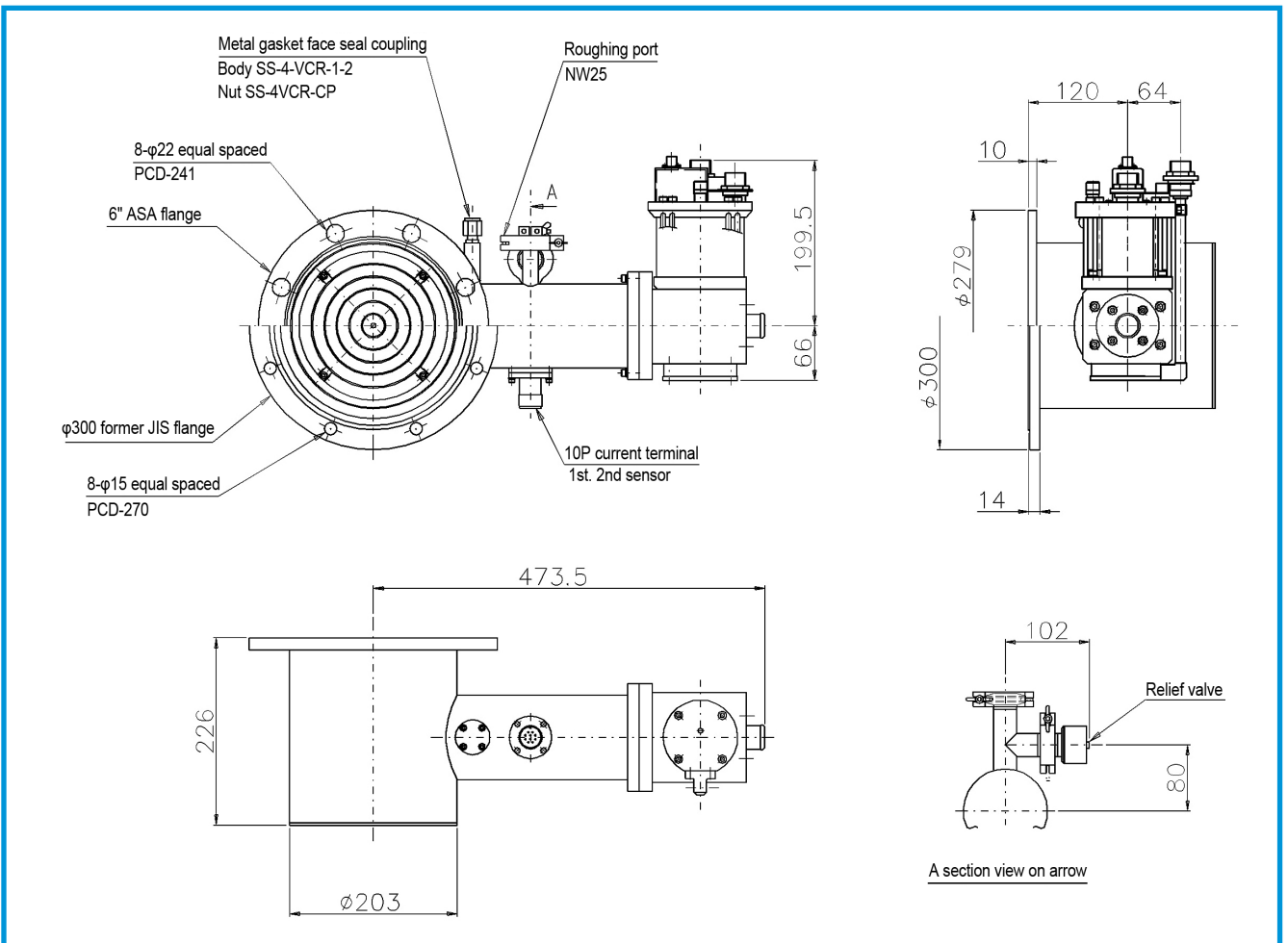
- Energy efficiency and productivity are improved significantly by switching to the "POWER Eco Series" cryopump. Operating costs can also be reduced significantly.

■ Dimensions diagrams

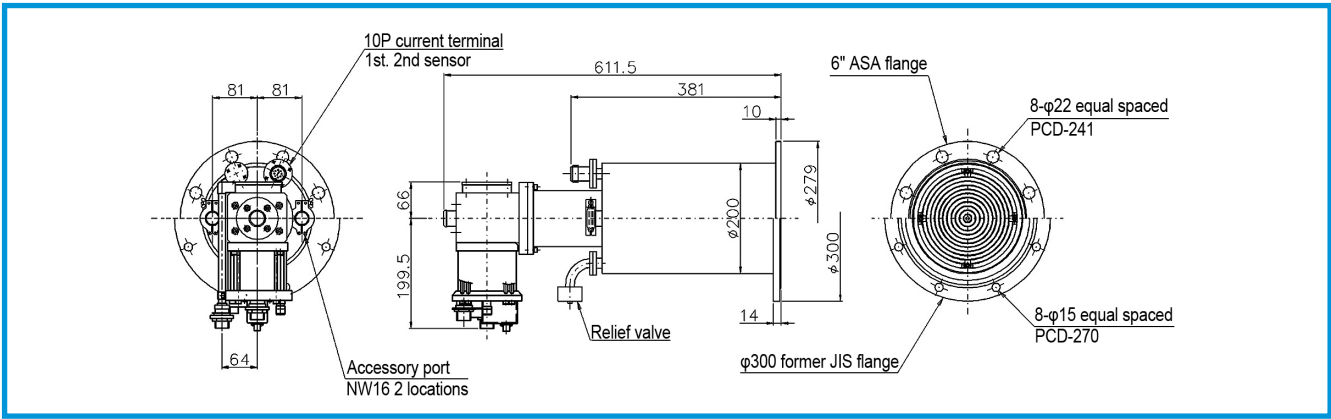
P-085C/P-086C



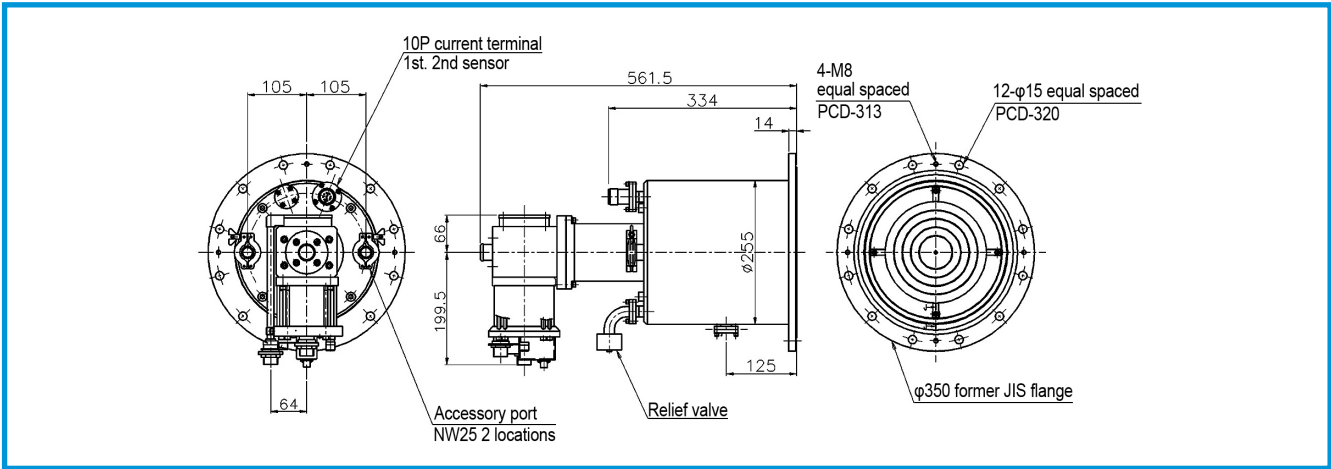
P-086CL



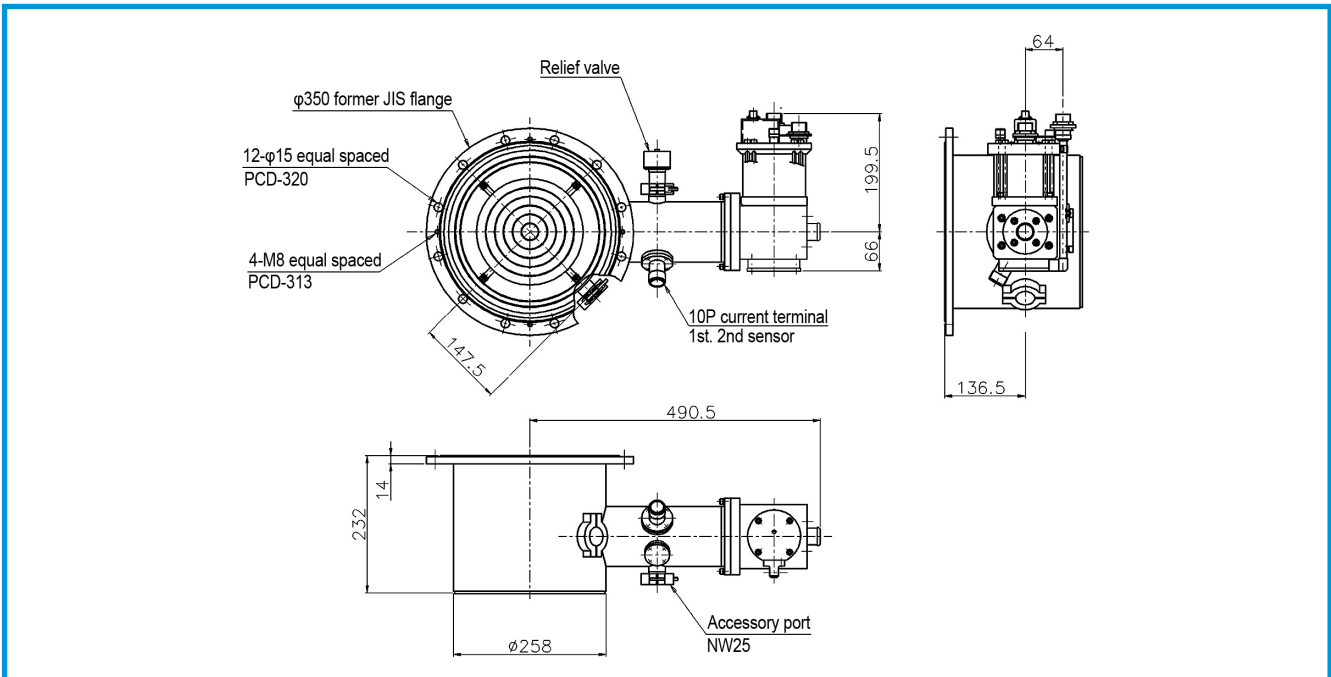
P-087C



P-105C/P-106C

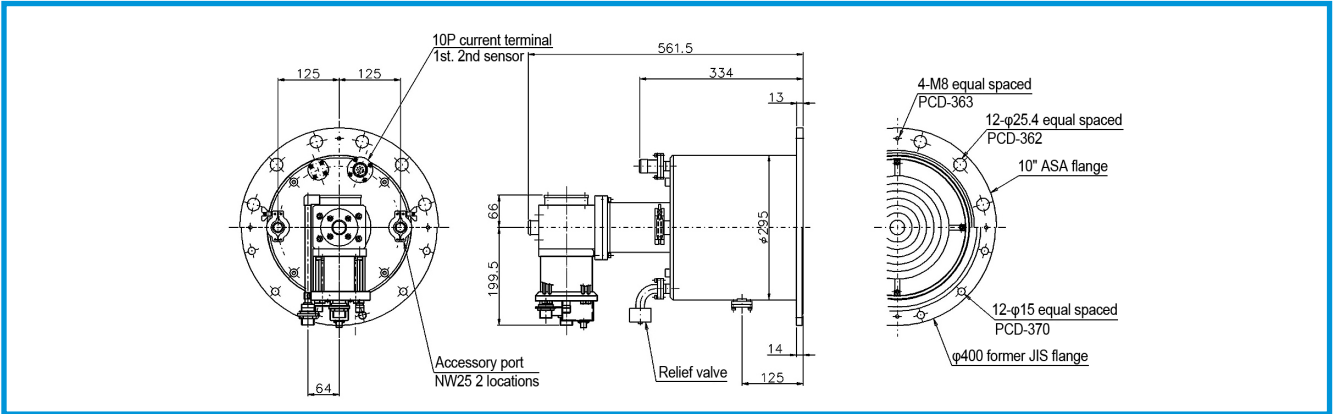


P-105CL/P-106CL

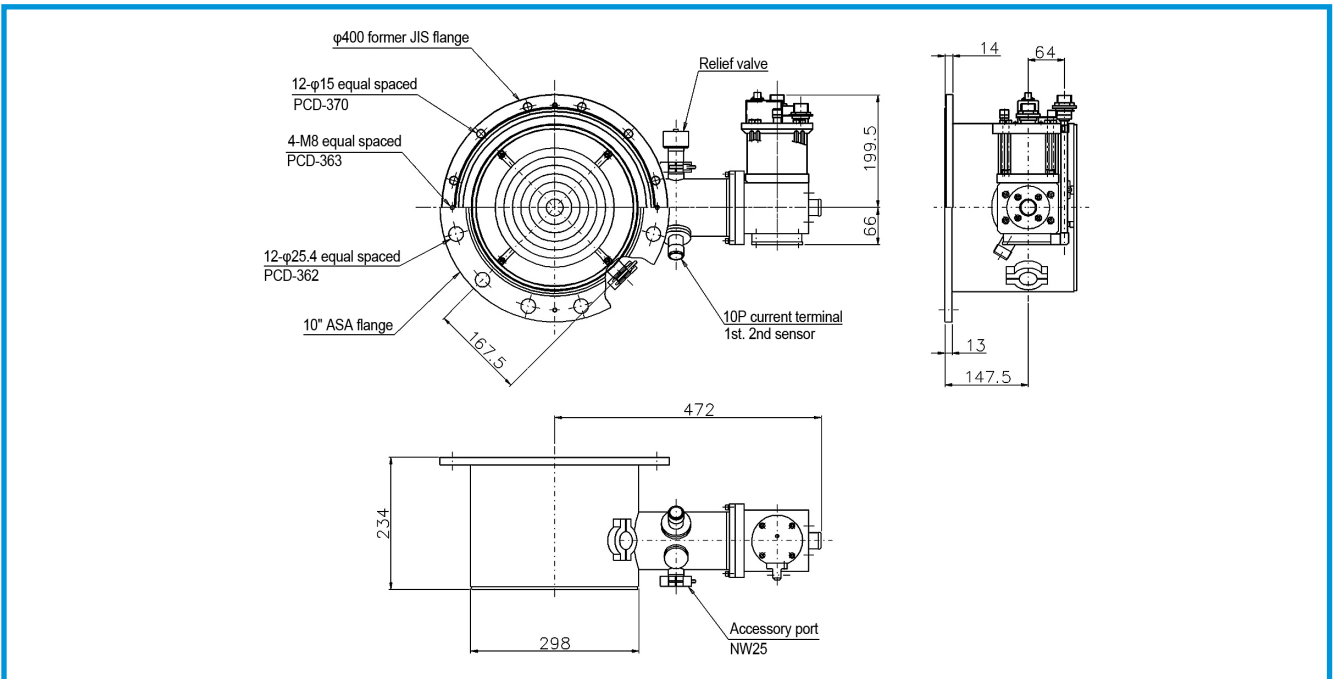


■ Dimensions diagrams

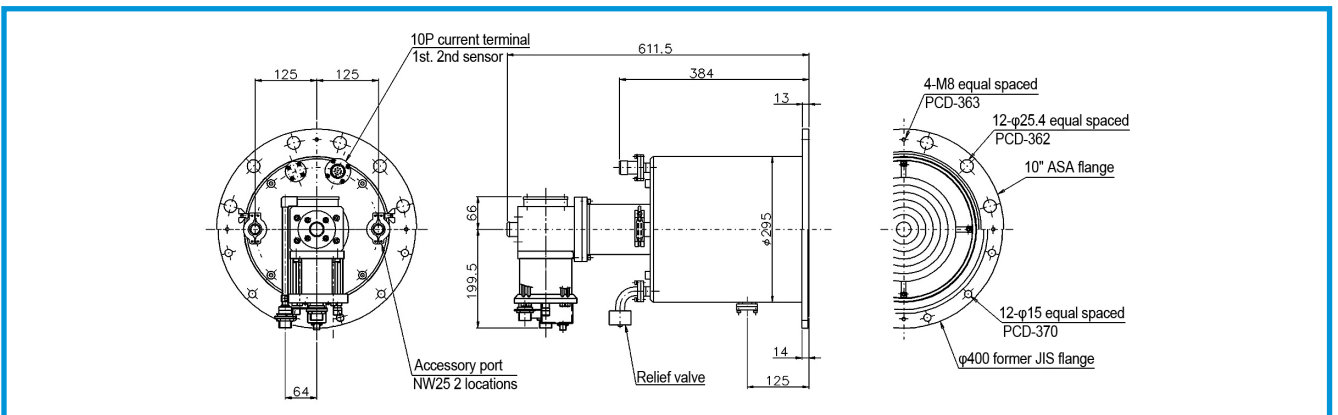
P-124C/P-126C



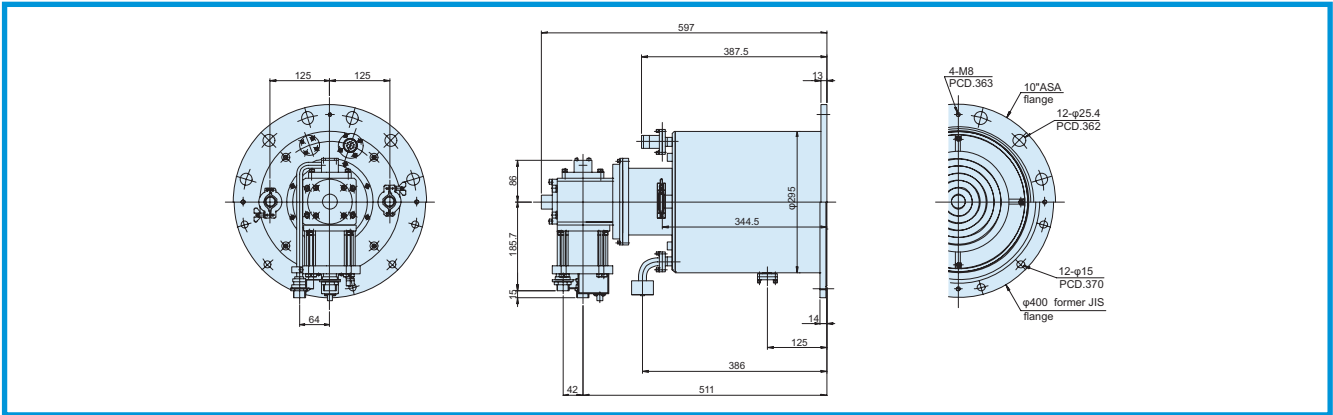
P-124CL/P-126CL



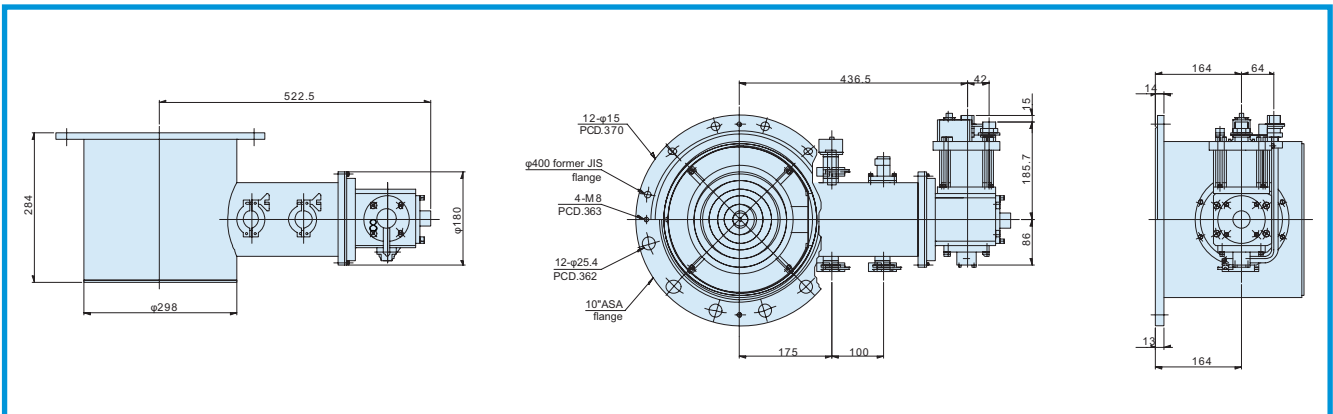
P-127C



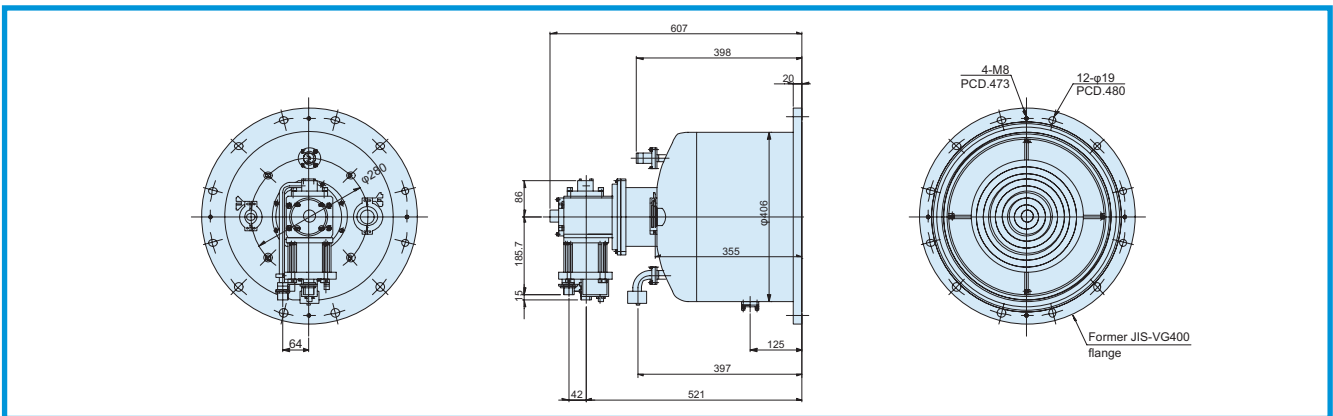
### P-128C



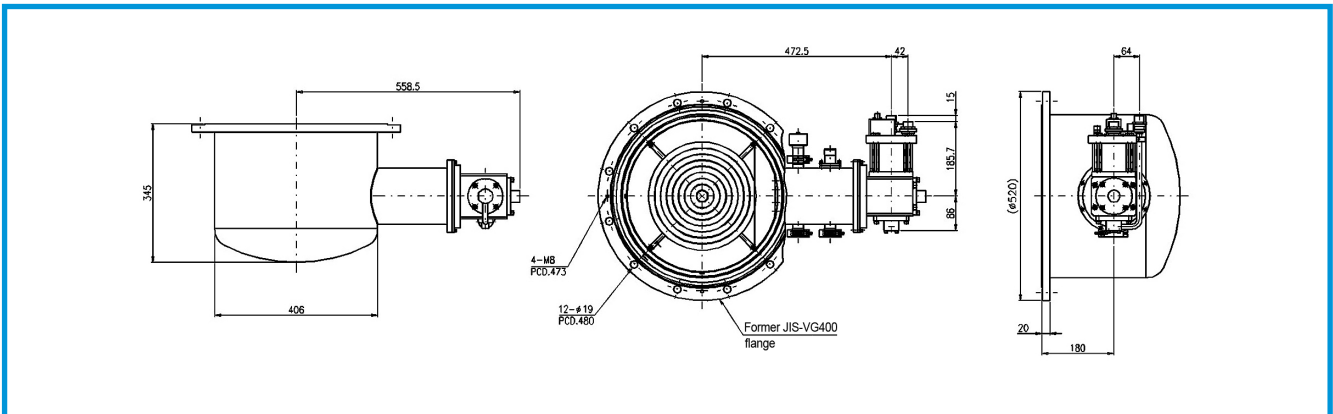
### P-128CL



### P-161C



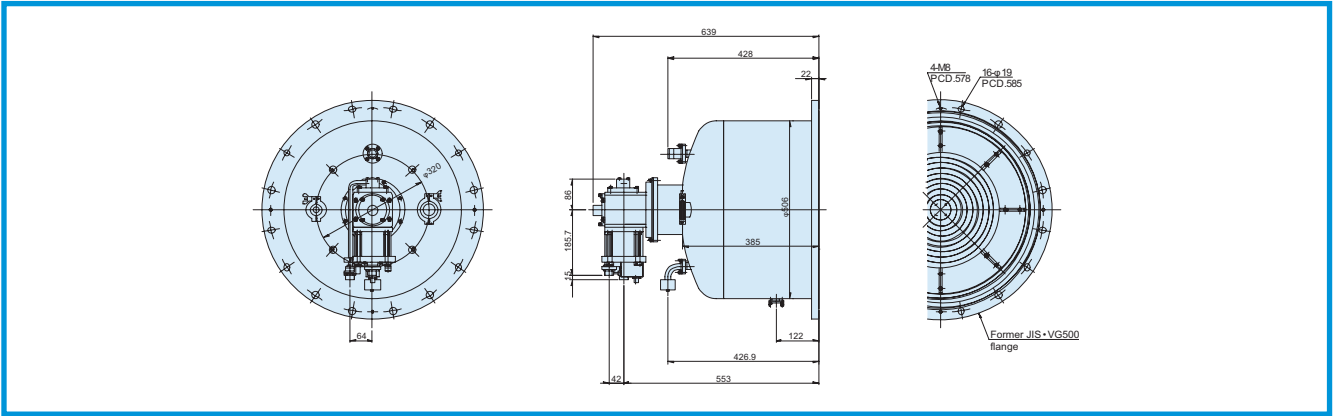
### P-161CL



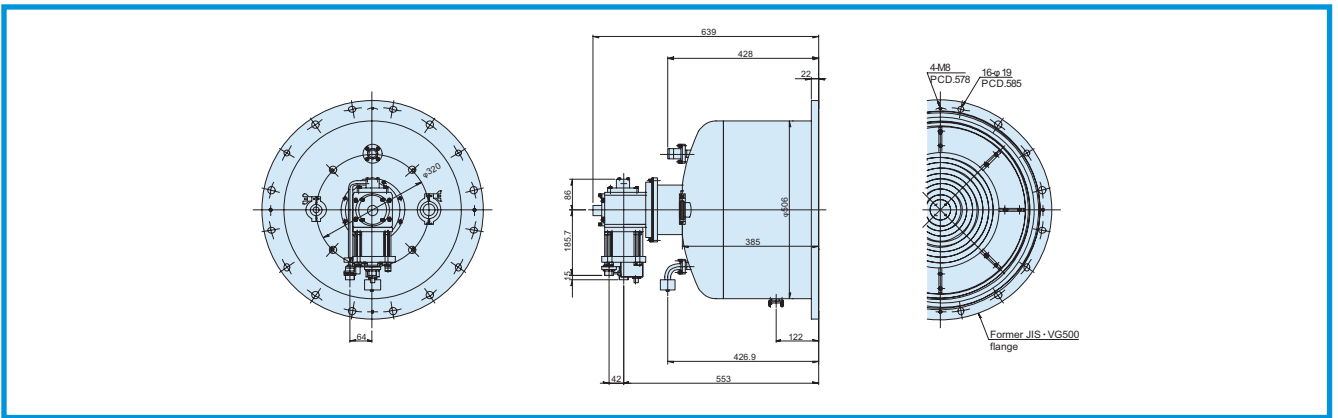


■ Dimensions diagrams

P-201C



P-206C



# Compressor unit for P-421CA POWER series cryopump

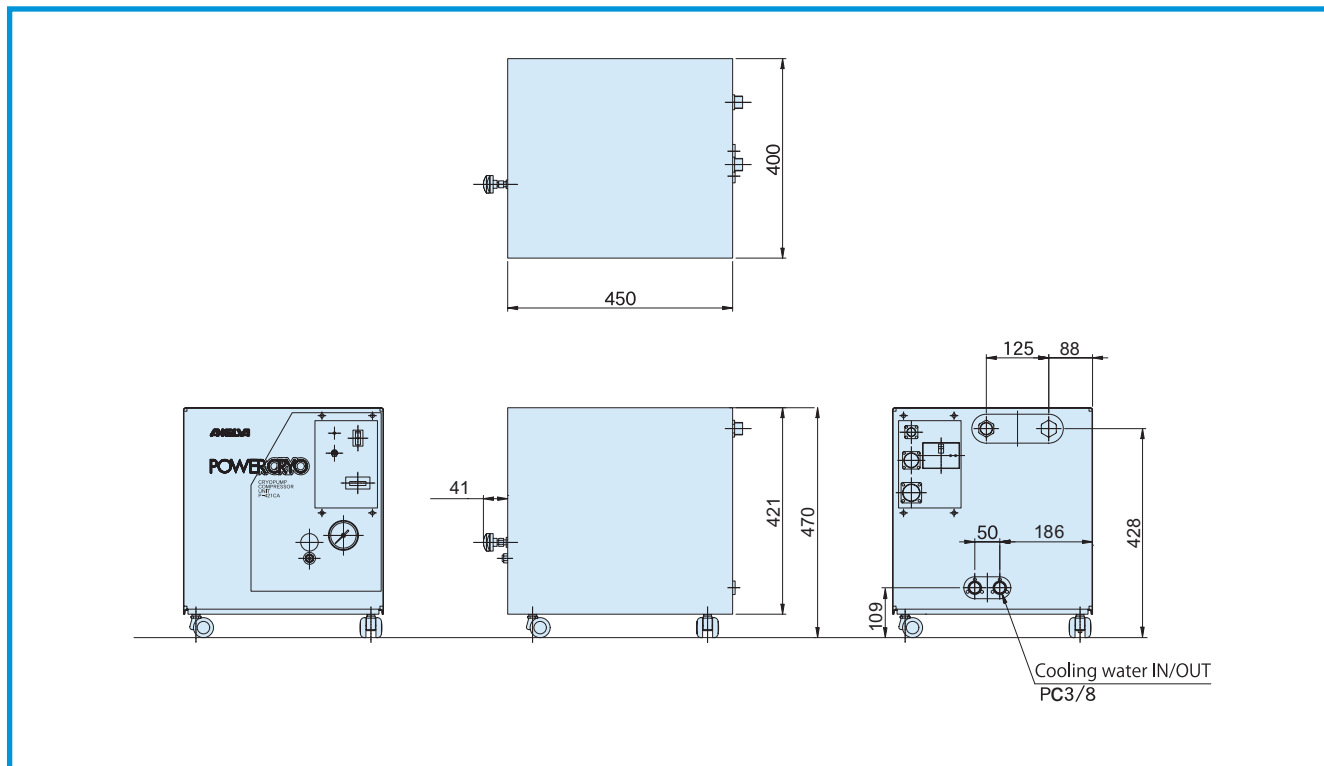


## ■ Specifications

Type		P-421CA
Helium gas pressure (MPa)	Not operating	1.60 to 1.65
	Operating (starting)	2.0 to 2.2
	Operating (running)	1.8 to 2.0
Compressor cooling water	Flow rate(L/H)	180 or more
	Inlet/outlet pressure difference (MPa)	0.13
	Maximum water pressure (MPa)	0.69
	Input temperature (°C)	30 or less
Input power supply/voltage (50/60Hz)		200V AC±10% 3φ
Power consumption (kW)	Steady-state (50Hz)	2.4
	Steady-state (60Hz)	2.8
Ambient temperature range (°C)	Operating	10 to 35
	Storage	-15 to 55
Maintenance interval (h) (adsorber replacement)		Every 30,000h
Dimensions (mm) WxDxH		400x450x470
Weight (kg)		75

## ■ Dimensions diagram

P-421CA



# Compressor unit for P-875CA POWER series cryopump



## Specifications

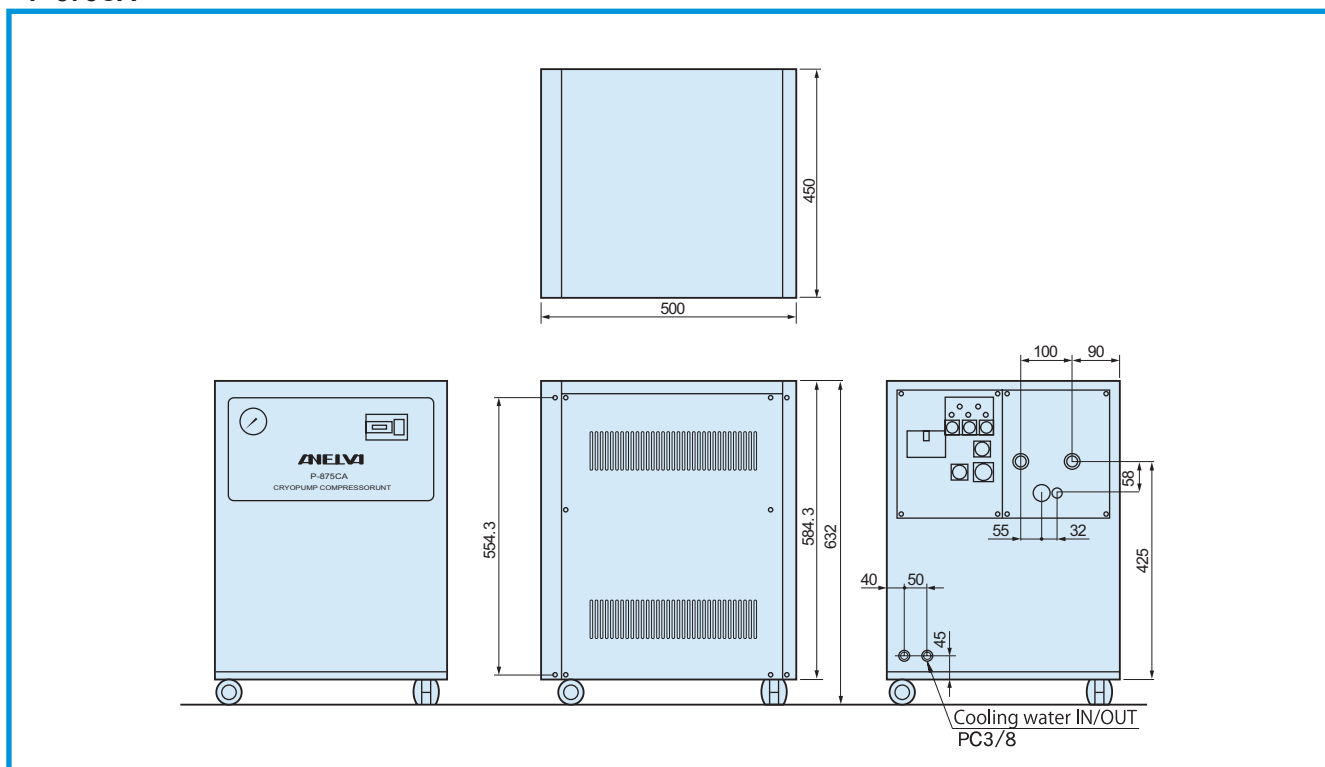
Type	P-875CA	
Helium gas pressure (MPa)	Not operating	1.50 to 1.55
	Operating (starting)	2.0 to 2.1
	Operating (running)	1.8 to 2.0
Compressor cooling water	Flow rate (L/h)	420 or more
	Inlet/outlet pressure difference (MPa)	0.15
	Maximum water pressure (MPa)	0.69
	Inlet temperature (°C)	30 or less
Input power supply/voltage (50/60Hz)	200V AC±10% 3φ	
Power consumption (kW)	Steady-state (50Hz)	4.8
	Steady-state (60Hz)	6.1
Ambient temperature range (°C)	Operating	10 to 35
	Storage	-15 to 55
Maintenance interval (h) (adsorber replacement)	Every 30,000h	
Dimensions WxDxH (mm)	450x500x632	
Weight (kg)	115	

## Features

- Up to three POWER series cryopumps can be operated simultaneously.
- Up to five small POWER<sup>Eco</sup> series cryopumps (8 inch diameter) can be operated simultaneously. (Up to four for 10 or 12 inch diameter.)
- Up to two medium-sized POWER<sup>Eco</sup> series cryopumps can be operated simultaneously.
- Large compressor unit contributing to the extra cooling performance of the POWER series.

## Dimensions diagram

### P-875CA



# P-450CM cryo-temperature monitor

## ■ Summary

The P-450CM cryo-temperature monitor monitors the status and temperature of the POWER/POWER<sup>ECO</sup> series cryopump and cryo trap and controls them by event output.

The Pt-Co resistance temperature sensor of the cryopump second stage or the Pt100 resistance temperature sensor of the cryopump first stage and cryo trap can be used by changing the setting.

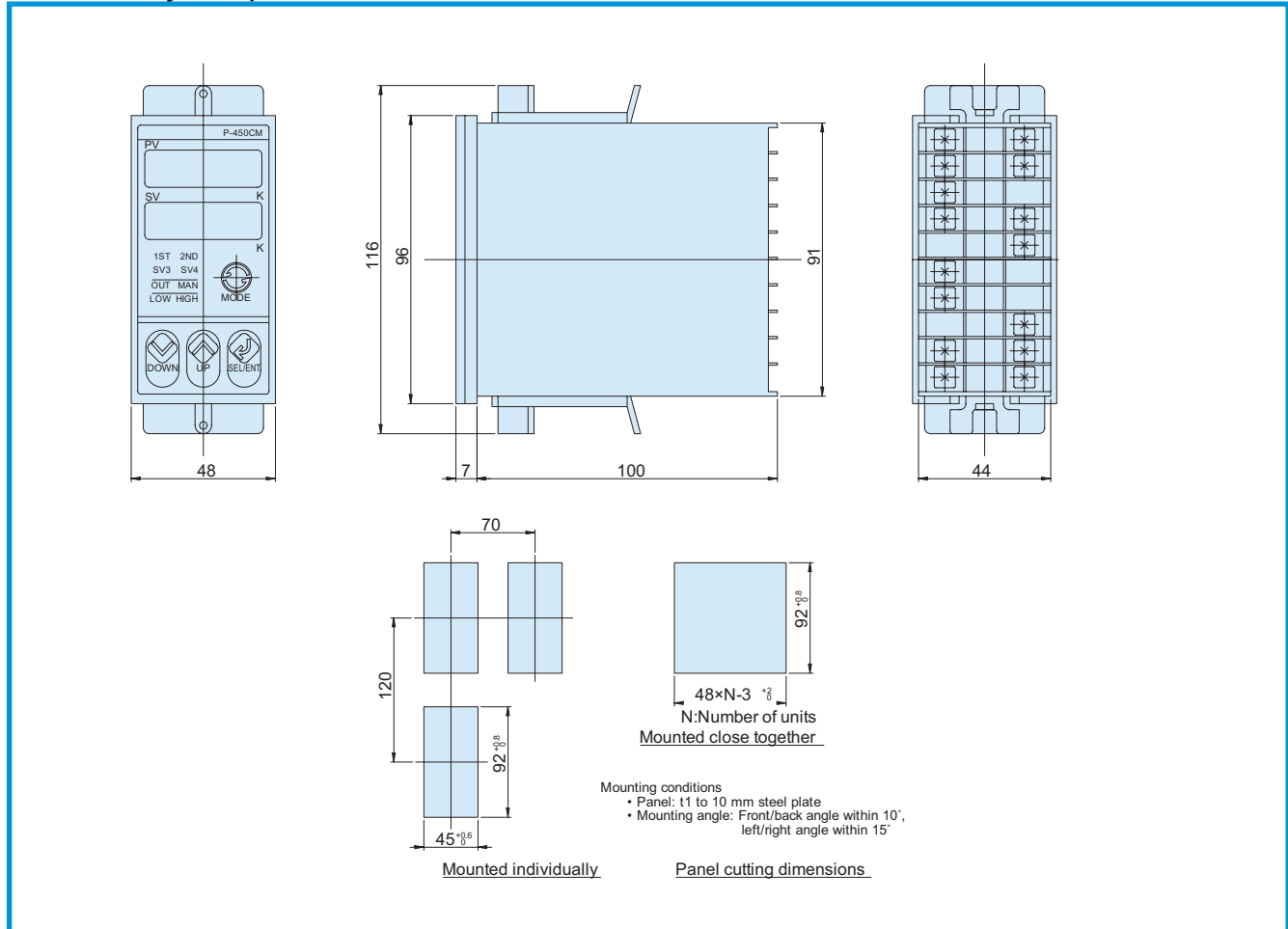
## ■ Specifications

Item	Specifications
Temperature sensor	Pt-Co resistance temperature sensor Pt100 resistance temperature sensor
Output event	Non-voltage contact output 3-points
Rated supply voltage	100 to 240V AC 50/60Hz (free power)
Transmission signal output (Option)	0 to 5V DC

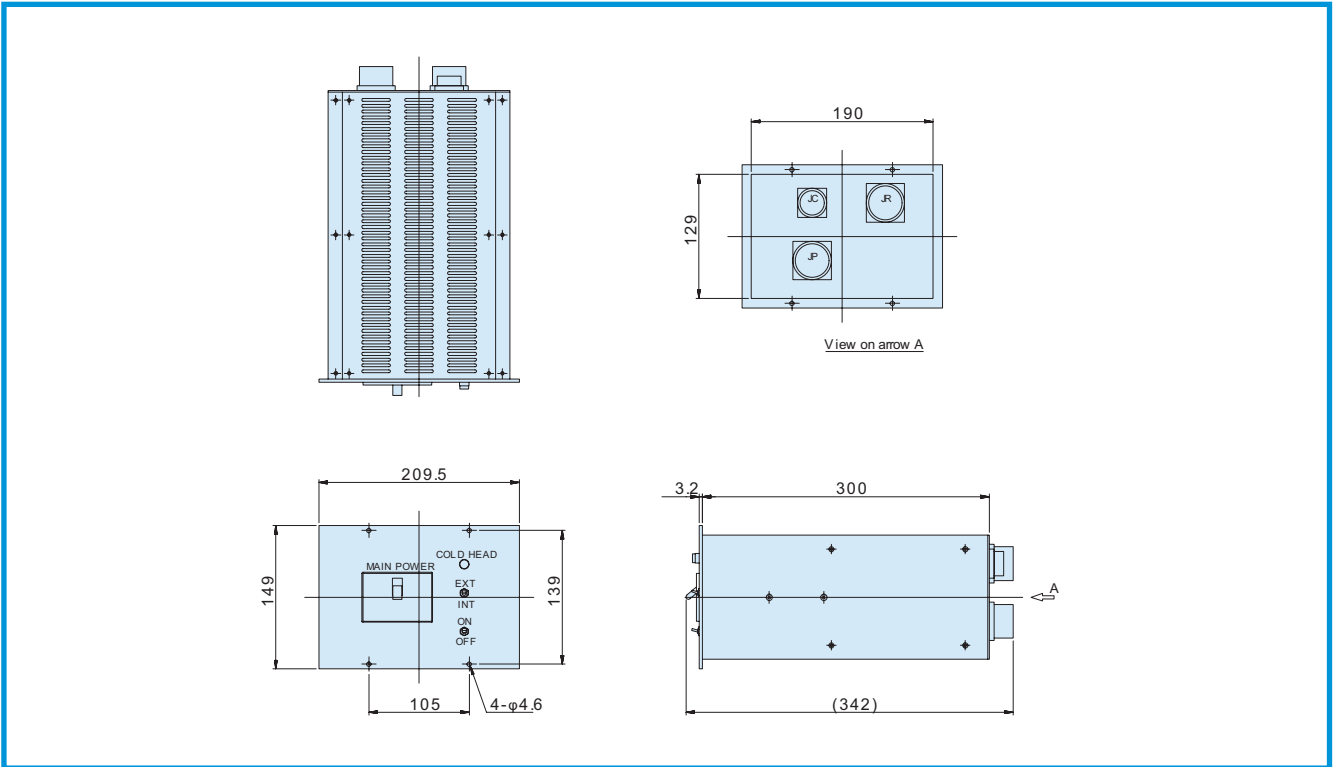


## ■ Dimensions diagrams

### P-450CM cryo-temperature monitor



Cold head driver P-021CD



UL standard compliant products are also available for the compressor unit and cold head driver.

• Ordering Information

Parts Number	Model	Description	Remarks	Code
0112-28831	P-080C-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11380
0112-28849	P-080C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11381
0112-28857	P-080C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11382
0112-28865	P-081C-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11383
0112-28873	P-081C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11384
0112-28792	P-081C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11385
0112-28881	P-081CL-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11386
0112-28899	P-081CL-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11387
0112-28904	P-081CL-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11388
0112-28912	P-082C-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11389
0112-28920	P-082C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11390
0112-28938	P-082C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11391
0112-28946	P-101C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11395
0112-28954	P-122C-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11392
0112-28962	P-122C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11393
0112-28970	P-122C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11394
0112-28988	P-085C-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11850
0112-28996	P-085C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11851
0112-29007	P-085C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11852
0112-28807	P-086C-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11853
0112-29015	P-086C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11854
0112-29023	P-086C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11855
0112-29031	P-086CL-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11856
0112-29049	P-086CL-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11857
0112-29057	P-086CL-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11858
0112-29065	P-087C-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11859
0112-29073	P-087C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11860
0112-29081	P-087C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11861
0112-29099	P-106C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11862
0112-29104	P-106C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11863
0112-29112	P-106CL-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11864
0112-29120	P-106CL-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11865
0112-29138	P-126C-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11866
0112-29146	P-126C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11867
0112-29154	P-126C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11868
0112-29162	P-126CL-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11869
0112-29170	P-126CL-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11870
0112-29188	P-126CL-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11871
0112-29196	P-127C-AN	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11872
0112-29201	P-127C-JN	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11873
0112-29219	P-127C-UN	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11874
0111-03196M	P-128C-A	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11775
0111-26291M	P-128C-J	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11776
0112-29227	P-128C-U	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11777
0111-03879M	P-128CL-A	POWER Cryopump (ASA Flange)	Resistance temperature sensor	11778
0111-53010M	P-128CL-J	POWER Cryopump (Old JIS Flange)	Resistance temperature sensor	11779
0112-28784	P-128CL-U	POWER Cryopump (ICF Flange)	Resistance temperature sensor	11780
0111-13840M	P-161C-J	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11781
0111-03073M	P-201C-J	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11783
0111-02962M	P-206C-J	POWER Cryopump(Old JIS Flange)	Resistance temperature sensor	11784

Note) Contact us for more information about CE (RoHS).

● Ordering Information

Parts Number	Model	Description	Remarks	Code
9009-11488	P-875CA	Compressor Unit	200V AC/3φ water-cooled	11418
9009-11470	P-421CA	Compressor Unit	200V AC/3φ water-cooled	11419
9009-11747	P-021CD-1	Cold Head Driver	200V AC/3φ, with 6M input cable	11786
9005-07328B	P-450CM	Cryo Temperature Monitor	100V AC, for both 1st and 2nd, without power supply or sensor cable	11792
9004-88914B	P-450CM-AL	Cryo Temperature Monitor (Analog output)	100V AC, for both 1st and 2nd, without power supply or sensor cable	11793
A22-02069		He Manifold L-2	Two port assignment type for direct compressor attachment	11524
A22-02070		He Manifold L-3	Three port assignment type for direct compressor attachment	11525
0111-55834,0111-55826		He Manifold L-4	For branch between flexi-hoses, 4 port assignment, R/S	11790
0111-55850,0111-00842		He Manifold L-5	For branch between flexi-hoses, 5 port assignment, R/S	11791
0114-01748D		Eco Unit (5L)	T type branch pipe, with 8Ax1M flexi-hose	11787
A23-00449,A23-00450		15Ax3m Flexible Hose Set	For P-080 to 127, one return/supply set	11550
A23-00648,A23-00649		15Ax6m Flexible Hose Set	For P-080 to 127, one return/supply set	11551
A23-01272,A23-01273		15Ax9m Flexible Hose Set	For P-080 to 127, one return/supply set	11552
A23-10531,A23-10532		15Ax12m Flexible Hose Set	For P-080 to 127, one return/supply set	11556
A23-00451,A23-00452		20Ax3m Flexible Hose Set	For P-128 to 206, one return/supply set	11553
A23-00944,A23-00945		20Ax6m Flexible Hose Set	For P-128 to 206, one return/supply set	11554
A23-01275,A23-01274		20Ax9M Flexible Hose Set	For P-128 to 206, one return/supply set	11555
A23-10533,A23-10534		20Ax12m Flexible Hose Set	For P-128 to 206, one return/supply set	11557

Note) Contact us for more information about CE (RoHS).

## ■ Technical notes

### ● Cryopump structure and pumping principle

The name of each part of the cryopump is shown.

- (1) Refrigerator
- (2) Refrigerator first thermal load stage
- (3) Refrigerator second thermal load stage
- (4) Pump container
- (5) Radiation shield
- (6) Cryosorption panel
- (7) Cryo-condensation panel
- (8) Louver

The cryopump cooling unit has two stages with panels that condense and adsorb gas.

The first thermal load stage (2) has a radiation shield (5) that blocks the heat from the outside and a louver (8) that condenses and traps mainly H<sub>2</sub>O (water vapor) at the pump inlet. It runs at approximately 50 to 80K.

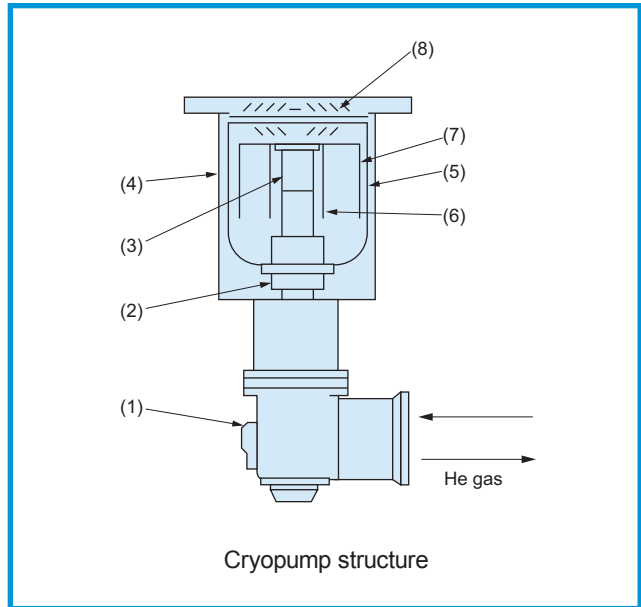
The second thermal load stage (3) runs at approximately 10 to 20K and consists of a cryo-condensation panel which freezes and condenses gases such as N<sub>2</sub> (nitrogen), O<sub>2</sub> (oxygen), and Ar (argon) and a cryosorption panel that adsorbs H<sub>2</sub> (hydrogen), Ne (neon), and He (helium) that do not condense at 10 to 20K.

As described above, the cryopump pumps the gas by

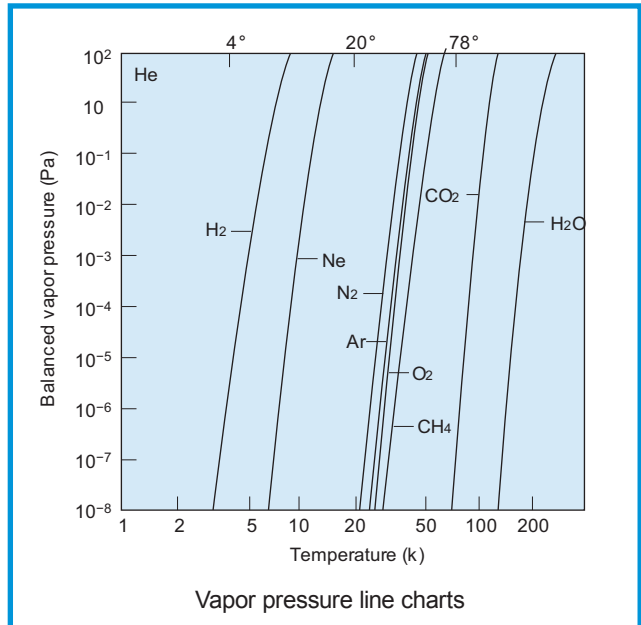
- (1) Cryo-condensation
- (2) Cryosorption

and at 20K or less, it can be seen in the vapor pressure line chart shown at right that all gases except H<sub>2</sub>, Ne, and He will be at 10<sup>-8</sup>Pa or less vapor pressure.

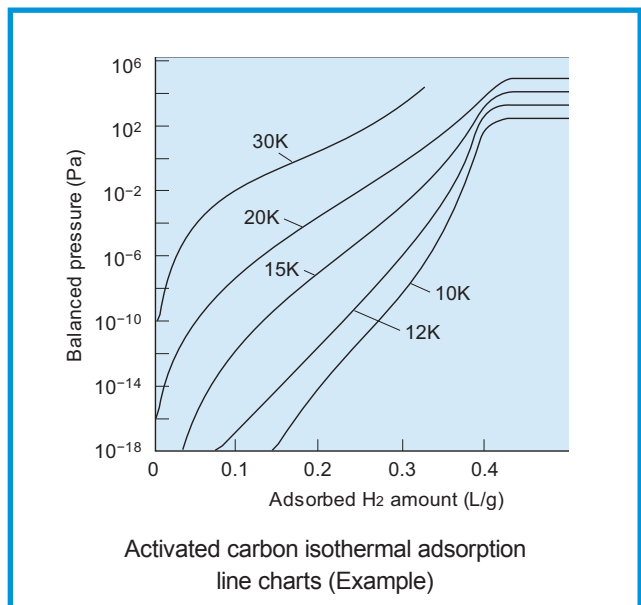
For H<sub>2</sub>, Ne, and He, the example of H<sub>2</sub> in the equal temperature adsorption line chart at right shows that when the temperature decreases and the adsorption volume increases, the balanced pressure becomes sufficiently low. Therefore, it is possible to pump practically any gas.



Cryopump structure



Vapor pressure line charts

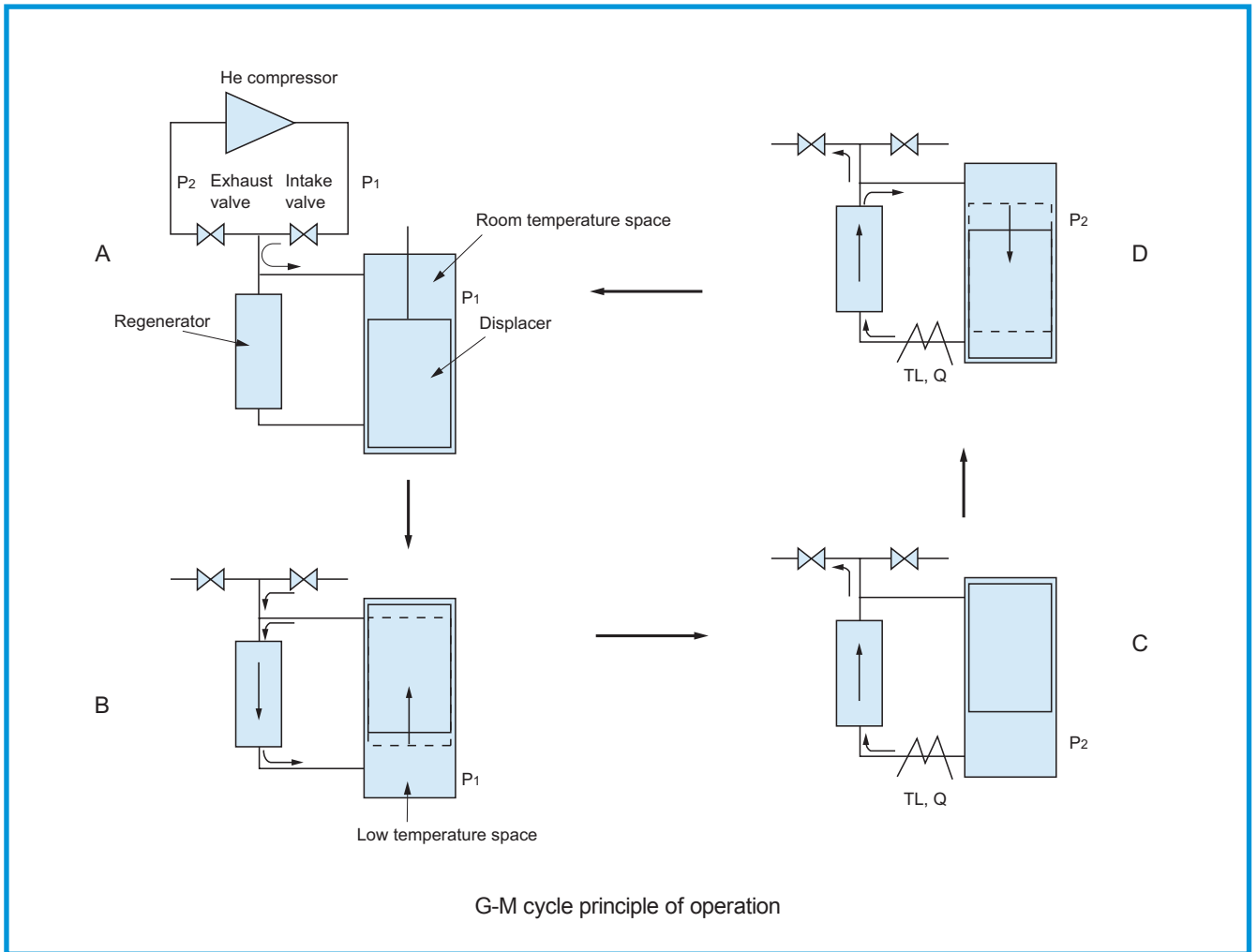


Activated carbon isothermal adsorption line charts (Example)



• **Structure and principle of cryopump refrigerator**

Cooling of the cryopump refrigerator using the G-M refrigeration cycle consists of four cycles.



- A. When the exhaust valve closes and the intake valve opens, the high pressure gas from the compressor fills the room temperature space at the top of the cylinder.
- B. When the displacer moves to the highest point while the intake valve is open, the high pressure gas at the room temperature space is cooled as it passes through the regenerator and moves to the low temperature space at the bottom of the cylinder. During this process, fresh high pressure gas is supplied through the intake valve since the volume of the moving high pressure gas decreases as the temperature drops.
- C. When the intake valve closes and the exhaust valve opens, the high pressure gas in the low temperature space is released, goes through adiabatic expansion, and creates a cold environment (low-temperature low-pressure gas). The low-temperature low-pressure gas cools the regenerator and returns to the intake side of the compressor after it adsorbs the refrigeration load.
- D. When the displacer moves to the lowest point with the exhaust valve open, the low temperature gas in the low temperature space cools the regenerator (the gas itself is heated) and moves to the room temperature space while some gas returns to the compressor.

# Foreline Trap

Foreline Trap 2F

Foreline Trap S

## ■ Summary

By using a foreline trap, the back flow of oil vapor can be prevented from contaminating the inside of the vacuum equipment when rough pumping clean high vacuum equipment using an ion pump or cryopump with an oil-sealed rotary vacuum pump.

The Anelva foreline trap efficiently adsorbs oil molecules using a molecular sieve placed in the gas passage. The foreline trap S efficiently adsorbs water vapor in addition to oil molecules by cooling the molecular sieve using liquid nitrogen.

In addition, the foreline trap has a built-in heater so that the adsorption performance of the molecular sieve can be restored easily by baking.



956-7100

## ● Applications

1. Preventing back flow of oil vapor when rough pumping a system using an ion pump or cryopump with an oil-sealed rotary vacuum pump.
2. Preventing back flow of oil vapor when using an oil-sealed rotary vacuum pump as an auxiliary pump for the turbo molecular pump or oil diffusion pump.
3. Preventing back flow of oil vapor when using an oil-sealed rotary vacuum pump to obtain clean vacuum in other cases.

## ● Specifications (Foreline Trap 2F)

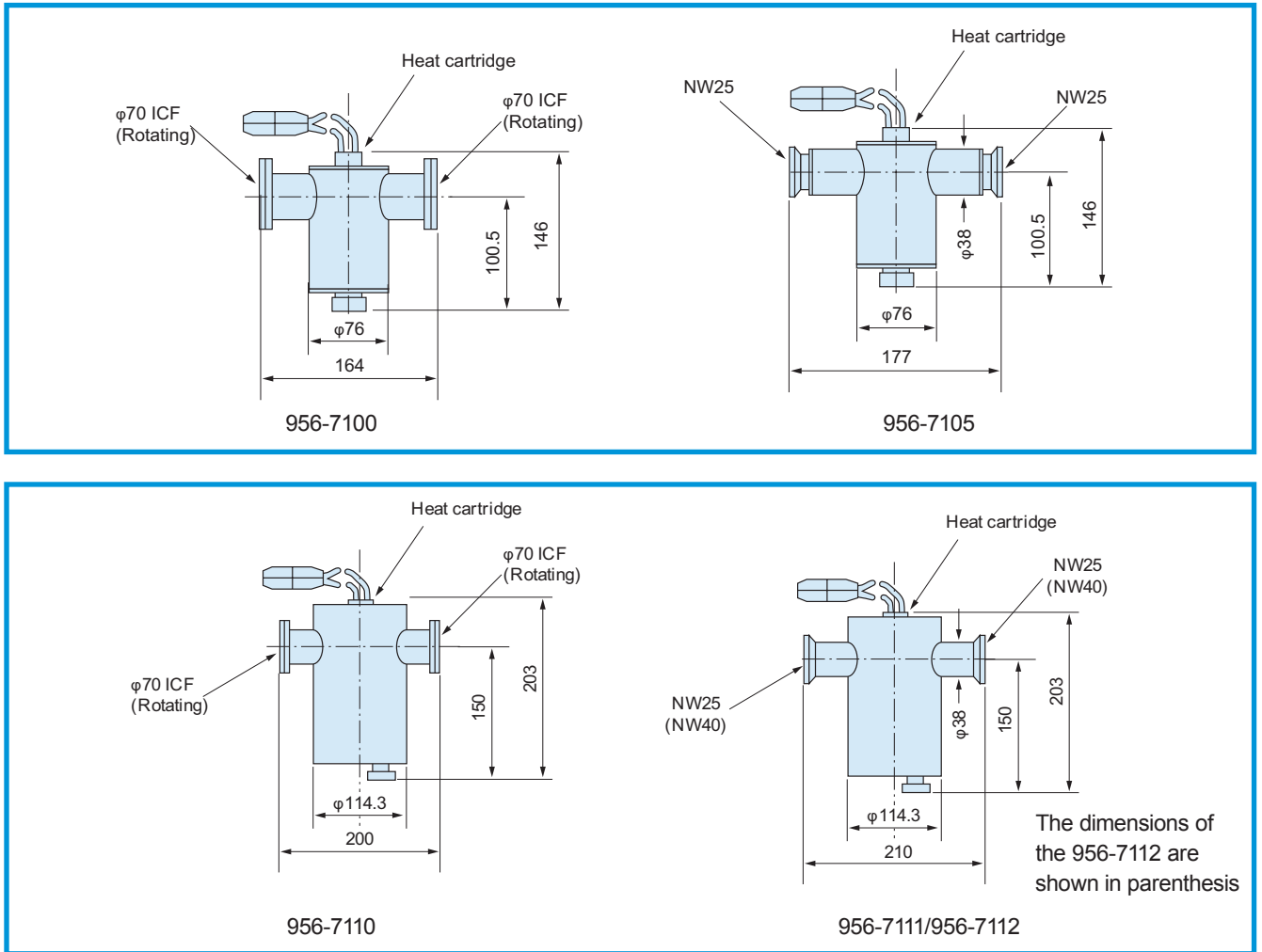
Type	Molecular Sieve capacity (g)*	Weight (kg)**	Heater capacity	Connection flange	Remarks
956-7100	Approximately 55	1.3	Single phase 100V 60W	$\phi 70$ IC <sup>Note1)</sup>	Applicable to equipment with small pumped capacity
956-7105		0.9		NW25 <sup>Note2)</sup>	
956-7110	Approximately 500	2.5	Single phase 100V 125W	$\phi 70$ IC <sup>Note1)</sup>	
956-7111		2.1		NW25 <sup>Note2)</sup>	
956-7112		2.1		NW40 <sup>Note2)</sup>	

\* Uses molecular sieve 13X (filled during shipment). \*\* Excluding molecular sieve.

Note 1) The 953-5014 gasket pack (5 per pack) and bolts/nuts are included as standard.

Note 2) The center ring and clamp are not included. Please order them separately.

• Dimensions diagram



• Foreline Trap S

The trap itself is in the form of a liquid nitrogen container so that it cools efficiently, prevents back flow of oil vapor, has high water vapor adsorption capability and can achieve high ultimate pressure. This simplifies startup of the ion pump in a system using an ion pump.



• Specifications (Foreline Trap S)

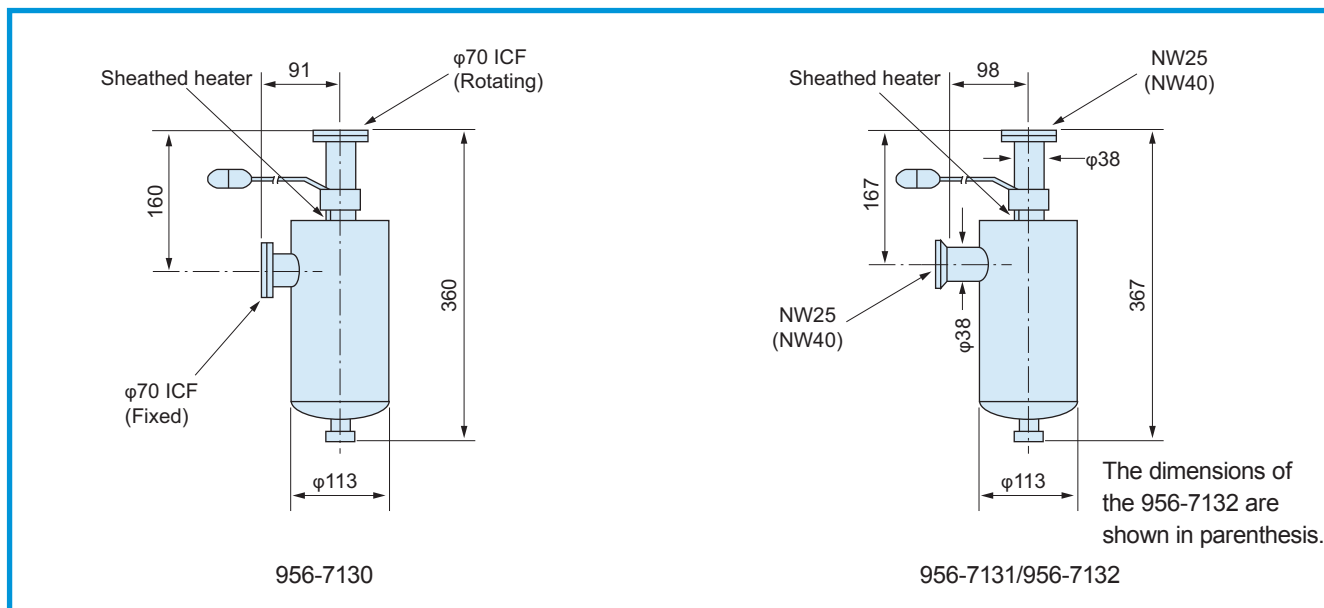
Type	Molecular sieve capacity (g)*	Weight (kg)**	Heater capacity	Connection flange
956-7130	Approximately 500	2.4	Single phase, 100V, 380W	$\phi 70$ ICF <sup>Note 1)</sup>
956-7131		2.0		NW25 <sup>Note 2)</sup>
956-7132		2.0		NW40 <sup>Note 2)</sup>

\* Uses molecular sieve 13X (included in a can at shipment).\*\* Excluding molecular sieve.

Note 1) The 953-5014 gasket pack (5 per pack) and bolts/nuts are included as standard.

Note 2) The center ring and clamp are not included. Please order them separately.

• Dimensions diagram



• Maintenance and consumable parts

Replacement molecular sieve (13X)

Type: 956-7101

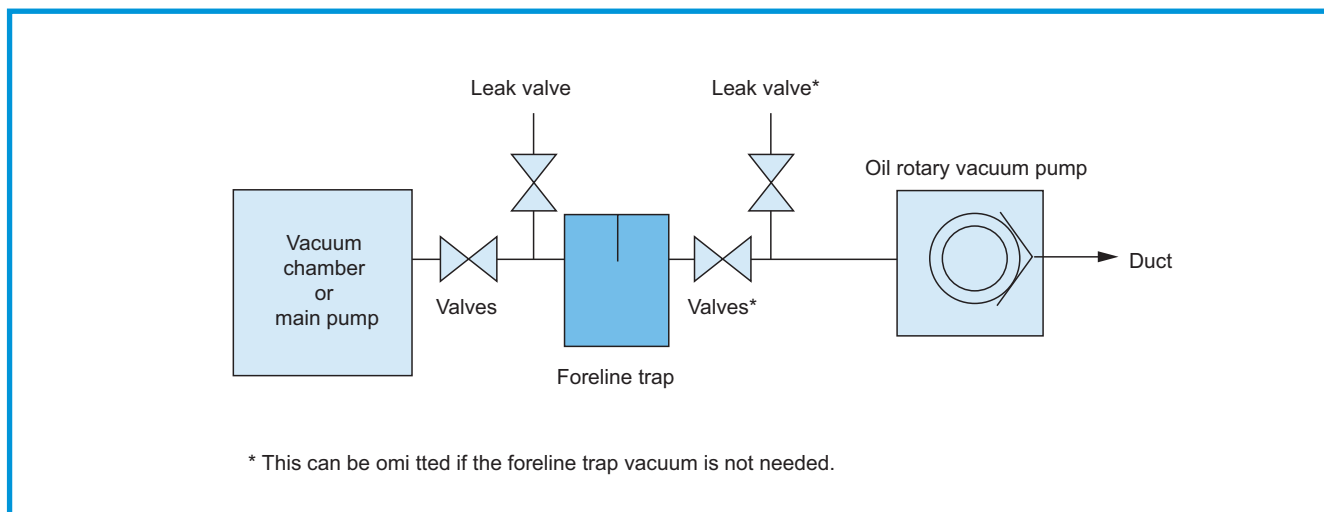
Contents: 500g (in can)

Replacement heater

Type	Applicable trap type	Remarks
956-9100	956-7100 956-7105	100V, 60W Cartridge heater
956-7114	956-7110 956-7111 956-7112	100V, 125W Cartridge heater
944-9150	956-7130 956-7131 956-7132	100V, 380W Sheathed heater

• Usage

The foreline trap is assembled in the vacuum pipe between the vacuum chamber (or main pump) and the oil-sealed rotary pump, as shown in the figure below.



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
P21-03509	956-7100	Fore-Line Trap 2F	Straight type, with $\phi$ 70ICF, with 100V AC/60W heater	13800
A23-00512	956-7105	Fore-Line Trap 2F	Straight type, with NW25 flange, with 100V AC/60W heater	13802
P25-00554	956-7110	Fore-Line Trap 2F	Straight type, with $\phi$ 70ICF, with 100V AC/125W heater	13803
P21-05520	956-7111	Fore-Line Trap 2F(w NW25)	Straight type, with NW25 flange, with 100V AC/125W heater	13804
P21-05172	956-7112	Fore-Line Trap 2F(w NW40)	Straight type, with NW40 flange, with 100V AC/125W heater	13805
P21-03776	956-7130	Fore-Line Trap S(w PY70 ICF)	Angle type, with $\phi$ 70ICF, with 100V AC/380W heater	13801
A22-00091	956-7131	Fore-Line Trap S(w NW25)	Angle type, with NW25 flange, with 100V AC/380W heater	13806
P21-01075	956-7132	Fore-Line Trap S(w NW40)	Angle type, with NW40 flange, with 100V AC/380W heater	13807
825-4619	956-7101	Molecularsieve	500 gram	13810
MOD-41514	956-9100	Cartridge Heater	100V AC/60W for 956-7100/7105	13811
P25-02238	956-7114	Cartridge Heater	100V AC/125W for 956-7110/7111/7112	13813

Note) Contact us for more information about CE (RoHS).

*Memorandum*

# Measurement Instruments & Controllers

Quadrupole Mass Spectrometer (Transducer Type)

Quadrupole Mass Spectrometer (High-speed /High-sensitivity Measurement)

QUADVISION

QUADVISION 3 Mobile

Gas Analysis System

Compact Gas Analysis System C Series

Compact Gas Analysis System D Series

Vacuum Gauges

Transducer Vacuum Gauge Series

Vacuum Gauge Series

Leak Detectors

Helium Leak Detectors

Film Thickness Meter

Crystal Oscillator for Film Thickness Sensor

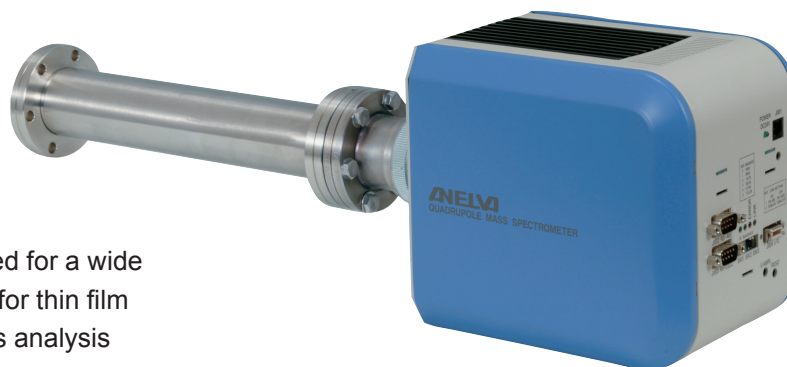
Quadrupole mass spectrometer designed exclusively to be controlled from a PC, meeting the demands for high sensitivity analysis and low emission

CE

RoHS

# Quadrupole Mass Spectrometer (Transducer Type)

M-070QA-TDF, M-101QA-TDF, M-101/201QA-TDM



## ■ Summary

Quadrupole Mass Spectrometer are used for a wide range of applications from gas analysis for thin film manufacturing equipment to furnace gas analysis and accelerator gas analysis.

Quadrupole Mass Spectrometer must have low gas emission and high sensitivity in order to support such applications. The M-101QA-TDF and M-101/201QA-TDM are highly sensitive/functional, low gas emission quadrupole mass spectrometers suitable for such applications, and are designed exclusively to be controlled from a PC.

The M-070QA-TDF is a low-cost quadrupole mass spectrometer ideally suited for residual gas monitoring of various vacuum equipment.

Adequate performance is ensured from management of production equipment vacuum quality to gas analysis for research and development.

## ■ Features

### 1. High sensitivity

- Uses a secondary-emission electron multiplier tube for the detector (M-101/201QA-TDM)

### 2. Low gas emission analyzer tube

- Uses a low gas emission ion source
- Provides a degassing function (\*1)

### 3. Excellent basic performance

- Support for advanced analysis -
- Enables detailed setting of ionization voltage and emission current (\*1)
- Wide dynamic range

\*1: Excluding M-070QA-TDF.

### 4. QUADVISION

- Easy to use Japanese/English control software -
- Multicontroller control (Can control up to eight units at the same time)
- Measured data can be converted to CSV

### 5. Standard equipped with a variety of I/O functions

- Auto measurement signal
- Analog signal input
- Set point output



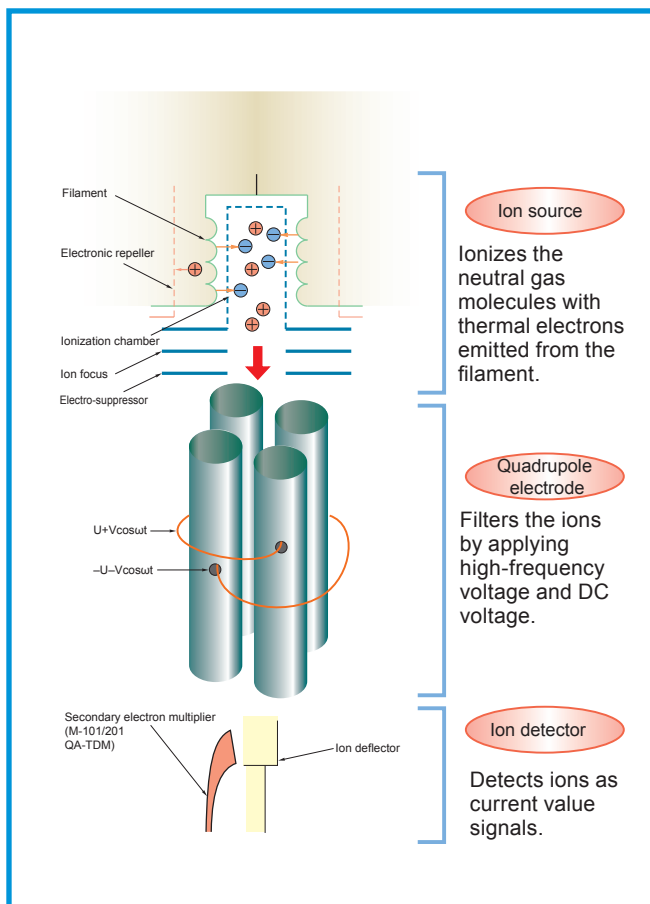
## ■ Selection guide

Application Area	M-070QA-TDF	M-101QA-TDF	M-101QA-TDM	M-201QA-TDM
PVD equipment residual gas monitor	◎	◎	◎	○
CVD equipment residual gas monitor	△	△	△	△
Etching equipment residual gas monitor	△	△	△	△
Vacuum equipment residual gas monitor	◎	◎	◎	○
Ultra-high vacuum equipment residual gas analysis	△	△	◎	○
Accelerator vacuum gas monitor	○	○	◎	○
Inorganic gas analysis	○	○	◎	○
Thermobalance emission gas analysis	△	○	○	◎
Thermal desorption gas analysis	△	○	○	◎
Trace gas analysis	△	△	◎	◎
PFC gas analysis	△	△	○	○
R&D	○	○	◎	◎

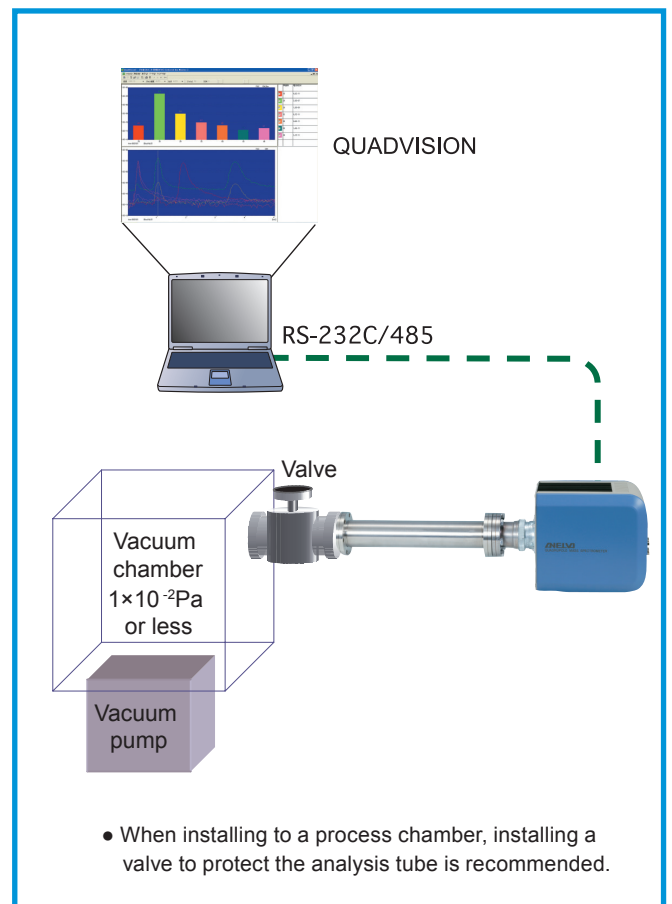
◎: Optimum ○: Applicable △: Contact us for details.

The table above lists the recommended quadrupole mass spectrometers for general use. If you are considering use in applications other than the above, please contact our sales department.

## ■ Analyzer tube principle diagram



## ■ Mass filter connection diagram

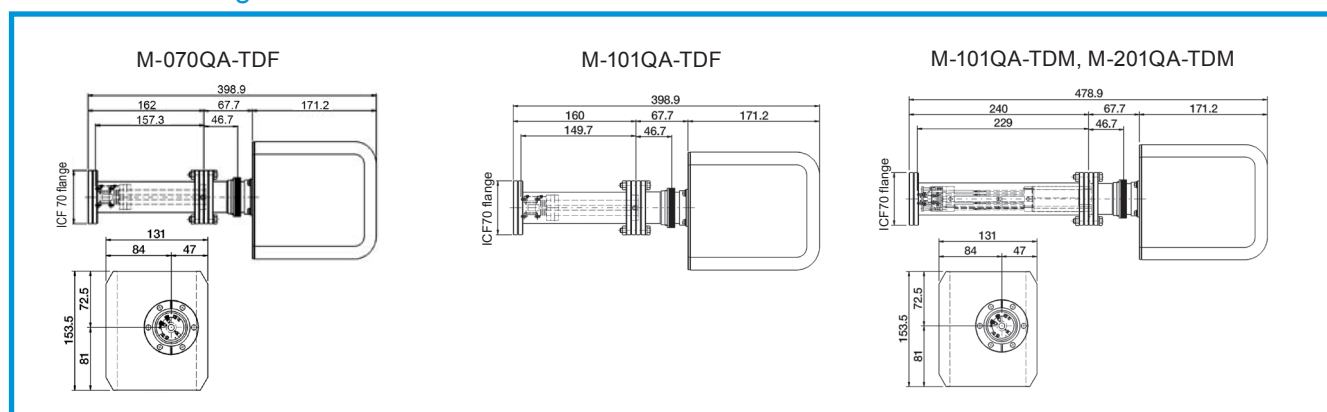


## ■ Specifications

Model		Standard Model		High-sensitivity Model		
		M-070QA-TDF	M-101QA-TDF	M-101QA-TDM	M-201QA-TDM	
Basic performance	Measurement weight range	1 to 70	1 to 100	1 to 100	1 to 200	
	Resolution	M/ΔM≥2M				
	Sensitivity (N <sub>2</sub> )	FC	1.5x10 <sup>-6</sup> A/Pa or more	7.0x10 <sup>-6</sup> A/Pa or more	-	-
		SEM	-		2.5A/Pa or more	1.8A/Pa or more
	Minimum detected partial pressure	6.7x10 <sup>-9</sup> Pa or less	5.0x10 <sup>-10</sup> Pa or less	1.0x10 <sup>-12</sup> Pa or less	1.0x10 <sup>-12</sup> Pa or less	
	Operating pressure	1.3x10 <sup>-2</sup> Pa or less				
Specifications	Detector	FC	○	○	○	
		EM	-	-	○	
	Ion source	Cage type		Cage type (Option: box type <sup>*1</sup> )		
	Filament	Yttria coated iridiumx2	Yttria coated iridiumx2 Option: Tungsten <sup>*1</sup>			
	Baking temperature	250°C (Analyzer tube only)				
	Degas function	-	Electron bombardment			
	Connection flange	φ70ICF				
	Rated input voltage	100V to 240V AC				
	Maximum power consumption	60W	90W			
	Weight	Analyzer tube	1.5kg	1.4kg	1.6kg	
		Controller	2.1kg	2.2kg		
	Communication interface	RS-232C/485				
	Standard software	QUADVISION				
RoHS, CE marking	compliant					

\*1 Please contact us for specifications of options.

## ■ Dimensions diagram



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-44854	M-201QA-TDM(W)	Quadrupole Mass Spectrometer	200amu, M type, W-FIL, AC adapter included, no communication cable* <sup>1</sup>	20090* <sup>2</sup>
0161-44846	M-201QA-TDM(Y)	Quadrupole Mass Spectrometer	200amu, M type, Y-FIL, AC adapter included, no communication cable* <sup>1</sup>	20091* <sup>2</sup>
0161-44901	M-101QA-TDM(W)	Quadrupole Mass Spectrometer	100amu, M type, W-FIL, AC adapter included, no communication cable* <sup>1</sup>	20092* <sup>2</sup>
0161-44896	M-101QA-TDM(Y)	Quadrupole Mass Spectrometer	100amu, M type, Y-FIL, AC adapter included, no communication cable* <sup>1</sup>	20093* <sup>2</sup>
0161-46466	M-101QA-TDF(W)	Quadrupole Mass Spectrometer	100amu, F type, W-FIL, AC adapter included, no communication cable* <sup>1</sup>	20094* <sup>2</sup>
0161-46474	M-101QA-TDF(Y)	Quadrupole Mass Spectrometer	100amu, F type, Y-FIL, AC adapter included, no communication cable* <sup>1</sup>	20095* <sup>2</sup>
0160-09509	M-070QA-TDF	Quadrupole Mass Spectrometer	70amu, F type, Y-FIL, AC adapter included, no communication cable* <sup>1</sup>	20096* <sup>2</sup>
0160-06438	M-201QA-TDM(Re)	Quadrupole Mass Spectrometer (box type ion source)	200amu, M type, Re-FIL, box type ion source, AC adapter included, no communication cable* <sup>1</sup>	20190* <sup>2</sup>
0160-06446	M-101QA-TDM(Re)	Quadrupole Mass Spectrometer (box type ion source)	100amu, M type, Re-FIL, box type ion source, AC adapter included, no communication cable* <sup>1</sup>	20191* <sup>2</sup>
N20069218		RS232C Cable (1.5m) for Quadrupole Mass Spectrometer	Cross cable	20290
N20069220		RS232C Cable (3m) for Quadrupole Mass Spectrometer	Cross cable	20291
N20069232		RS232C Cable (5m) for Quadrupole Mass Spectrometer	Cross cable	20292
N20069244		RS232C Cable (10m) for Quadrupole Mass Spectrometer	Cross cable	20293
N20096390	COM-1 (USB) H	USB-RS232C Converter		20430
0161-47690		RS485 Y Cable Set (5m)	RS-485 cable 5m + Y cable (0.3m)	20296
0161-47750		RS485 Y Cable Set (10m)	RS-485 cable 10m + Y cable (0.3m)	20297
0161-47713		RS485 Y Cable Set (15m)	RS-485 cable 15m + Y cable (0.3m)	20298
0161-47721		RS485 Y Cable Set (20m)	RS-485 cable 20m + Y cable (0.3m)	20299
N20097497	COM-1D(PM)	RS-485 Card		20390
N20097928	COM-2PD(PC1)H	RS-485 Board		20391
N20097980	COM-1PD (USB)H	USB-RS485 Converter		20392
N20073881	PARANI-SD1000	Blue Tooth Serial Conversion Adapter	For QV mobile	20431
0161-48036		AC Adapter Extension Cable (5m)	For M-010/101/201QA	20395
0161-48044		AC Adapter Extension Cable (10m)	For M-010/101/201QA	20396
0161-48052		AC Adapter Extension Cable (15m)	For M-010/101/201QA	20397
H11-27574		NIST Library Data Conversion Software	For QUADVISION-WIN7	20422
0161-42909	TD-W-FIL	W Filament for TD-MASS		20490
0161-41822	TD-Y-FIL	Y Filament for TD-MASS		20491
0161-75504		Ion Source for M-070		20493
P15-58845	TD-Re-FIL	Re Filament for TD-MASS (Box type ion source)	For M-101/201	20492
0190-00512	V-040LV-MMI	DN40 Manual L Type Valve MSB	Protection valve for M-101/201	30111

Notes \*1 The quadrupole mass spectrometer includes dedicated software QUADVISION (CD version).

\*2 Indicates CE (RoHS) compliant. Contact us for other products.

# Quadrupole Mass Spectrometer (High-speed /High-sensitivity Measurement)

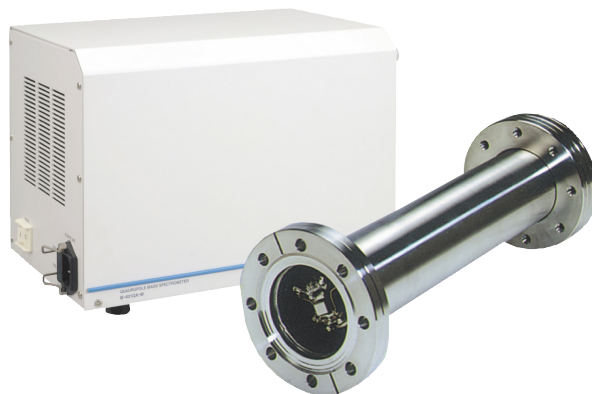
CE	RoHS
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**M-401QA-MU/G**

## ■ Summary

The M-401QA-MU/G is a high-performance/high-functionality quadrupole mass spectrometer capable of measuring weight up to 410amu.

As a general purpose mass spectrometer, the M-401QA-MGSY/ MUSY has increased measurement speed of up to 10 times that of our previous product.



## ■ Features

### 1. High-speed measurement support (M-401QA-MGSY/MUSY)

Obtains  $m/Z=1$  to 410 data at 1-second intervals

### 2. Two types of ion source

Selectable between UHV type (cage type) and gas feedthrough type (box type)

### 3. High-sensitivity (M-401QA-MGHY/ MUHY)

8-digits dynamic range

### 4. Low gas emission analyzer tube

Uses a low gas emission ion source  
Provides a degassing function

## ■ Selection guide

Application Area	High-speed Type		High-sensitivity Type	
	M-401QA-MGSY	M-401QA-MUSY	M-401QA-MGHY	M-401QA-MUHY
Ultra-high vacuum equipment residual gas analysis	○	◎	○	◎
Inorganic gas analysis	○	○	◎	○
Thermobalance emission gas analysis	◎	○	◎	○
Thermal desorption gas analysis	◎	○	◎	◎
Trace gas analysis	○	△	◎	◎
PFC gas analysis	△	○	○	○
R&D	◎	◎	◎	◎

◎: Optimum ○: Applicable △: Contact us for details.

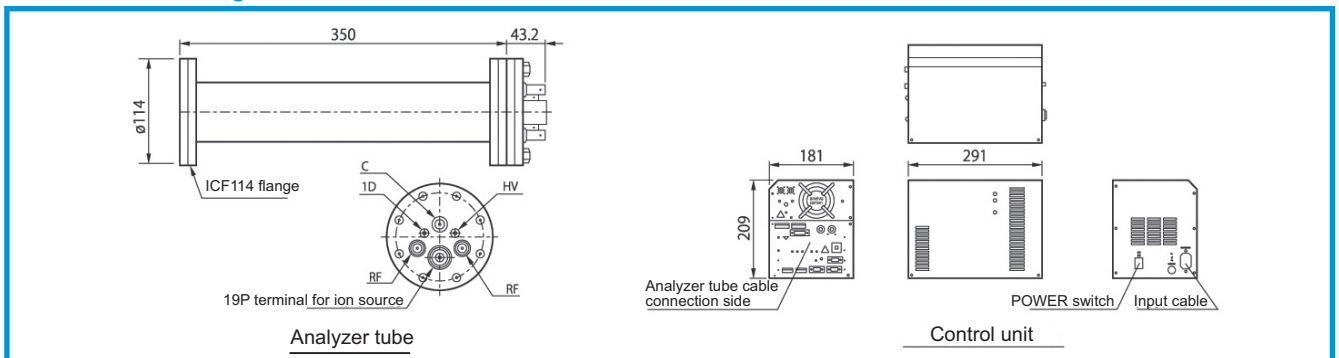
The table above lists the recommended quadrupole mass spectrometers for general use. If you are considering use in applications other than the above, please contact our sales department.

## Specifications

Model		High-speed type		High-sensitivity type	
		M-401QA-MGSY	M-401QA-MUSY	M-401QA-MGHY	M-401QA-MUHY
Basic performance	Weight	1 to 410			
	Resolution	M/ΔM ≥ 2M			
	N <sub>2</sub> sensitivity   SEM	4.0x10 <sup>-1</sup> A/Pa	4.0A/Pa	4.0x10 <sup>-1</sup> A/Pa	4.0A/Pa
	Minimum detected partial pressure	≤ 5.0x10 <sup>-12</sup> Pa		≤ 1.0x10 <sup>-12</sup> Pa	
	Maximum operating pressure	1.3x10 <sup>-2</sup> Pa or less			
	Dynamic range	7 digits		8 digits	7 digits
	(high-speed)	5 digits		-	-
Specifications	Ion source shape	Gas inlet type (box type)	UHV type (cage type)	Gas inlet type (box type)	UHV type (cage type)
	Filament type	Yttria coated iridium <sup>*1</sup>			
	Baking temperature	300°C (Analyzer tube only)			
	Degas function	Ion source heater	Electron bombardment	Ion source heater	Electron bombardment
	Sweep speed	1mSec/amu -		10mSec/amu -	
	Connection flange	φ114ICF			
	Rated input voltage	100V to 240V AC			
	Maximum power consumption	300W			
	Weight	Analyzer tube	5.1kg		
		Controller	6.2kg		
	Communication interface	RS-485/USB			
	Standard software	QUADVISION			
RoHS, CE marking	compliant				

\*1 Optional filament materials are available. Please contact us for details.

## Dimensions diagram



## Ordering information

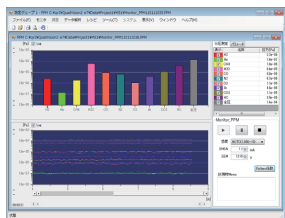
Parts Number	Model	Description	Remarks	Code
0161-81000	M-401QA-MGSY	Quadrupole Mass Spectrometer (Gas Induction Ion source type)	410amu, gas inlet type (box type) high-speed type, Y203-FIL, no communication cable*1	20110*2
0161-81026	M-401QA-MUSY	Quadrupole Mass Spectrometer (UHV Type Ion source)	410amu, UHV type (cage type) high-speed type, Y203-FIL, no communication cable*1	20111*2
0161-80957	M-401QA-MGHY	Quadrupole Mass Spectrometer (Gas Induction Ion source type)	410amu, gas inlet type (box type) high-sensitivity type, Y203-FIL, no communication cable*1	20112*2
0161-80973	M-401QA-MUHY	Quadrupole Mass Spectrometer (UHV Type Ion source)	410amu, UHV type (cage type) high-sensitivity type, Y203-FIL, no communication cable*1	20113*2
0161-47690		RS485 Y Cable Set (5m)	RS-485 cable 5m + Y cable (0.3m)	20296
0161-47750		RS485 Y Cable Set (10m)	RS-485 cable 10m + Y cable (0.3m)	20297
0161-47713		RS485 Y Cable Set (15m)	RS-485 cable 15m + Y cable (0.3m)	20298
0161-47721		RS485 Y Cable Set (20m)	RS-485 cable 20m + Y cable (0.3m)	20299
N20097980	COM-1PD/USB/H	USB-RS485 Converter		20392
H11-27574		NIST Library Data Conversion Software	for QUADVISION2-WIN7	20422
0161-31411	401G-Y203-FIL	Filament for TD-MASS (box type)	Box type filament for M-401QA (Y203)	20130
0161-51966	401U-Y203-FIL	Filament for TD-MASS (Gas Induction type)	Cage type filament for M-401QA (Y203) IS integrated	20131

Notes \*1 The quadrupole mass spectrometer includes dedicated software QUADVISION (CD version).

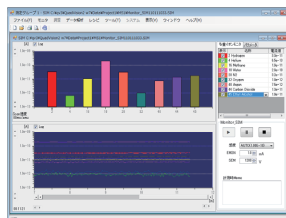
\*2 Indicates CE (RoHS) compliant. Contact us for other products.

# QUADVISION

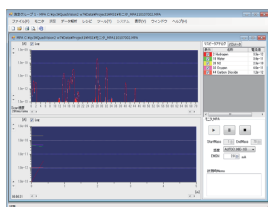
Easy measurement with simple operation



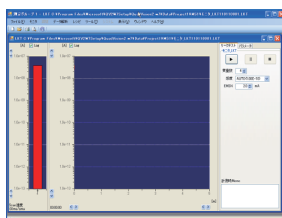
Partial pressure measurement



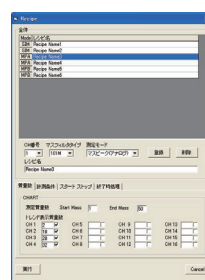
Multiple ion detection



Mass peak analog/bar



Leak test



Recipe/sequence measurement

Measurements

## ■ QUADVISION specifications

Compatible quadrupole mass spectrometer	M-070QA-TDF M-101/201QA series	RS-232C/485 communication
	M-401QA series	USB/RS-485 communication
Measurement modes	Multiple ion detection (SIM)	Weight trend monitor with up to 16 channels
	Mass peak monitor (MPM)	Continuous mass spectrum measurement of specified range
	Leak test (LT)	Leak test at specified weight
	Partial pressure measurement (PPM)	Fixed 10 components Partial pressure measurement (H <sub>2</sub> , He, CH <sub>4</sub> , H <sub>2</sub> O, CO, N <sub>2</sub> , O <sub>2</sub> , Ar, CO <sub>2</sub> , HC, + total pressure)
Other features	Recipe function	
	Area calculation	
	Adjustment mode (weight calibration, waveform adjustment)	
	CSV conversion of stored data	
	Status check	
	Automatic measurement, analog input (0 to 10V), set point output	
	Pressure reading	Pressure values can be loaded into QUADVISION by RS-232C communication <sup>*1</sup>
Options	Temperature reading	Temperature values can be loaded into QUADVISION by RS-232C communication <sup>*2</sup>
	NIST conversion	Saved data may be converted to format searchable in NIST library
Personal computer specifications	OS	Windows 7
	Interface	RS-232C (9P)/485 port/USB

Note

\*1 A Canon ANELVA specified vacuum gauge and cable must be used when reading pressure.

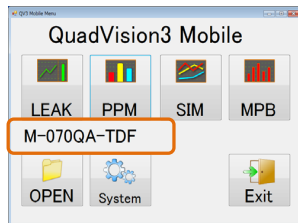
\*2 A Canon ANELVA specified temperature control module and cable must be used when reading temperature.

# QUADVISION 3 Mobile

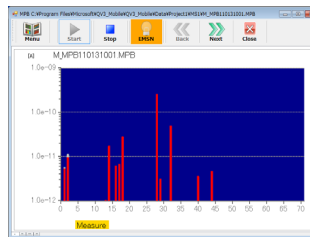
Simplified mobile software for QUADVISION.

Easy operation and measurement with touch panel support

- Easy partial pressure management and leak test
- Touch panel support
- Capable of wireless (Bluetooth) measurement



Menu screen



Measurement screen

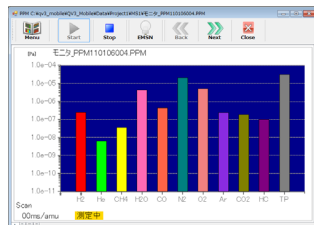
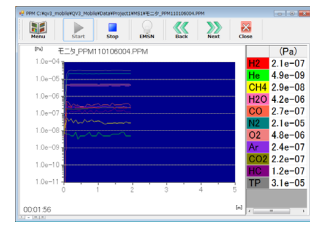


Chart screen



Trend screen

M-070QA-TDF			
H2	2.3e-07	N2	2.1e-05
He	8.1e-09	O2	4.9e-06
CH4	4.4e-08	Ar	2.3e-07
H2O	4.1e-06	CO2	1.8e-07
CO	3.0e-07	HC	1.3e-07
		TP	3.1e-05

Numeric value screen

Parameters screen

Switch screens as needed.

Measurements

## ■ QUADVISION 3 Mobile details

Compatible quadrupole mass spectrometer	M-070QA-TDF, M-101/201TDM series
Communication specifications	Wireless specification: Bluetooth Wired specification: RS-232C
Measurement modes	Multiple ion detection (SIM) Mass peak monitor (MPM) Leak test (LT) Partial pressure measurement (PPM)
Other features <sup>*3)</sup>	Touch panel support 1 set point output <sup>*1)</sup> Status check function Data save function <sup>*2)</sup>
PC specification	OS: Windows 7 Interface: RS-232C, Bluetooth

\*1) Set point output is performed from the quadrupole mass spectrometer controller.

\*2) Saved data can be reproduced and modified using the QUADVISION software.

\*3) There is no adjustment mode. Use the separate QUADVISION software.



# Compact Gas Analysis System C Series

M-070/101/201GA-C series



## ■ Summary

The C Series is a compact gas analysis system offering a high degree of freedom using a quadrupole mass spectrometer. Select the system configuration that meets your measurement needs.

## ■ Features

### 1. Flexible customization

Options tailored to individual applications are available in addition to the basic configuration to meet your measurement needs.

### 2. Space saving

Small installation space of only W480mm × D500mm.

### 3. Easy operation

Pumping controlled with a single switch. Interlock functions available for pumping/measurement.

## ■ Combination example

Select the configuration that meets your needs.

Category	Measurement Application	Basic Structure	Recommended Option	Others
		Type	Feedthrough System Selection	
Vacuum equipment gas analysis	Residual gas measurement/ process measurement	M-070GA-CRFY	Gas inlet system 1 or 2	Vacuum gauge
R&D gas analysis	High-sensitivity process measurement	M-101GA-CDMY	Gas inlet system 1 or 3	Vacuum gauge heater
	Atmospheric pressure thermal desorption gas analysis	M-201GA-CRMY	Gas inlet system 5 or 6	Vacuum gauge heater
	Atmospheric pressure thermal desorption gas analysis	M-201GA-CRMW	Gas inlet system 3 or 4	Vacuum gauge heater
	Exhaust gas analysis	M-201GA-CRMY	Gas inlet system 6	Vacuum gauge heater
	Atmospheric pressure furnace gas analysis	M-101GA-CRMY	Gas inlet system 5 or 6	Vacuum gauge heater
	Vacuum furnace gas analysis	M-101GA-CRMW	Gas inlet system 3 or 4	Vacuum gauge heater
	Vacuum equipment gas analysis	M-101GA-CDFY	Gas inlet system 2 or 3	Vacuum gauge
Catalytic reaction gas analysis	M-101GA-CRMW	Gas inlet system 5 or 6	Vacuum gauge heater	



## Basic structure

Basic configuration selection    Quadrupole mass spectrometer and foreline pump selection

MASS (Measurement range selection)	
070	M-070QA-TDF
101	M-101QA-TDF
101	M-101QA-TDM
201	M-201QA-TDM

FP	
R	Oil-rotary pump
D	Membrane pump

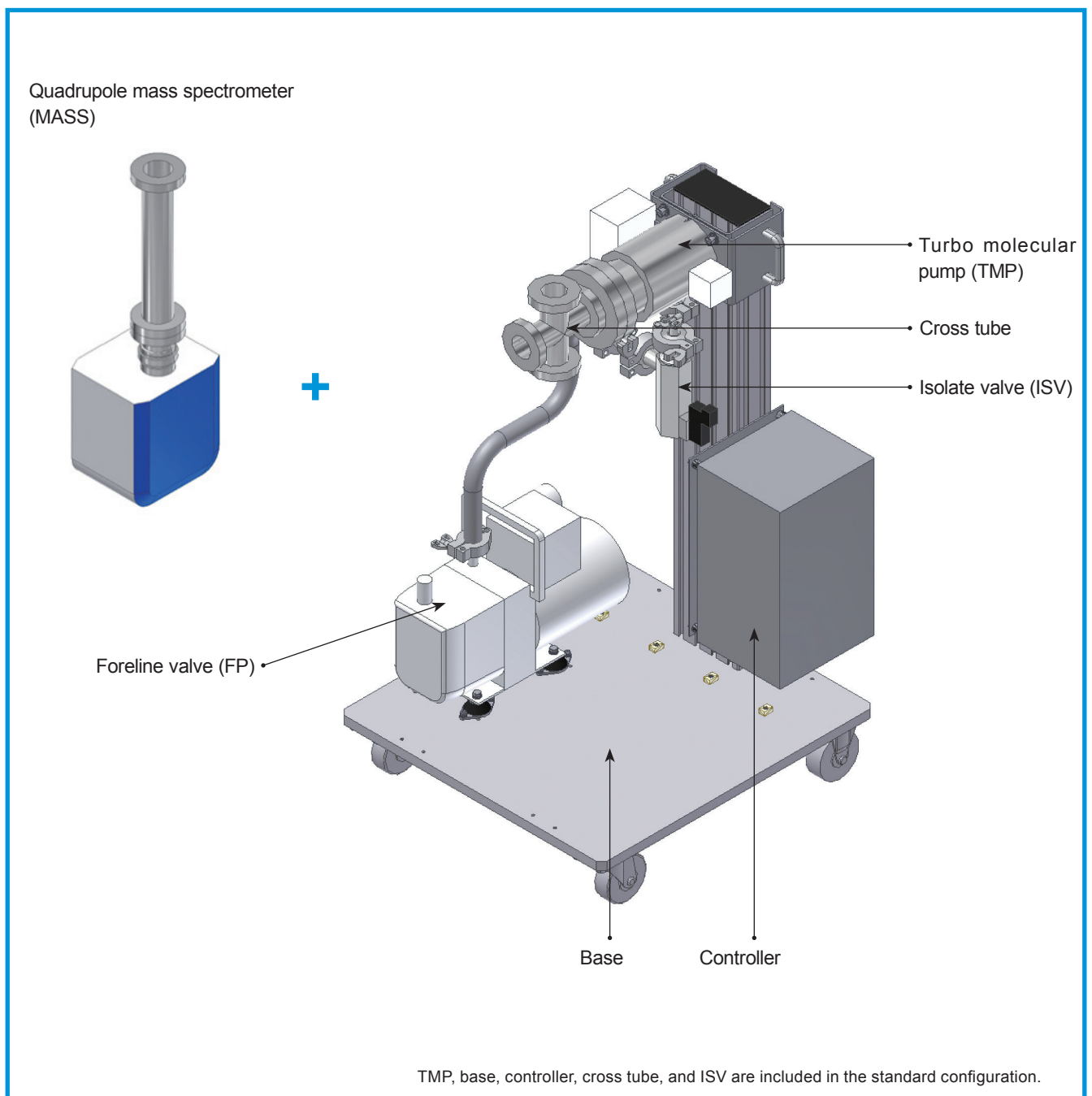
  

MASS (Filament selection)	
W	Tungsten
Y	Ir-Y203

MASS (Detector selection)	
F	M-070QA-TDF
F	M-101QA-TDF
M	M-101QA-TDM
M	M-201QA-TDM

## Basic configuration external view



## ■ Specifications

Type	M-070GA-CRFY	M-101GA-CRFY	M-101GA-CRMY	M-201GA-CRMY
Analyzer	M-070QA-TDF	M-101QA-TDF	M-101QA-TDM	M-201QA-TDM
Weight range	1 to 70	1 to 100		1 to 200
Sensitivity	100PPM	10PPM		
Vacuum pumping system	Turbo molecular pump (70L/s) + oil-sealed rotary pump (25L/min) [membrane pump (20L/min)]			
Ultimate pressure	1x10 <sup>-5</sup> Pa or less			
Software function	QUADVISION2 Win7			
Power supply	100V AC 1.0kVA			

\* The quadrupole mass spectrometers and options are installed by the customer.

## ■ Option selection 1 (selection of gas inlet system)

Gas introduction system relation table

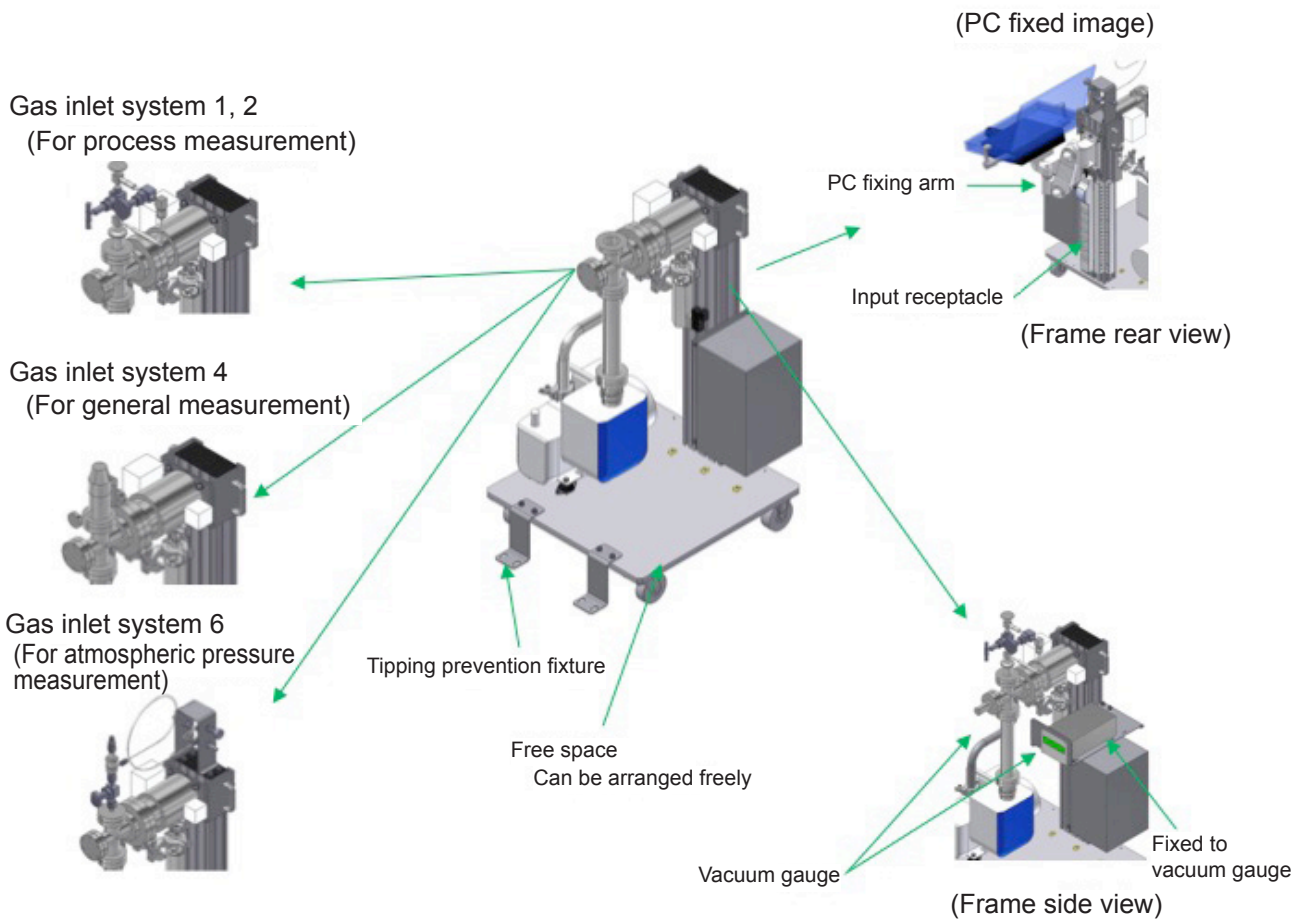
Name	Main Use	E-6	E-5	E-4	E-3	E-2	E-1	E0	E+1	E+2	E+3	E+4	E+5 Atmospheric pressure
Gas inlet system 1	Process gas measurement General gas measurement			BG measurement 7.1E-5Pa to 2.0E-2Pa				1Pa	10Pa	500Pa <sup>*1</sup>			
Gas inlet system 2	General gas measurement		7.1E-5Pa to 2.0Pa							100Pa <sup>*1</sup>			
Gas inlet system 3	Process gas measurement		8.0E-6Pa to 2.0Pa										
Gas inlet system 4	General gas measurement					1.3E-2Pa to atmospheric pressure							
Gas inlet system 5	General gas measurement Real-time gas measurement					1.3E-2Pa to atmospheric pressure							
Gas inlet system 6	Atmospheric pressure gas analysis Thermal desorption gas analysis Furnace gas analysis												0.05Mpa to 0.25Mpa

\*1: Special order

## ■ Option selection 2 (other options)

Improved measurement accuracy and operability with additional options

Vacuum gauge set	-1	Ionization vacuum gauge set M-431HG + MG-2F + mount + interlock cable	Analysis chamber pressure measurement
	-2	M-350PG Pirani gauge	Turbo molecular pump back pressure measurement
	-3	Pirani gauge set M-350PG + M-601GC (display unit) + mount + Interlock cable	Turbo molecular pump back pressure measurement
Heater kit	-1	2ch heater unit + ribbon heater (1.5m) + thermocouple + interlock cable	For analyzer tube + analysis chamber
	-2	Ribbon heater (1.5m) + thermocouple	For gas inlet system
	-3	Ribbon heater (2.5m) + thermocouple	For capillary gas inlet system
Notebook PC arm type mount		3 joint free-arm type, mountable dimension (390x300), load capacity 7kg	Notebook PC mount
Tipping prevention fixture		Four sets of dedicated metal fittings	For pumping system mount tipping prevention

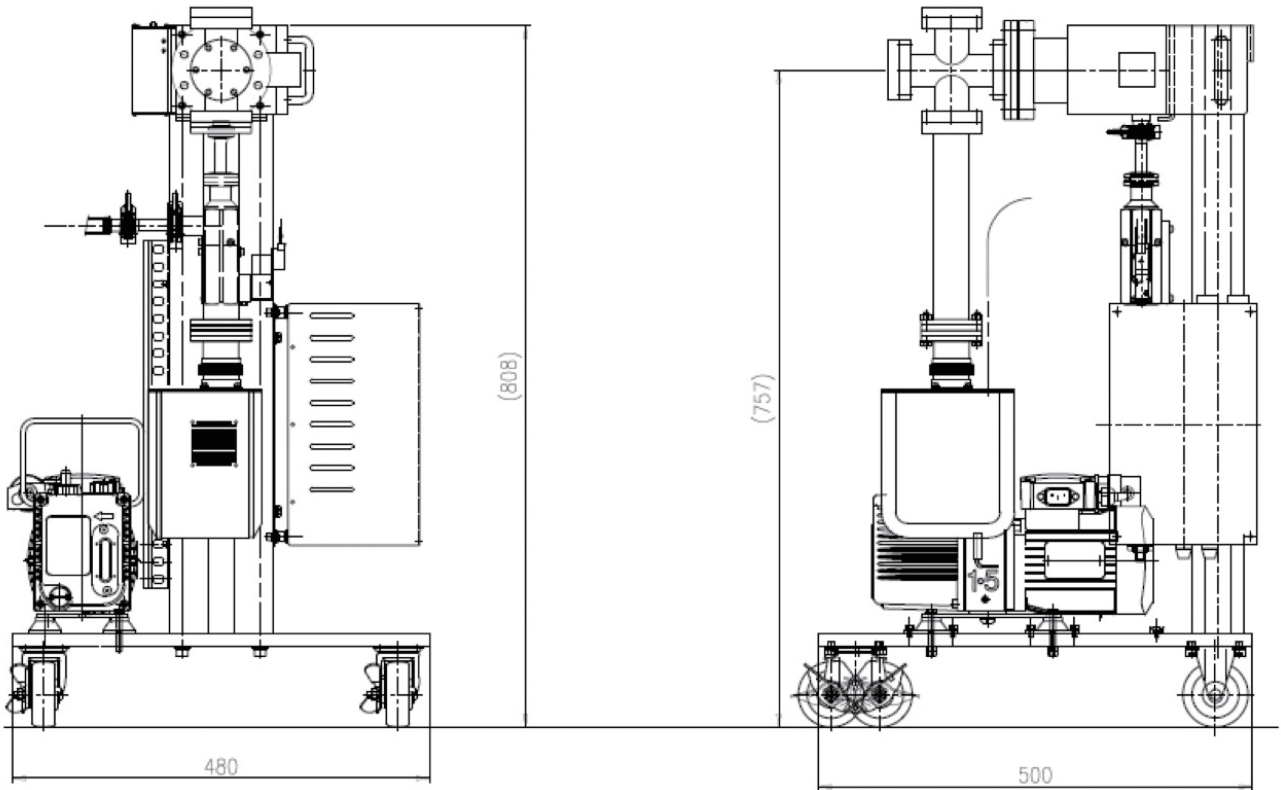


## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0371-59482	M-070GA-CRFY	Compact Gas Analysis System		46700
0371-59490	M-070GA-CDFY	Compact Gas Analysis System		46701
0371-59505	M-101GA-CRFY	Compact Gas Analysis System		46702
0371-59513	M-101GA-CDFY	Compact Gas Analysis System		46703
0371-59521	M-101GA-CRMY	Compact Gas Analysis System		46704
0371-59539	M-101GA-CDMY	Compact Gas Analysis System		46705
0371-59547	M-201GA-CRMY	Compact Gas Analysis System		46706
0371-59555	M-201GA-CDMY	Compact Gas Analysis System		46707
0371-60742	M-101GA-CRFW	Compact Gas Analysis System		46742
0371-60776	M-101GA-CDFW	Compact Gas Analysis System		46743
0371-60750	M-101GA-CRMW	Compact Gas Analysis System		46744
0371-60784	M-101GA-CDMW	Compact Gas Analysis System		46745
0371-60768	M-201-CRMW	Compact Gas Analysis System		46746
0371-60792	M-201GA-CDMW	Compact Gas Analysis System		46747
0371-59393	M-001GA-CR	Pumping System for Gas Analysis with RVP		46708
0371-59424	M-001GA-CD	Pumping System for Gas Analysis with DRY		46709
0371-57472	SS-1CO	Gas Introduction System-1	Valve with orifice (for 1Pa, 10Pa attached)	46714
0371-57480	SS-1CR	Gas Introduction System-2	Flow control valve	46710
VMT-8368	SS-1M	Gas Introduction System-3	Combination valve inlet system	46711
0190-04867	951-7172	Gas Introduction System-4	Variable leak valve	31001
VMT-9693		Gas Introduction System-5	3-way variable leak valve	46712
0371-60700		Gas Introduction System-6 (Capillary Model)	For capillary gas inlet system	46713
0371-60140		Vacuum Gauge Set-1 (M-431HG set)	M-431HG vacuum gauge set	46731
0371-60514		Vacuum Gauge Set-2 (M-350PG-SP)	M-350PG Pirani gauge	46732
0371-60522		Vacuum Gauge Set-3 (M-350PG-SD+M-601GC)	M-350PG Pirani gauge set	46733
0371-60564		Heater Kit-1 (2CH Heater Unit Plus 1 Heater Set)	2ch heater unit + heater (1.5m) + thermocouple	46736
0371-60530		Heater Kit-2 (Heater(1.5m) 1 Heater Set)	Heater (1.5m) + thermocouple	46737
0371-60548		Heater Kit-3 (Heater(2.5m) 1 Heater Set)	Heater (2.5m) + thermocouple	46738
0371-59458		Arm Set for PC	3 joint free arm PC mount	46720
0371-59872		Fall-Prevention Hardware	Crank type dedicated bracket x 4 sets	46722

Note) Contact us for more information about CE (RoHS).

■ Dimensions diagram



# Compact Gas Analysis System D Series

M-101/201/401GA-D series

## ■ Summary

The M-101/201/401GA-D series is a compact, low-cost gas analysis system ideally suited for quadrupole mass spectrometer application technology products, vacuum equipment residual gas analysis, inorganic gas analysis, thermal desorption analysis (TDS, etc.), emission gas analysis, and research and development gas analysis.

This system can be flexibly configured to meet specific, individual applications by optionally combining the quadrupole mass spectrometer analyzer with the TMP pumping system.

The system can be used for a wide range of gas analysis applications in research and development.



## ■ Features

### 1. Customizable system

- Systems that combine a quadrupole mass spectrometer, gas feedthrough system and other options can be easily set up to meet your specific needs.
- The quadrupole mass spectrometer can be selected from six different models: M-070QA-TDF, M-101QA-TDF, M-101/201QA-TDF, and M-401QA-M (high sensitivity/high speed).

### 2. Space-saving, compact design

- The compact quadrupole mass spectrometer and TMP pumping system can be mounted on a small rack.

### 3. Simple operation

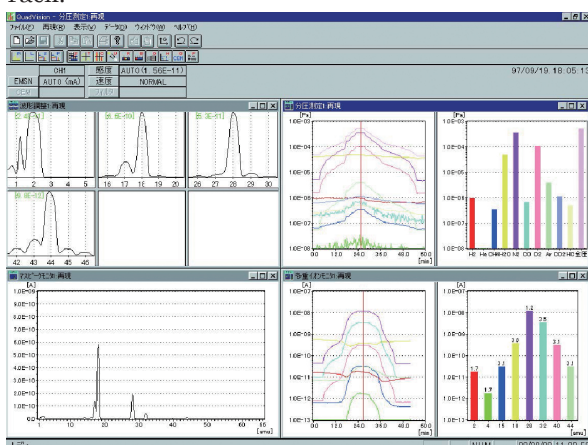
- Measurement operations can be easily controlled using a PC.

### 4. Windows compatible software

**QUADVISION**

## ■ Applications

- Vacuum equipment residual gas analysis
- Thermobalance emission gas analysis
- Thermal desorption gas analysis
- Furnace gas analysis
- Sealed gas analysis

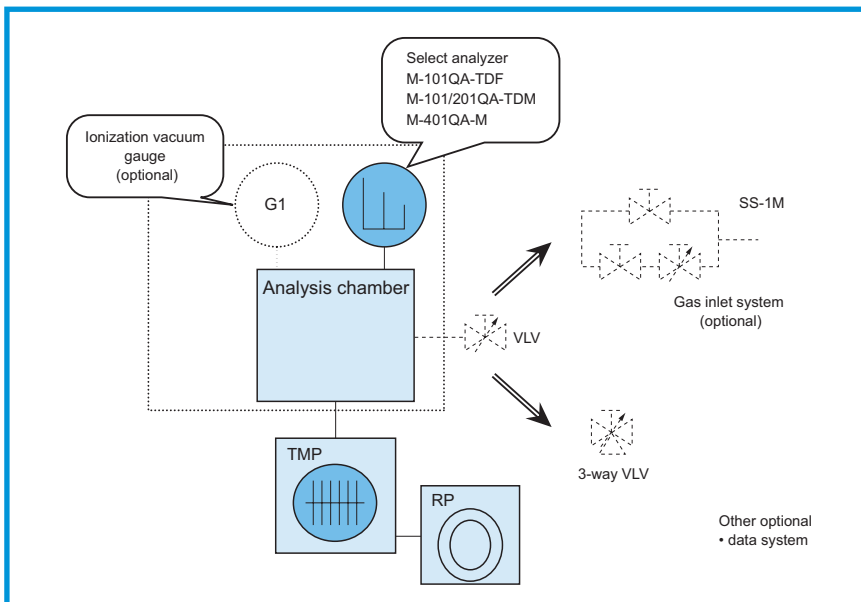


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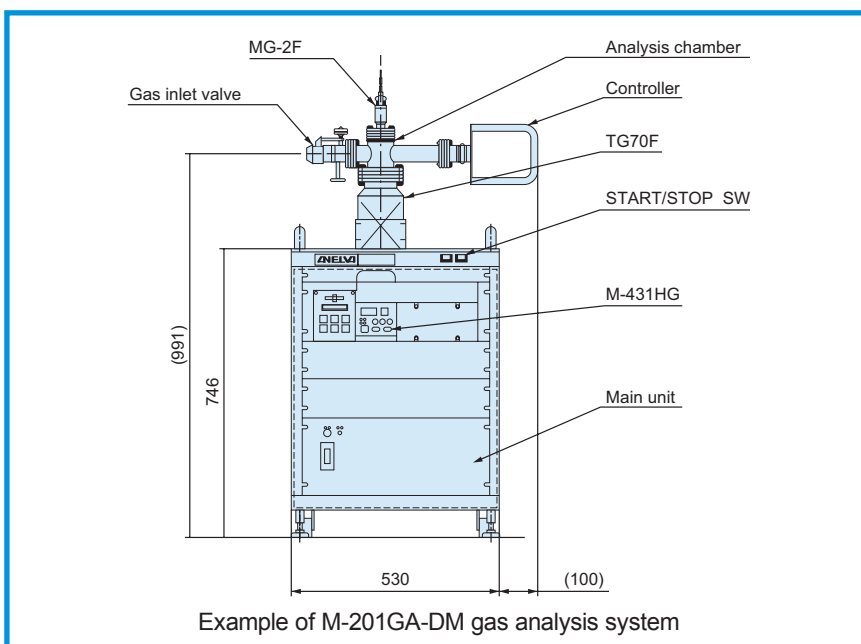
## Specifications

	M-101GA-DF	M-101GA-DM	M-201GA-DM	M-401GA-DM
Analyzer	M-101QA-TDF	M-101QA-TDM	M-201QA-TDM	M-401QA-M
Measured weight	1 to 100		1 to 200	1 to 410
Sensitivity	100	10	10ppm	10ppm
Ultimate pressure	5x10 <sup>-6</sup> Pa or less			
Inducible gas pressure Sample gas pressure	VLV	< Atmospheric pressure		
	SS-1M	< 3Pa		
	Capillary inlet system	Atmospheric pressure -		
Software function	Multi-ion detection mode, partial pressure measurement mode, mass peak mode, leak test mode			
Operating environment	Inquire for details			
Utility	Power supply	100V AC 2.0kVA		
	N <sub>2</sub> gas	0.5MPa (supply when N <sub>2</sub> purge is necessary)		
Connection flange	φ70ICF			φ114ICF

## Block diagram



## Dimensions diagram





Seamless coverage from atmosphere to ultra-high vacuum

# Transducer Vacuum Gauge Series

## ■ Summary

Compact wire-saving, RoHS/CE marking compliant environment-friendly products.

These Transducer type vacuum gauges are capable of handling a wide range from atmospheric pressure to  $10^{-8}$ Pa. The vacuum gauges include capacitance gauges, Pirani gauges, cold cathode Pirani gauge, crystal ion gauge, and ion gauge display units (1ch, 3ch). They are ideally suited for all types of industries such as state-of-the-art semiconductor manufacturing equipment and flat panel manufacturing equipment.




## ■ Selection guide

### • Features

- Transducer type
- Wire saving
- Space saving
- Energy saving with low power consumption
- Analog type, communication type supported
- Gauge auto recognition (display unit)
- Series with uniform external design
- Lead-free solder used
- CE marking compliant

### • Applications

- Vacuum thin film equipment, deposition equipment
- Semiconductor manufacturing equipment, electronic component manufacturing equipment
- Electron microscopes, electron beam equipment
- Mass spectrometers, various analyzers
- Vacuum furnaces, freeze drying equipment
- Various industrial equipment
- Various pumping equipment
- R&D equipment

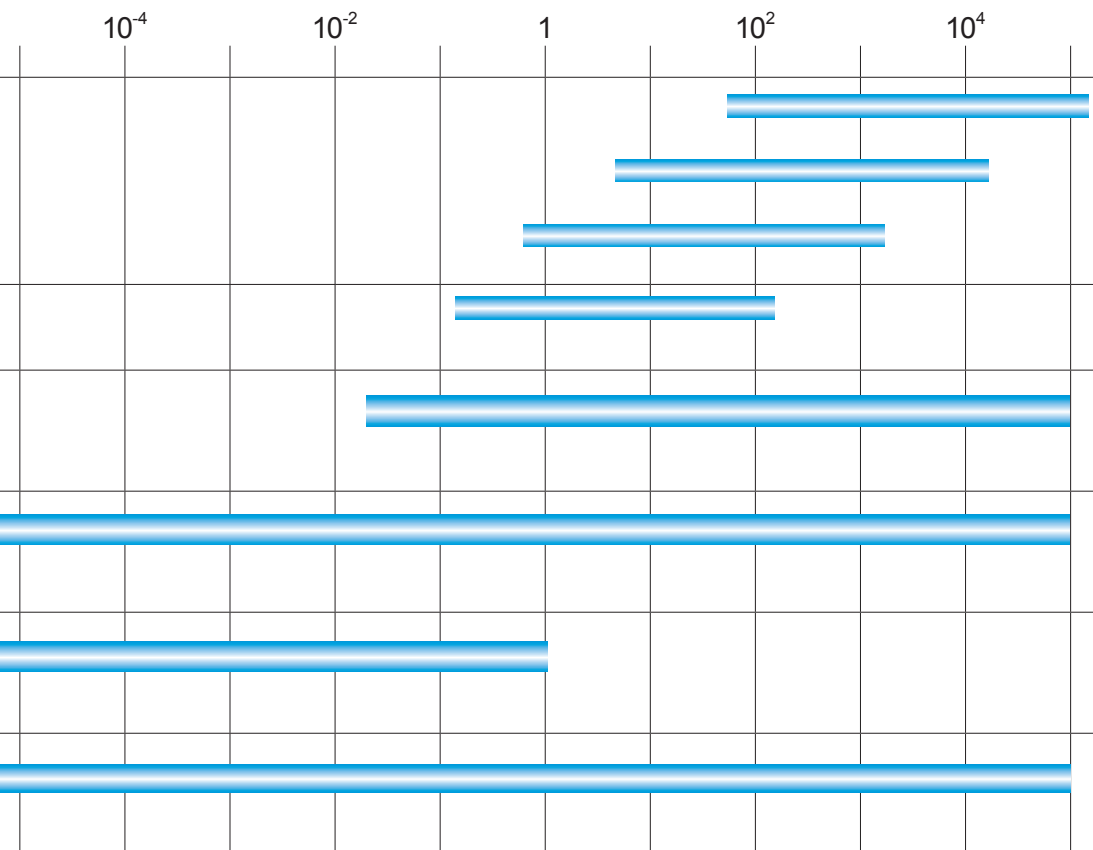
Gauge name		Pa $10^{-8}$		$10^{-6}$	
Capacitance gauge M-342DG	133kPa				
	13.3kPa				
	1.33 kPa				
Capacitance gauge M-341DG	133Pa				
Pirani gauge M-350PG M-351PG					
Cold cathode Pirani gauge M-360CP					
Ion gauge M-311HG					
Crystal ion gauge M-336MX					

Measurements





Recommended measurement pressure range



\* This table lists the recommended pressure measurement range, which is different from the measurable pressure range.

# Capacitance Gauge

## M-341DG

### ■ Summary

These capacitance gauges (diaphragm gauge) are complied with RoHS. They offer push button zero adjustment, LED status display, and low power consumption for improved usability and precision.

### ■ Features

- Static capacitance diaphragm gauge using micro machine technology
- Single crystal silicon diaphragm used for the sensor
- Compact, light weight, low cost, and low power consumption
- High precision and repeatability

### ■ Applications

Sputtering systems, ashing systems

Load lock chambers

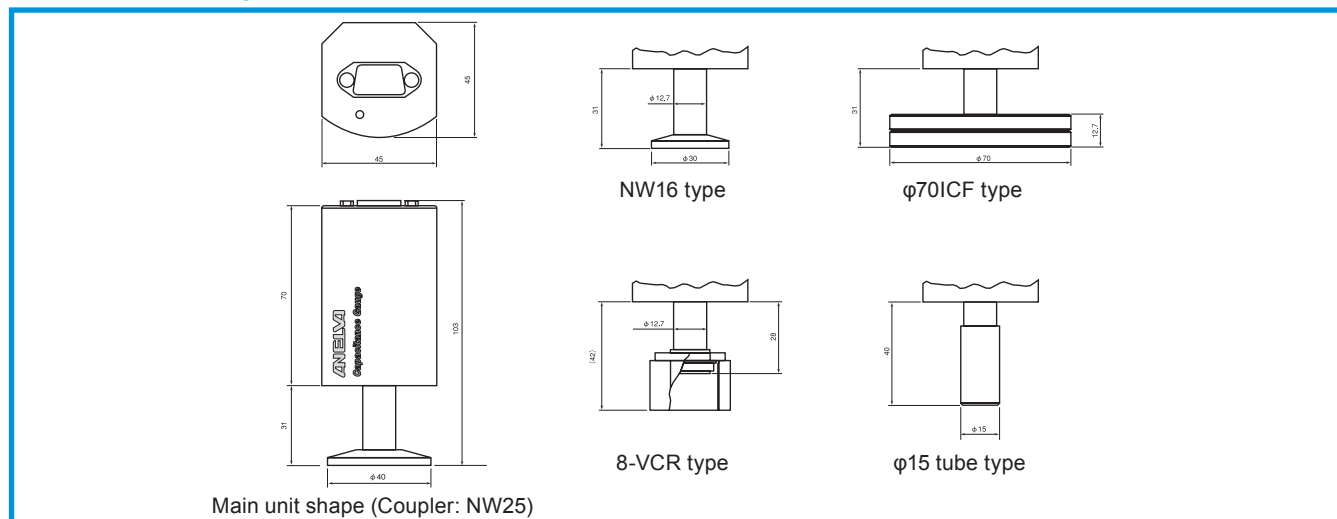
Gas analysis/pumping system pressure measurement

CE	RoHS
----	------



Type	M-341DG-01
Full scale pressure (Pa)	133
Precision (% of reading)	0.25 (at 25°C)
Zero temperature drift coefficient (% of F.S./°C)	0.015
Span temperature drift coefficient (% of reading/°C)	0.01
Maximum operating pressure (Pa)	200kPa (However, the internal pressure of NW16 and NW25 with φ15 tube coupler must not become positive.)
Input voltage (V DC)	+13.5 to 26.4
Power consumption (W)	0.5 or less
Analog output (V DC)	0 to 10
Response speed (ms)	40
Operating temperature (°C)	5 to 50
Storage temperature (°C)	-20 to 70°C (not operating)
Maximum cable length (m)	20 (0.13mm <sup>2</sup> )
I/O connector	D-sub 9 pin male
Gas contacting part material	SUS304, SUS316, Si, Tempax float®, Viton®
Flange shape and weight	NW16 (210g), NW25 (220g), φ70ICF (540g), 8-VCR female (250g), φ15 tube (220g)
Applicable standards and regulations	CE, IP40, RoHS
Security trade regulations	Not applicable
Compatible display unit	M-601GC (1ch), M-603GC (3ch)

### ■ Dimensions diagram



# Capacitance Gauge

## M-342DG

CE	RoHS
----	------

### ■ Summary

The capacitance gauge M-342DG is a diaphragm gauge that enables accurate, stable pressure measurement with minimum zero adjustment. This is achieved using a newly developed small silicon MEMS chip as the pressure sensor unit to minimize the influence from the outside environment such as changes in temperature, vibrations, and atmospheric pressure.

### ■ Features

#### 1. High precision, stable pressure measurement

- Excellent zero point stability.
- Has low temperature dependence providing excellent stability without the need of a temperature adjustment mechanism.
- Excellent anti-vibration noise performance.

#### 2. Compact and low power consumption

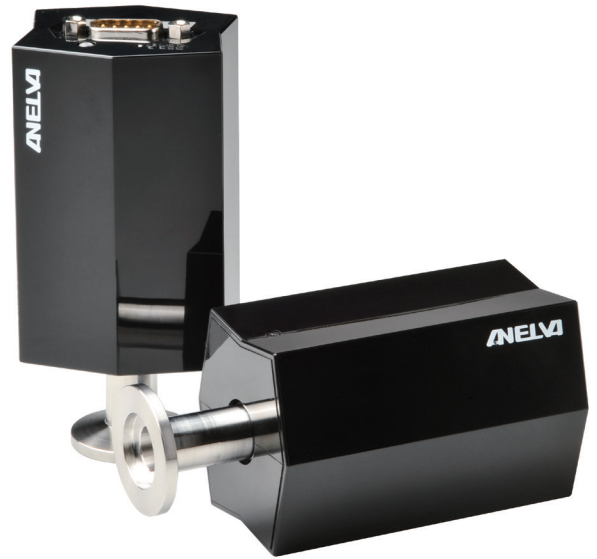
- 200g, W46mm × H49mm × L70mm compact, lightweight.<sup>\*1</sup>
- Power consumption 0.5W.

<sup>\*1</sup>: Size and weight of the coupling NW16 specifications

### ■ Applications

Supports a wide range of general industry applications such as medical and food in addition to semiconductor manufacturing equipment, panel display manufacturing equipment, and other vacuum equipment.<sup>\*2</sup>

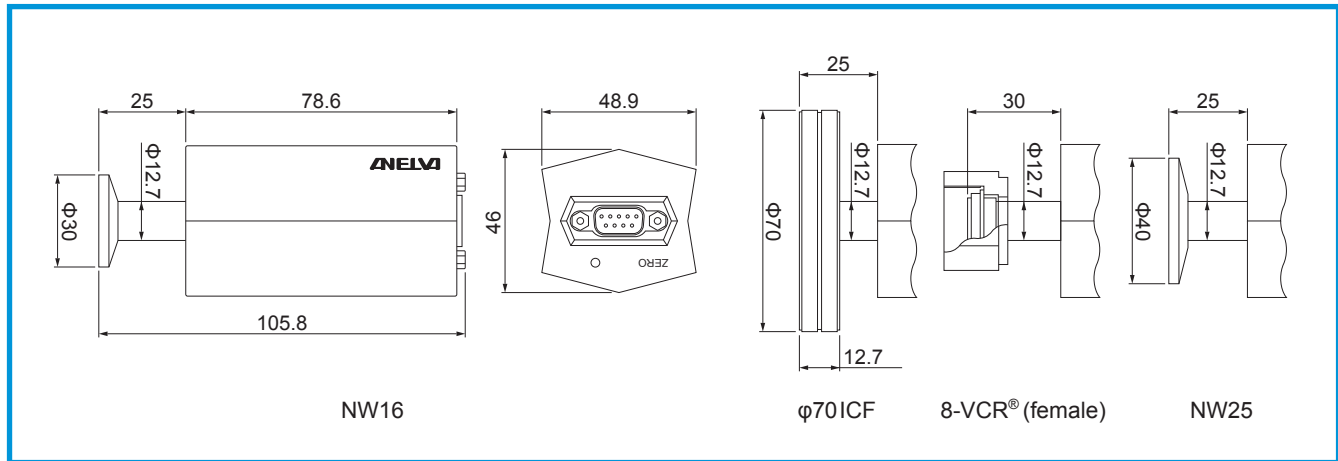
<sup>\*2</sup>: Not suitable for applications where corrosive gas is used.  
Please consult us for details.



### ■ Specifications

Type	M-342DG-11	M-342DG-12	M-342DG-13
Full scale pressure (Pa)	1.33k	13.3k	133k
Precision (% of reading)	0.20 (at 23°C)		
Zero temperature drift coefficient (% of F.S./°C)	0.002		
Span temperature drift coefficient (% of reading/°C)	0.005		
Maximum operating pressure (Pa)	200kPa (However, the internal pressure of NW16 and NW25 with φ15 tube coupler must not become positive.)		
Input voltage (V DC)	+13.5 to 26.4		
Power consumption (W)	0.5 or less		
Analog output (V DC)	0 to 10		
Response speed (ms)	30		
Operating temperature (°C)	0 to 50		
Storage temperature (°C)	-20 to 70°C (not operating)		
Maximum cable length (m)	100 (dedicated cable)		
I/O connector	D-sub 9 pin male		
Gas contacting part material	SUS304, SUS316, Si, Tempax float®, Viton®		
Flange shape and weight	NW16 (200g), NW25 (210g), 8-VCR female (250g), φ70ICF (460g)		
Applicable standards and regulations	CE, IP40, RoHS		
Security trade regulations	Not applicable		
Compatible display unit	M-601GC(1ch), M-603GC(3ch)		

## ■ Dimensions diagram



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-65656	M-341DG-01/N16	Capacitance Diaphragm Gauge (133Pa)	Coupling: NW16	22645*
0161-65672	M-341DG-01/N25	Capacitance Diaphragm Gauge (133Pa)	Coupling: NW25	22646*
0161-65680	M-341DG-01/C70	Capacitance Diaphragm Gauge (133Pa)	Coupling: φ70ICF	22647*
0161-65664	M-341DG-01/VCR	Capacitance Diaphragm Gauge (133Pa)	Coupling: 8-VCR female	22648*
0161-65698	M-341DG-01/P15	Capacitance Diaphragm Gauge (133Pa)	Coupling: φ15 tube	22649*
0160-11459	M-342DG-11-N16	Capacitance Diaphragm Gauge (1.33kPa)	Coupling: NW16	22715*
0160-11467	M-342DG-11-N25	Capacitance Diaphragm Gauge (1.33kPa)	Coupling: NW25	22716*
0160-11475	M-342DG-11-C70	Capacitance Diaphragm Gauge (1.33kPa)	Coupling: φ70ICF	22717*
0160-11483	M-342DG-11-VC8	Capacitance Diaphragm Gauge (1.33kPa)	Coupling: 8-VCR female	22718*
0160-11140	M-342DG-12-N16	Capacitance Diaphragm Gauge (13.3kPa)	Coupling: NW16	22720*
0160-11158	M-342DG-12-N25	Capacitance Diaphragm Gauge (13.3kPa)	Coupling: NW25	22721*
0160-11077	M-342DG-12-C70	Capacitance Diaphragm Gauge (13.3kPa)	Coupling: φ70ICF	22722*
0160-11166	M-342DG-12-VC8	Capacitance Diaphragm Gauge (13.3kPa)	Coupling: 8-VCR female	22723*
0160-11093	M-342DG-13-N16	Capacitance Diaphragm Gauge (133kPa)	Coupling: NW16	22725*
0160-11108	M-342DG-13-N25	Capacitance Diaphragm Gauge (133kPa)	Coupling: NW25	22726*
0160-11116	M-342DG-13-C70	Capacitance Diaphragm Gauge (133kPa)	Coupling: φ70ICF	22727*
0160-11124	M-342DG-13-VC8	Capacitance Diaphragm Gauge (133kPa)	Coupling: 8-VCR female	22728*

Note) \* marked indicates CE (RoHS) compliant.

# Pirani Gauge

## M-350PG

### ■ Summary

This Pirani vacuum gauge can handle a wide range of applications. It offers convenient measurement capability from atmospheric pressure with high cost performance. The gauge can be mounted on various systems for low to medium vacuum measurements in a variety of industries such as food, automobile, and pharmaceutical.

### ■ Features

- Good repeatability and low cost
- From  $5 \times 10^{-2}$  Pa to atmospheric pressure
- Suitable for low to medium vacuum range measurements

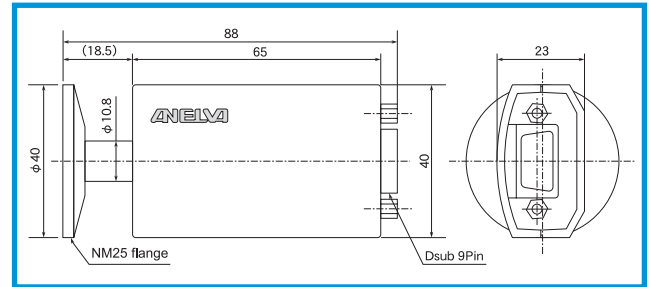
### ■ Applications

Roughing pump system pressure measurement, pumping system pressure monitoring and control

CE	RoHS
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### ■ Dimensions diagram



### ■ Specifications

Type	Pirani Gauge		
	M-350PG-SD Standard type	M-350PG-SP Type with set point	M-350PG-RS RS485 type
Set pressure range*1	$5 \times 10^{-2}$ to $1 \times 10^{-5}$ (Pa)		
Precision (Pa)	$\pm 50\%$ : $5 \times 10^{-2}$ to $1 \times 10^{-1}$ $\pm 15\%$ : $1 \times 10^{-1}$ to $1 \times 10^4$ $\pm 50\%$ : $1 \times 10^4$ to $1 \times 10^5$		
Repeatability	$\pm 2\%$ : $1 \times 10^{-1}$ to $1 \times 10^4$ Pa		
Input voltage	+14 to 30V DC		
Power consumption	1W		
Analog output	0 to 10V		
Gauge identification resistance	13K $\Omega$ (between D-sub 5 and 9 pin)		
Set point	-	2 contact output (1A 30V, DC)	
Interface	-	-	RS485
I/O connector	D-sub 9 pin		
Maximum cable length	200m (0.34mm <sup>2</sup> ) supported*1		
Operating temperature range	5 to 60°C		
Storage temperature range	-20 to 70°C (not operating)		
Baking temperature	$< +150^\circ\text{C}$ (O-ring specification, gauge head only) $< +300^\circ\text{C}$ (metal seal specification, gauge head only)		
Allowed overload pressure	1MPa (limited to coupler shape NPT and inert gas, absolute temperature)		
Applicable Pirani sensor type	MP-1		
Flange shape	NW16, NW25, $\phi 34$ ICF, 1/8NPT, $\phi 15$ adapter, $\phi 18$ adapter		
Sensor material (Main component)	Pirani filament: Tungsten Sensor tube: Stainless steel Inlet terminal insulator: Kovar glass		
Protection standard	IP40		
RoHS, CE marking	compliant		

\*1 The maximum length of the gauge cable is 100m when connecting an M-601/603GC display unit.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0160-06608	M-350PG-SD/N16	Pirani Gauge	With NW16 flange	22500*
0160-06616	M-350PG-SD/N25	Pirani Gauge	With NW25 flange	22501*
0160-06624	M-350PG-SD/P15	Pirani Gauge	For $\phi$ 15 gauge port	22502*
0160-06632	M-350PG-SD/P18	Pirani Gauge	For $\phi$ 18 gauge port	22503*
0160-07133	M-350PG-SD/C34	Pirani Gauge	With $\phi$ 34ICF flange	22504*
0160-07125	M-350PG-SD/NPT	Pirani Gauge	With 1/8" NPT (male)	22505*
0160-06658	M-350PG-SP/N16	Pirani Gauge (w Setpoints)	With NW16 flange	22506*
0160-06666	M-350PG-SP/N25	Pirani Gauge (w Setpoints)	With NW25 flange	22507*
0160-06674	M-350PG-SP/P15	Pirani Gauge (w Setpoints)	For $\phi$ 15 gauge port	22508*
0160-06682	M-350PG-SP/P18	Pirani Gauge (w Setpoints)	For $\phi$ 18 gauge port	22509*
0160-08286	M-350PG-SP/C34	Pirani Gauge (w Setpoints)	With $\phi$ 34ICF flange	22510*
0160-07531	M-350PG-SP/NPT	Pirani Gauge (w Setpoints)	With 1/8" NPT (male)	22511*
0160-06690	M-350PG-RS/N16	Pirani Gauge (RS485)	With NW16 flange	22512*
0160-06705	M-350PG-RS/N25	Pirani Gauge (RS485)	With NW25 flange	22513*
0160-06713	M-350PG-RS/P15	Pirani Gauge (RS485)	For $\phi$ 15 gauge port	22514*
0160-06721	M-350PG-RS/P18	Pirani Gauge (RS485)	For $\phi$ 18 gauge port	22515*
0160-11205	M-350PG-RS/C34	Pirani Gauge (RS485)	With $\phi$ 34ICF flange	22516*
0160-09575	M-350PG-RS/NPT	Pirani Gauge (RS485)	With 1/8" NPT (male)	22517*
0161-51275	MP1/NW16	Pirani Gauge Head	With NW16 flange	22527*
0161-51479	MP1/NW25	Pirani Gauge Head	With NW25 flange	22528*
0161-51982	MP1/C34	Pirani Gauge Head	With $\phi$ 34ICF flange	22529*
0161-56788	MP1/NPT	Pirani Gauge Head	With 1/8"NPT (male)	22530*
0161-55986	MP1/PY15	Pirani Gauge Head	For $\phi$ 15 gauge port	22531*
0161-55994	MP1/PY18	Pirani Gauge Head	For $\phi$ 18 gauge port	22532*

Note) \* marked indicates CE (RoHS) compliant.

# Pirani Gauge (Corrosion-resistant Type)

## M-351PG

### ■ Summary

This model uses an Ni filament to increase corrosion resistance. It supports hard process equipment such as RIE and CVD.

### ■ Features

- Improved corrosion resistance Uses Ni filament.
- Good repeatability and low cost. From  $5 \times 10^{-2}$  Pa to atmospheric pressure.
- Can be mounted in any direction.

### ■ Applications

- Semiconductor and electronic device manufacturing equipment  
Dry etching equipment, plasma CVD equipment, LD-CVD equipment
- Food and drug manufacturing equipment  
Vacuum-freeze drying, reduced-pressure distillation, sterilization equipment

### ■ Specifications

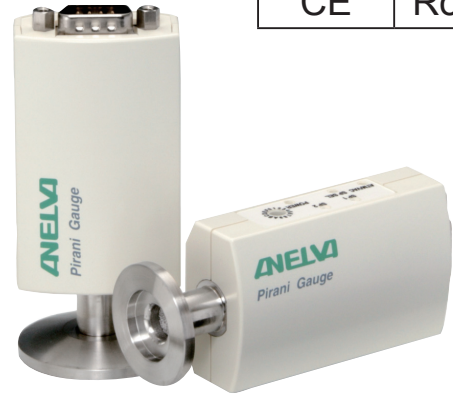
Type	M-351PG-SP (Ni filament) (Set point equipped type)
Measurement pressure range	$5 \times 10^{-2}$ to $1 \times 10^5$ (Pa)
Precision (Pa)	$\pm 50\%$ : $5 \times 10^{-2}$ to $1 \times 10^{-1}$
	$\pm 15\%$ : $1 \times 10^{-1}$ to $1 \times 10^4$
	$\pm 50\%$ : $1 \times 10^4$ to $1 \times 10^5$
Repeatability	$\pm 2\%$ : $1 \times 10^{-1}$ to $1 \times 10^4$ Pa
Input voltage	+14 to 30V DC
Power consumption	2W
Analog output	0 to 10V
Gauge identification resistance	13K $\Omega$ (between D-sub 5 and 9 pin)
Set point	2 contact output (1A 30V, DC)
Interface	-
I/O connector	D-sub 9 pin
Maximum cable length	200m (0.34mm <sup>2</sup> ) supported *1
Operating temperature range	5 to 60°C
Storage temperature range	-20 to 70°C (not operating)
Baking temperature	<+150°C (O-ring specification, gauge head only) <+300°C (metal seal specification, gauge head only)
Allowed overload pressure	1MPa (limited to coupler shape NPT and inert gas, absolute temperature)
Applicable Pirani sensor type	MP-2
Flange shape	NW16, NW25, 1/8NPT
Sensor material (Main component)	Pirani filament: Nickel
	Sensor tube: Stainless steel
	Inlet terminal insulator: Kovar glass+Al <sub>2</sub> O <sub>3</sub> coat
Protection standard	IP40
RoHS, CE marking	compliant

\*1 The maximum length of the gauge cable is 100m when connecting an M-601/603GC display unit.

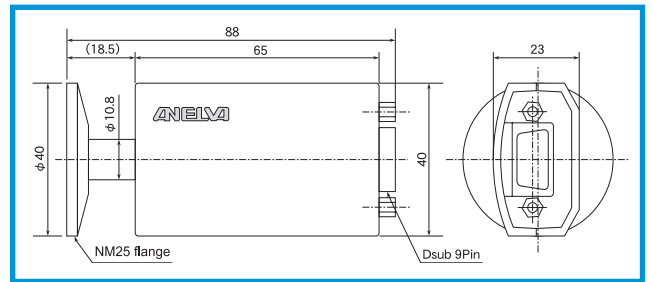
### ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0160-08359	M-351PG-SP/N16	Pirani Gauge	With NW16 flange	22665*
0160-08854	M-351PG-SP/N25	Pirani Gauge	With NW25 flange	22666*
0161-62080	MP-2/NW16	Pirani Gauge Head	With NW16 flange	22668*
0161-70368	MP-2/NW25	Pirani Gauge Head	With NW25 flange	22669*

Note) \* marked indicates CE (RoHS) compliant.



### ■ Dimensions diagram





# Cold Cathode Pirani Gauge

## M-360CP

### ■ Summary

This combination gauge uses a Pirani gauge for low vacuum range measurement and a cold cathode gauge for high vacuum range measurement. The cold cathode gauge has no burnout problem because no heated filament is used. This single device is capable of measuring a wide range of pressures.

### ■ Features

- Combination gauge combining a Pirani gauge and a cold cathode gauge
- From  $5 \times 10^{-7}$  Pa to atmospheric pressure
- Capable of sensor cleaning

### ■ Applications

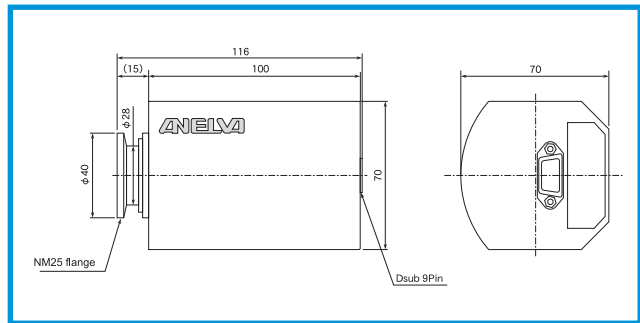
Electron microscopes and other analyzers, vapor deposition equipment, vacuum furnaces, and other vacuum equipment.

Roughing and ultimate pressure measurement of semiconductor and electronic component manufacturing equipment.

CE	RoHS
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### ■ Dimensions diagram



### ■ Specifications

Type	Cold cathode Pirani gauge	
	M-360CP-SP Type with set point	M-360CP-RS RS485 type
Pressure measurement range	5x10 <sup>-7</sup> to 1x10 <sup>5</sup> (Pa)	
Input voltage	+15 to 30V DC	
Power consumption	3W	
Analog output	0 to 10V	-
Set point	2 contact output (DC30V, 1A)	
Interface	-	RS485
I/O connector	D-sub 9 pin	
Maximum cable length	300m (1mm <sup>2</sup> ) <sup>*1</sup>	
Protection standard	IP40 compliant	
Operating temperature range	5 to 55°C	
Storage temperature range	-20 to 70°C (not operating)	
Sensor type	CP-1	
Sensor material (main component)	Filament: W, Electrode: Mo, Case: SUS304	
Dimensions (mm)	116x70x70 (NW25)	
Flange shape	NW25, NW40, φ70ICF	
Protection standard	IP40	
RoHS, CE marking	compliant	

\*1 The maximum length of the gauge cable is 100m when connecting an M-601/603GC display unit.



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-92962	M-360CP-SP/N25	Cold Cathode Pirani Gauge	With NW25 flange	22700*
0161-54142	M-360CP-SP/N40	Cold Cathode Pirani Gauge	With NW40 flange	22701*
0161-93007	M-360CP-SP/C70	Cold Cathode Pirani Gauge	With $\phi$ 70ICF flange	22702*
0161-54184	M-360CP-RS/N25	Cold Cathode Pirani Gauge (RS485)	With NW25 flange	22703*
0161-54207	M-360CP-RS/N40	Cold Cathode Pirani Gauge (RS485)	With NW40 flange	22704*
0161-54223	M-360CP-RS/C70	Cold Cathode Pirani Gauge (RS485)	With $\phi$ 70ICF flange	22705*

Note) \* marked indicates CE (RoHS) compliant.

# Crystal Ion Gauge

## M-336MX

CE RoHS

### ■ Summary

This combination gauge uses a crystal gauge with excellent repeatability and response for measurement in the low vacuum range and a miniature B-A gauge proven over many years for measurement in the high vacuum range. This single device is capable of measuring a wide range of pressures from atmospheric pressure to ultra-high vacuum.

### ■ Features

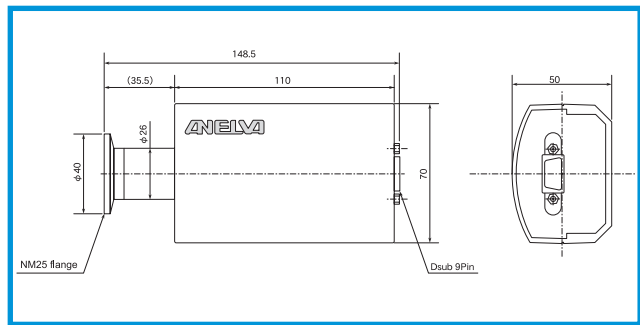
- Combination gauge combining a crystal gauge and a miniature B-A gauge
- From ultra-high vacuum to atmospheric pressure
- High precision with excellent repeatability in the low vacuum range

### ■ Applications

Roughing pump and ultimate pressure measurement of vacuum equipment, semiconductor and electronic component manufacturing equipment pressure measurement.



### ■ Dimensions diagram



### ■ Specifications

Type	Crystal Ion Gauge	
	M-336MX-SP Type with set point	M-336MX-RS RS485 type
Pressure measurement range <sup>*1</sup>	4x10 <sup>-8</sup> to 1x10 <sup>5</sup> (Pa)	
Input voltage	+20 to 28V DC	
Power consumption	12W	
Analog output	0 to 10V	-
Set point	2 contact output	
Interface	-	RS485
I/O connector	D-sub 9 pin	
Maximum cable length	300m (1mm <sup>2</sup> )**	
Protection standard	IP40 compliant	
Operating temperature range <sup>*2</sup>	5 to 50°C	
Storage temperature range <sup>*2</sup>	-20 to 70°C (not operating)	
Sensor type	MX-1	
Sensor material (main component)	Filament: Y <sub>2</sub> O <sub>3</sub> /Ir, Case: SUS304	
Dimensions (mm)	149x70x50 (NW25)	
Flange shape	NW16, NW25, NW40, φ70ICF	
Protection standard	IP40	
RoHS, CE marking	compliant	

\*1. The minimum pressure measurement shows the soft X-ray limit of B-A gauge.

Minimum pressure measurement ICF: Approx. 10<sup>-7</sup>Pa  
NW: Approx. 10<sup>-6</sup>Pa

\*2. Use or storage under high temperatures may reduce the product life.

\*\* The maximum length of the gauge cable is 100m when connecting an M-601/603GC display unit.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-14825	MX-1/N16	Crystal Ion Gauge Head(336MX)	With NW16 flange	22559*
0161-14752	MX-1/N25	Crystal Ion Gauge Head(336MX)	With NW25 flange	22560*
0161-14689	MX-1/N40	Crystal Ion Gauge Head(336MX)	With NW40 flange	22561*
0161-14647	MX-1/C70	Crystal Ion Gauge Head(336MX)	With $\phi$ 70ICF flange	22562*
0160-06797	M-336MX-SP/N16	Crystal Ion Gauge	With NW16 flange	22545*
0160-06810	M-336MX-SP/N25	Crystal Ion Gauge	With NW25 flange	22546*
0160-07206	M-336MX-SP/N40	Crystal Ion Gauge	With NW40 flange	22547*
0160-06828	M-336MX-SP/C70	Crystal Ion Gauge	With $\phi$ 70ICF flange	22548*
0160-06836	M-336MX-RS/N16	Crystal Ion Gauge (RS485)	With NW16 flange	22549*
0160-06844	M-336MX-RS/N25	Crystal Ion Gauge (RS485)	With NW25 flange	22550*
0160-07963	M-336MX-RS/N40	Crystal Ion Gauge (RS485)	With NW40 flange	22551*
0160-06852	M-336MX-RS/C70	Crystal Ion Gauge (RS485)	With $\phi$ 70ICF flange	22552*

Note) \* marked indicates CE (RoHS) compliant.

# Ion Gauge

## M-311HG

### ■ Summary

The ion gauge is a transducer vacuum series ion gauge. It (hot cathode ionization vacuum gauge) is an excellent vacuum gauge with good repeatability and linearity, capable of measuring a wide range of pressures. It uses a proven miniature gauge (MG-2I) for the sensor.

### ■ Features

- Wide pressure measurement range  
From  $10^{-7}$ Pa to 10Pa, capable of measuring low vacuum below the sputtering process without sacrificing the ultra-high vacuum side characteristics.
- High response analog output  
The analog signal output of the pressure value has excellent response (within 100ms) to enable use in process pressure control.
- Four emission current setting modes  
The mode can be selected based on the application to improve the filament life during use in the high pressure range.
- Space-saving and low power consumption  
Space-saving of 40% by volume ratio, and power saving. (Compared to the conventional model (M-310HG))
- Safe and environmentally friendly  
RoHS and CE marking compliant

### ■ Specifications

	Ion Gauge	
	M-311HG-SP	M-311HG-RS
Pressure measurement range	1x10 <sup>-7</sup> to 10Pa	
Input voltage	20 to 28V DC	
Power consumption	12W	
Analog output	0 to 10 V	-
Set point	2 point relay output	
Interface	-	RS485
I/O connector	Dsub-9 (Male)	
Maximum cable length	200m (1mm <sup>2</sup> )	
Operating temperature range	5 to 50°C	
Storage temperature range	-20 to 70°C	
Sensor Type	Miniature B-A Gauge (MG-2I Series)	
Sensor material (main component)	Filament: Y <sub>2</sub> O <sub>3</sub> /Ir, Case: SUS304	
Dimensions (mm)	110x70x50	
Flange shape	NW16, NW25, ICF34, ICF70	
Protection standard	IP40	
RoHS, CE marking	compliant	

CE RoHS



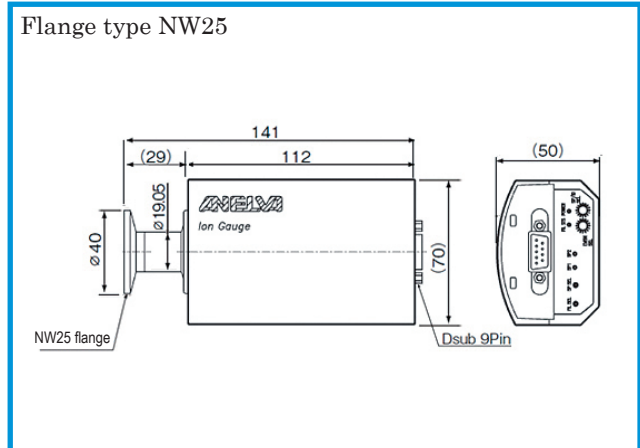
### ■ Applications

- Production use vacuum equipment pressure measurement
- Semiconductor sputtering equipment pressure measurement
- Various vacuum equipment

### ■ Options

- Display units for the series are available.  
The large, easy-to-read digital LCD significantly improves operability.  
A 1ch type or 3ch type display unit can be selected according to your needs.

### ■ Dimensions diagram



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-78390	M-311HG-SP/N16	Ion Gauge	With NW16 flange	22670*
0161-78405	M-311HG-SP/N25	Ion Gauge	With NW25 flange	22671*
0161-78413	M-311HG-SP/C70	Ion Gauge	With $\phi$ 70ICF flange	22672*
0161-78421	M-311HG-SP/C34	Ion Gauge	With $\phi$ 34ICF flange	22673*
0161-78439	M-311HG-RS/N16	Ion Gauge (RS485)	With NW16 flange	22674*
0161-78447	M-311HG-RS/N25	Ion Gauge (RS485)	With NW25 flange	22675*
0161-78455	M-311HG-RS/C70	Ion Gauge (RS485)	With $\phi$ 70ICF flange	22676*
0161-78463	M-311HG-RS/C34	Ion Gauge (RS485)	With $\phi$ 34ICF flange	22677*

Note) \* marked indicates CE (RoHS) compliant.

# Display Unit (1 ch/3 ch)

## M-601GC/603GC

CE | RoHS

### Summary

These display units support the transducer type vacuum gauge series.

The large, easy-to-read digital LCD significantly improves operability. The units offer numerous features to improve on-site usability. A 1ch type or 3ch type display unit can be selected according to your needs.

### Features

- Gauge auto recognition
- Large digital LCD
- RS232C interface equipped as standard
- Excellent operability
- Capable of simultaneous display (3ch)
- Easy-to-read 3-type display (3ch)

- Digital display
- Trend graph (up to 18H)
- Analog meter

### Specifications

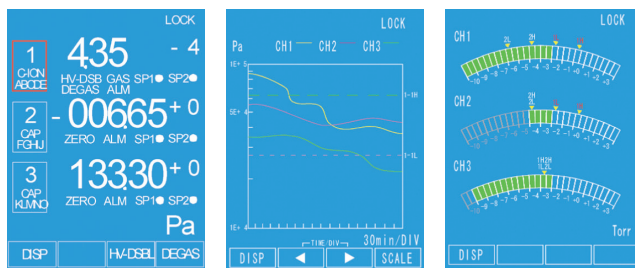
Type	M-601GC (1 ch connection type)	M-603GC (3 ch connection type)
Input voltage	90 to 250V AC 50/60Hz	
Power consumption	50VA	100VA
Operating temperature	5 to 50°C	5 to 40°C
Storage temperature	-20 to 60°C	
Gauge recognition	Auto	
Number of connected channels	1Ch	3Ch (Simultaneously displayable)
Connected gauge	Ion gauge (M-311HG) Pirani, Capacitance, Crystal ion, CC Pirani	
Set point	2 points	2/Ch
Protection standard	IP30 compliant	
Analog output	1	1/Ch
Recorder output	1	1/Ch
Communication function	RS232C	
Dimensions (mm)	84×106.3×212	128.5×106.3×212
Display	Back lit LCD	Color TFT LCD
Protection standard	IP30	
RoHS, CE marking	compliant	



1ch display unit

3ch display unit

### 3ch display unit Display mode

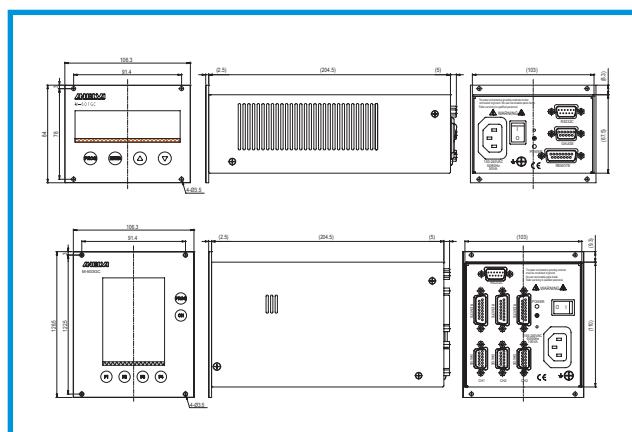


Digital

Trend graph

Analog meter

### Dimensions diagram



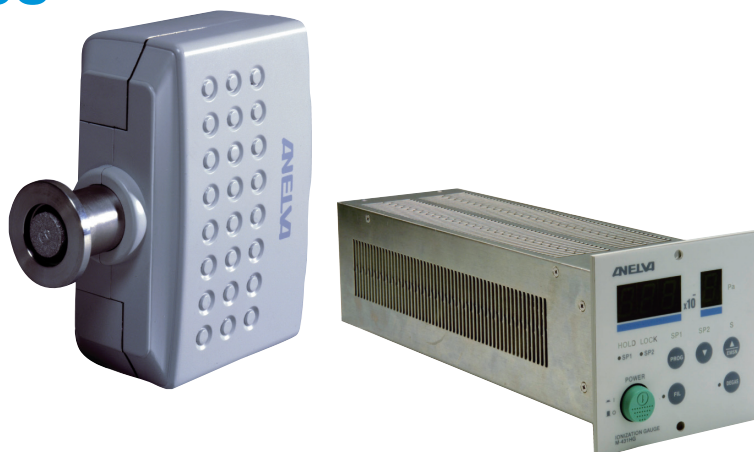
Measurements

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-56738	M-601GC	Display Unit (1CH)	No external control connector, AC cable	22563*
0161-56746	M-603GC	Display Unit (3CH)	No external control connector, AC cable	22564*
0161-52946	601-005	Gauge Cable for M-601/603GC (5m)		22567
0161-52954	601-010	Gauge Cable for M-601/603GC (10m)		22568
0161-52962	601-015	Gauge Cable for M-601/603GC (15m)		22569
9007-83851		Connector for Gauge (D-Sub9P)		22570
9007-83835		Power Cable for M601/603GC	3m	22571
0164-29767		SCREWDRIVER(PLASTICS)	Ordering unit 10E	22572
9007-83869		I/O Connector for M-601/603GC (D-Sub15P)		22573

Note) \* marked indicates CE (RoHS) compliant. Contact us for other products.

# Vacuum Gauge Series



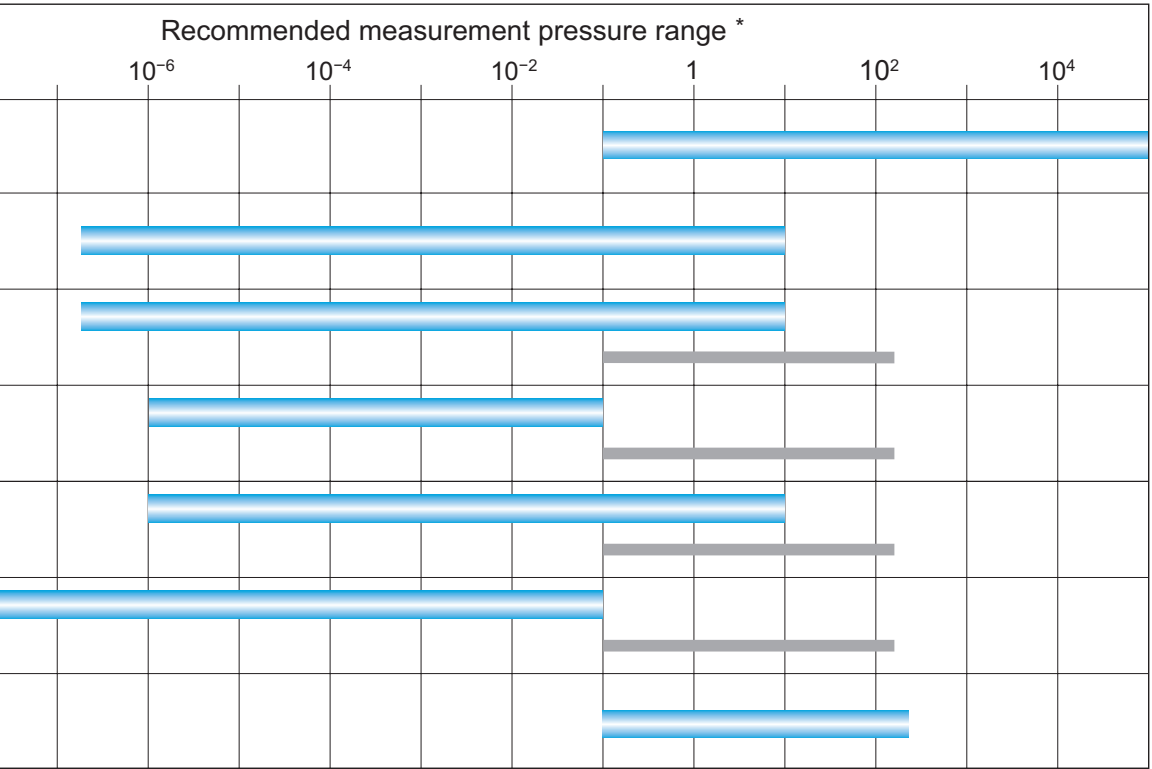
## ■ Summary

The vacuum gauge series includes analog and digital, manual and automatic vacuum gauges from low to ultra-high vacuum to meet the demands for a variety of applications.

## ■ Selection guide

Control unit	Measurement gauge	Pa		
				10 <sup>-8</sup>
Crystal Gauge M-320XG	Built-in main unit measurement gauge			
Wide range ionization vacuum gauge M-431HG	Miniature B-A Gauge MG-2 Series			
Wide range ionization vacuum gauge M-833HG	Miniature B-A Gauge MG-2 Series (Thermocouple Gauge TG-550C option)			
Wide range ionization vacuum gauge M-723HG	B-A Gauge UGD-1S (Thermocouple Gauge TG-550C option)			
Wide range ionization vacuum gauge M-823HG	Wide Range B-A Gauge BRG-1B (Thermocouple Gauge TG-550C option)			
Wide range ionization vacuum gauge M-923HG	Nude Ion Gauge NIG-2F/NIG-2TF (Thermocouple Gauge TG-550C option)			
Thermocouple Vacuum Gauge M-012DM	Thermocouple Gauge TG-550C			





\* This table lists the recommended measurement pressure range, which is different from the measurable pressure range.

## Crystal Gauge

### M-320XG

#### ■ Summary

Crystal gauges are capable of performing a wide range of highly reliable measurements from atmospheric pressure to  $10^{-2}$ Pa.

Instead of the unstable thermal phenomenon used by conventional roughing gauges such as Pirani and thermocouple gauges, crystal gauges utilize the phenomenon where the crystal oscillator's resonant impedance changes according to pressure; thereby ensuring excellent repeatability and stable measurement near atmospheric pressure.

In addition to roughing gauges, a crystal gauge can be used as a pressure switch to detect chamber atmospheric pressure vent or for process pressure measurement.

#### ■ Features

##### 1. Wide measurement range

Enables measurement with excellent repeatability from atmospheric pressure to  $10^{-2}$ Pa.

##### 2. High stability

Crystal gauges are vacuum gauges without a heat source (filament).

Enables safe handling without affecting the process gas.

##### 3. Compact and ultra-light weight

Weighing only 200g, the controller can fit in the palm of your hand.

##### 4. 2W low power consumption

Low power consumption that is friendly to the environment.

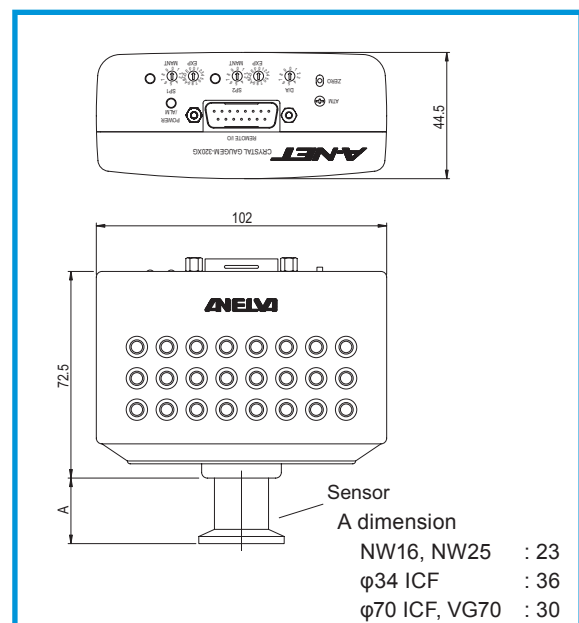
#### ■ Applications

- Roughing pump pressure measurement of various vacuum equipment
- Various process pressure measurement
- Pressure switch for detection of chamber vent, etc.
- Other pressure measurements from atmospheric pressure to  $10^{-2}$ Pa

If you are considering process gas (especially corrosive gases) pressure measurement, please contact our sales office. The sensor life may be reduced depending on the type of gas and usage environment.



#### ■ Dimensions diagram



## ■ Specifications

Type	M-320XG
Measurement gauge	XG-1 Crystal Gauge Head (exclusive for crystal gauge)
Measurement pressure range	10 <sup>-2</sup> to atmospheric pressure
Gas type selections	N <sub>2</sub> , Ar, H <sub>2</sub> , Air
Analog output (pressure signal)	0 to 10V DC: Use the digit switch to set the output format of the following items: (1) Log output (2) Multiple output (3) Linear output Full scale pressure range selectable (1x10 <sup>1</sup> , 1x10 <sup>2</sup> , 1x10 <sup>3</sup> , 1x10 <sup>4</sup> , 1x10 <sup>5</sup> Pa)
Remote I/O	INPUT: (1) Gas type setting Switch with 2 bit signal (2) Zero adjustment (3) ATM setting OUTPUT: 2 set point outputs
Set point	2 points (photocoupler output, fixed hysteresis) Set using the digit switch (SP1, SP2 mantissa, exponent)
Operating environment	5°C to 50°C (including controller) Gauge head only withstand temperature 150°C MAX
Zero adjustment	PUSH switch or software adjustment by remote I/O
Full scale adjustment	Adjustment by trimmer
I/O connector	Dsub 15P
Display	LED x3 (PWR/ALM (Green/Red), SP1-Status (Green), SP2-Status (Green))
Power requirements	22V to 33V DC, (maximum power consumption 2W)
Dimensions (mm)	72.5Hx102Wx44.5D (excluding gauge head)
Weight	200g (excluding gauge head)
Sensor attaching flange	NW16, NW25, φ34ICF, φ70ICF, etc.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0160-01331	M-320XG/N16	A-NET Crystal Gauge	Controller + Crystal gauge head (with NW16)	21561
0160-01349	M-320XG/N25	A-NET Crystal Gauge	Controller + Crystal gauge head (with NW25)	21562
0160-01365	M-320XG/C34	A-NET Crystal Gauge	Controller + Crystal gauge head (with PY34ICF)	21580
0160-01373	M-320XG/C70	A-NET Crystal Gauge	Controller + Crystal gauge head (with PY70ICF)	21581
0160-01357	M-320XG/VG70	A-NET Crystal Gauge	Controller + Crystal gauge head (with PY70VG)	21582
H21-03280	XG-1/NW16	Crystal Gauge Head with NW16		21575
H21-03281	XG-1/NW25	Crystal Gauge Head with NW25		21576
0161-17920	XG-1/ICF34	Crystal Gauge Head with PY34ICF		21577
0161-17938	XG-1/ICF70	Crystal Gauge Head with PY70ICF		21578
0161-44888	XG-1/VG70	Crystal Gauge Head with PY70VG		21579

Note) Contact us for more information about CE (RoHS).

# A-NET Display Unit

## M-390•M-391

### ■ Summary

The M-390 and M-391 are dedicated display units for the A-NET series (M-310HG, M-320XG,

M-330MX, IKR-251/261, and PKR-251/261).

They are single channel support models. (One display unit per gauge is required.)

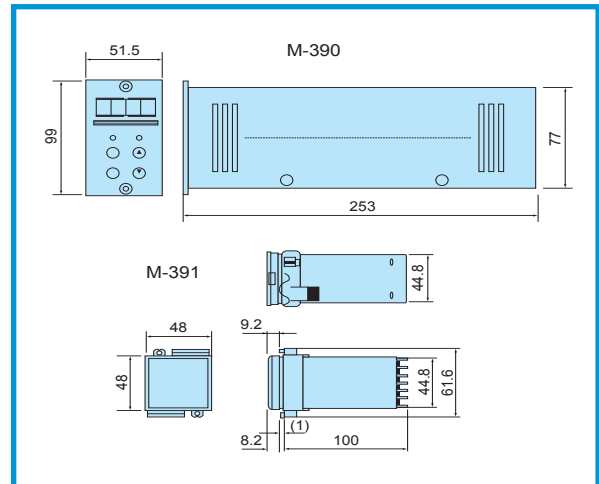
### ■ Specifications

Type	M-390	M-391
Supported gauge	M-330MX (crystal ion gauge) <sup>*1</sup> M-310HG (ion gauge) <sup>*1</sup> M-320XG (crystal gauge) IKR-251/261 (cold cathode gauge) <sup>*1</sup> PKR-251/261 (full range gauge) <sup>*1</sup>	
Front panel size	1/8JIS rack size	DIN size
Display digits	2 mantissa digits + 1 exponent digit	2 mantissa digits + 1 exponent digit
Set point	2 points Contact capacity 24V DC 0.5A	4 points Contact capacity 250V AC 1A
External output	Analog output (Through OUT) Status output	None
External input	2 points (1 spare)	None
A-NET gauge supply power	24V DC	None
Power requirements	85 to 132V AC 70W MAX	21.6 to 26.4V AC 160mA MAX
Dimensions (mm)	99Hx51.5Wx253D	48Hx48Wx100D
Weight	1300g	340g
Communication function	None	None
AC input cable	2m	None
Between each gauge and display	Option, standard 5m	None
Connection cable		

\* 1 Discontinued



### ■ Dimensions diagram



Measurements

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
P23-04307	M-390	A-NET Display Unit	A-NET series dedicated display unit, no cable	21563
H21-03614	M-391	A-NET Display Unit	A-NET series dedicated display unit, no cable	21583*
0161-37475	390-03BA	A-NET Cable for Display Unit (for Ion Gauge 3m)	For ion gauge 3m	21567
0161-37483	390-05BA	A-NET Cable for Display Unit (for Ion Gauge 5m)	For ion gauge 5m	21564
0161-37491	390-10BA	A-NET Cable for Display Unit (for Ion Gauge 10m)	For ion gauge 10m	21568
0161-37506	390-15BA	A-NET Cable for Display Unit (for Ion Gauge 15m)	For ion gauge 15m	21569
0161-37514	390-20BA	A-NET Cable for Display Unit (for Ion Gauge 20m)	For ion gauge 20m	21570
0161-37409	390-03CR	A-NET Cable for Display Unit (for Crystal Gauge 3m)	For crystal ion gauge, crystal gauge 3m	21571
0161-37417	390-05CR	A-NET Cable for Display Unit (for Crystal Gauge 5m)	For crystal ion gauge, crystal gauge 5m	21565
0161-37425	390-10CR	A-NET Cable for Display Unit (for Crystal Gauge 10m)	For crystal ion gauge, crystal gauge 10m	21572
0161-37433	390-15CR	A-NET Cable for Display Unit (for Crystal Gauge 15m)	For crystal ion gauge, crystal gauge 15m	21573
0161-37441	390-20CR	A-NET Cable for Display Unit (for Crystal Gauge 20m)	For crystal ion gauge, crystal gauge 20m	21574
0161-37344	390-05CC	A-NET Cable for Display Unit (CC, for Full Range Gauge 5m)	CC, for full-range gauge 5m	21566
0161-37360	390-010CC	A-NET Cable for Display Unit (CC, for Full Range Gauge 10m)	CC, for full-range gauge 10m	21587
0161-37378	390-015CC	A-NET Cable for Display Unit (CC, for Full Range Gauge 15m)	CC, for full-range gauge 15m	21588
0161-37386	390-020CC	A-NET Cable for Display Unit (CC, for Full Range Gauge 20m)	CC, for full-range gauge 20m	21589

Note) \* marked indicates CE (RoHS) compliant. Contact us for other products.

Complies with European and US safety standards.

## Wide Range Ionization Vacuum Gauge

### M-431HG

CE RoHS

#### ■ Summary

The miniature gauge exclusive M-431HG vacuum gauge control power inherits the basic performance, space-saving, and lightweight features of the conventional model (M-430HG). In addition, the gauge now supports the safety standards in Europe and the United States.

#### ■ Features

1. CE marking compliant
2. External I/O and RS-232C communication functions equipped as standard
3. Wide input voltage (M-431 HG)
4. Low power consumption/24V DC input



M-431 HG

#### ■ Applications

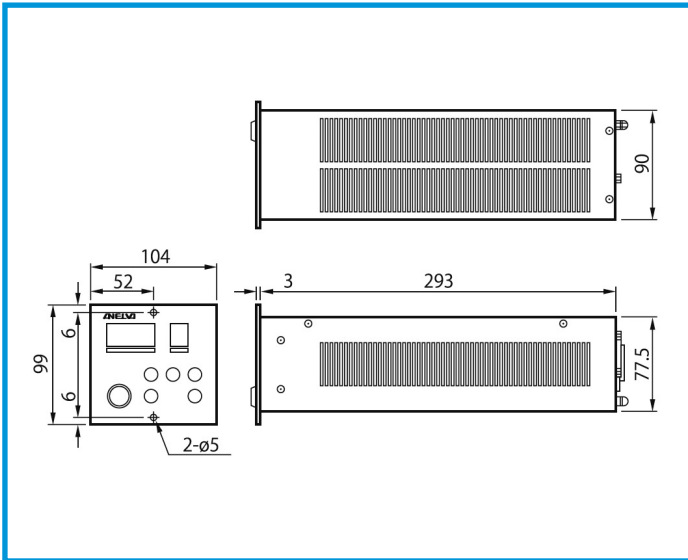
- Automated vacuum equipment pressure measurement
- Sputtering process pressure measurement and control
- Multi-chamber system pressure measurement
- General vacuum equipment pressure measurement

#### ■ Specifications

Type	M-431HG
Pressure display range	0.01x10 <sup>-7</sup> to 13.2x10 <sup>0</sup> Pa
Pressure display	Digital, measurement range auto switch
Set point	Standard equipped with 2 points (with hysteresis)
D/A output	Switch between LOG or combined output (0 to 10V)
Analog output	0 to 10V (APC compatible output)
External control function (Remote operation)	INPUT: Filament ON/OFF, parameter LOCK, filament switching, degas ON/OFF, range hold OUTPUT: Set points 1, 2, Filament ON/OFF status degas status, filament 1/2 status
Communication function	RS232C standard equipped (9600, 4800, 2400, 1200 bps)
Dimensions (mm), Weight	104Wx99Hx296D 1.2kg
Power consumption	50VA 90 to 240V AC 50/60Hz
Emission current	10μA, 100μA, 1mA (auto switched, or fixed)
Degas	Grid electrical heating method, 3 min timer
Filament switching	Key and remote I/O control
Filament protection	Filament OFF at 13.3x10 <sup>0</sup> Pa
Standard configuration	Vacuum gauge main unit (measurement gauge and cables not included)
RoHS, CE marking	compliant

\* The cable included with the M-431HG is for use at 100V. Please contact us when using at 200V.

## ■ Dimensions diagram



## ■ Accessories

### Cables

- Dedicated gauge cable (60°C heat-resistant temperature)  
Standard length 5m, 10m, 15m, 20m
- Bakable cable also available (250°C heat-resistant temperature).  
Standard length 5m, 10m, 15m, 20m

### Measurement gauge

Refer to the miniature gauge in the measurement gauge section.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
H21-03430	430-901	Cable for Miniature B-A Gauge (5m)	For MG-2/2F	21672
H21-03432	430-902	Cable for Miniature B-A Gauge (10m)	For MG-2/2F	21673
H21-03433	430-903	Cable for Miniature B-A Gauge (15m)	For MG-2/2F	21674
0161-24189	430-904	Cable for Miniature B-A Gauge (20m)	For MG-2/2F	21675
0161-44820	430-911	Bakable Cable for MG-2 (5m)	Maximum operating temperature range 250°C	21676
0161-44838	430-912	Balable Cable for MG-2 (10m)	Maximum operating temperature range 250°C	21677
0161-36966	430-913	Balable Cable for MG-2 (15m)	Maximum operating temperature range 250°C	21678
0161-36974	430-914	Bakable Cable for MG-2 (20m)	Maximum operating temperature range 250°C	21679
0161-55554	M-431HG	Wide Range Ion Gauge	For MG-2	21685*

Note) \* marked indicates CE (RoHS) compliant. Contact us for other products.



## Wide Range Ionization Vacuum Gauge

### M-833HG

CE	RoHS
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#### ■ Summary

The M-833HG is a control unit made exclusively for miniature B-A gauges. Optional expansion boards supporting versatile gauge and data output are available. The combination of a miniature B-A gauge and TC gauge (option) and the use of an auto filament for auto gauge switching enables highly accurate vacuum measurement from atmospheric pressure to ultra-high vacuum. The M-833HG is ideally suited for installation on high to ultra-high vacuum equipment.

#### ■ Features

1. Easy-to-read liquid crystal display. Pressure values and messages are displayed on the LCD.
2. Automatically switched pressure range.
3. Variety of external control functions enabling fully remote operation.
4. Two set points equipped as standard.
5. Highly expandable supporting up to four option boards. (Note: GP-IB option not supported.)
6. Compliant with RoHS and CE marking.



#### ■ Applications

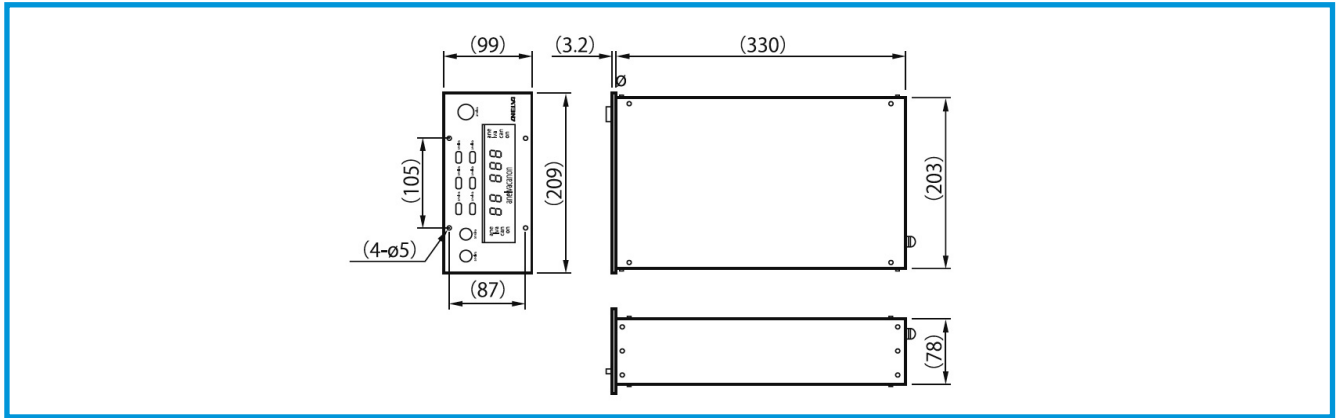
- Automated vacuum equipment pressure measurement
- Sputtering process pressure measurement and control
- Multi-chamber system pressure measurement
- General vacuum equipment pressure measurement

#### ■ Specifications

Type	M-833HG
Measurement gauge	Miniature gauge MG-2 Series
Pressure display range	0.1x10 <sup>-7</sup> to 9.9x10 <sup>0</sup> Pa
Pressure display	Measurement range auto switch
Set point	Two set points equipped as standard (open collector)
D/A output	0 to 10V: Mantissa output 0 to 11V: Combined output or LOG output
Analog output (Electron meter output)	When set to APC mode (0.1 to 2.5V) When set to normal mode (0.1 to 1.6V)
External control function (Remote operation)	INPUT: Filament ON/OFF Six types of external control functions such as degas ON/OFF etc. OUTPUT: Six types of status signal output
Special function	APC compatible: Range hold function Electron meter output function
Dimensions and Weight	H99xW209xD330, 1.9kg
Power requirements	100 to 240V AC 100VA or less, 50/60Hz
Emission current	10μA, 100μA, 1mA auto switched or fixed
Degas	Grid electrical heating method
Filament switching	Key and remote I/O control
Filament protection	Over range setting or emission current ±50% variation
Standard configuration	Vacuum gauge main unit (measurement gauge and cables not included)
RoHS, CE marking	compliant



## ■ Dimensions diagram



## ■ Accessories

### Cables

- Dedicated gauge cable (60°C heat-resistant temperature)  
Standard length 5m, 10m, 15m, 20m
- Bakable cable also available (250°C heat-resistant temperature).  
Standard length 5m, 10m, 15m, 20m

### ■ Expansion function options

\* Refer to the section on the M-723HG, M-823HG, and M-932HG accessories for the option board combinations

TC gauge board	Combination of thermocouple gauge and B-A gauge enables measurement from roughing pressure to ultra-high vacuum. Two TG-550Cs can be measured with one board. However, the standard configuration is one TG-550C1 and one cable.
BCD output board	Enables BCD output of pressure values.
CM gauge board	Enables measurement of atmospheric pressure to ultra-high vacuum in combination with a capacitance manometer.
Set point output	Expansion and relay output of pressure set points are possible.
RS232C board	For external control (600, 1200, 2400, 4800, 9600, 19200 bps)
Gauge selector box	Capable of connecting and selecting between two miniature B-A gauges.

### ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-63816	M-833HG	Wide Range Ion Gauge	Miniature gauge dedicated power supply, cable/no measurement gauge	21734*
0161-68604	722-TC	TC Gauge Board	TG-550C for M-723HG, 823HG, 833HG, 923HG with 5m cable	21487
0161-70465	722-BCD	BCD Output Board	With connector for M-723HG, 823HG, 833HG, 923HG	21483
0161-70423	722-CM	CM.XTL Gauge Board	With connector for M-723HG, 823HG, 833HG, 923HG	21481
P23-04131	722-SPB	Set Points Board	With connector for M-723HG, 823HG, 833HG, 923HG	21480
P23-04132	722-232C	RS-232C Board	With connector for M-723HG, 823HG, 833HG, 923HG	21485
0161-70499	831-331	Gauge Selector Box for M-833HG	No cable, for MG-2	21776
P23-01064	831-323	Gauge Selector Box for MG-2	For M-833HG, including cable (5m between main unit, 2m between gauge)	21775
H21-03430	430-901	Cable for Miniature B-A Gauge (5m)	For MG-2/2F	21672
H21-03432	430-902	Cable for Miniature B-A Gauge (10m)	For MG-2/2F	21673
H21-03433	430-903	Cable for Miniature B-A Gauge (15m)	For MG-2/2F	21674
0161-24189	430-904	Cable for Miniature B-A Gauge (20m)	For MG-2/2F	21675
0161-44820	430-911	Bakable Cable for MG-2 (5m)	Maximum operating temperature range 250°C	21676
0161-44838	430-912	Balable Cable for MG-2 (10m)	Maximum operating temperature range 250°C	21677
0161-36966	430-913	Balable Cable for MG-2 (15m)	Maximum operating temperature range 250°C	21678
0161-36974	430-914	Bakable Cable for MG-2 (20m)	Maximum operating temperature range 250°C	21679

Note) \* marked indicates CE (RoHS) compliant. Contact us for other products.

## Ionization Vacuum Gauge

### M-723HG, M-823HG, M-923HG



#### ■ Summary

This series includes the most common B-A ionization vacuum gauges, with abundant expansion board selection supporting a variety of gauges.

A remote control function necessary for process control of vacuum equipment and a range hold function effective for APC (auto pressure control) are equipped as standard.

Combining a wide range B-A gauge and a thermocouple gauge and the use of an auto filament for auto gauge switching, the M-823HG enables highly accurate vacuum measurement from atmospheric pressure to ultra-high vacuum.

#### ■ Features

1. Automatically switched pressure range.
2. Pressure values and messages are displayed on the LCD.
3. Variety of external control functions enabling fully remote operation.
4. Two set points equipped as standard.
5. D/A output equipped as standard (four outputs: mantissa, exponent, composite, and LOG) for recorder output.

6. Convenient range hold function for APC (auto pressure control) equipped as standard. This feature enables fixing/releasing to/from the set pressure range. In addition, a high response analog output (electrometer output) separate from the D/A output is provided as a signal for APC.
7. The M-823HG is equipped with an auto filament function that automatically switches from roughing gauges such as TC and CM to a B-A gauge.
8. The relative sensitivity can be set by gas type.
9. In addition to 100V AC, power supply voltages of 115V AC, 200V AC, and 230V AC are also available by special order.
10. Functions can be enhanced using a variety of options.

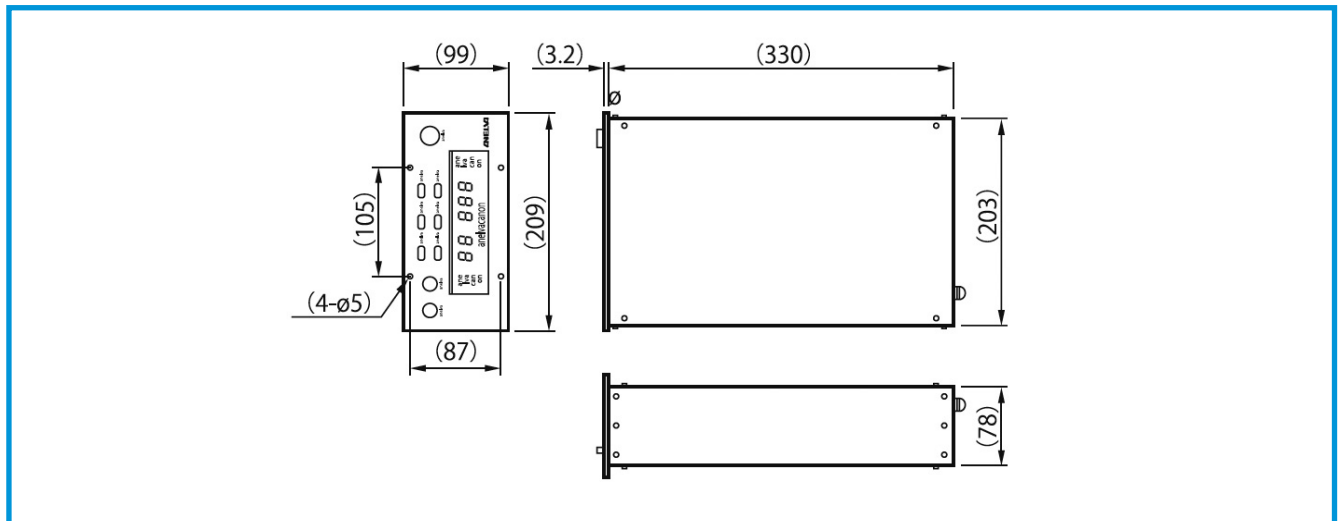
#### ■ Applications

- Automated vacuum equipment pressure measurement
- Sputtering process pressure measurement and control
- Multi-chamber system pressure measurement
- General vacuum equipment pressure measurement

## ■ Specifications

Type	M-723HG	M-823HG	M-923HG
Measurement gauge	UGD-1S B-A gauge	BRG-1B wide range B-A gauge	NIG-2F/NIG-2TF Nude Ion Gauge
Pressure measurement range	5 range auto switch $10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}$ Pa	7 range auto switch $10^0, 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}$ Pa	8 range auto switch $10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7}, 10^{-8}, 10^{-9}$ Pa
Measurement range switching	Auto switching (range hold possible)		
Degas	Grid electrical heating method		Electron bombardment method
Filament switching	Can be switched from the front panel or by external control input (M823HG excluded).		
Filament protection	Turns off automatically if there is a problem in the fluctuation range of pressure, ion current, or emission current.		
Analog output	D/A output (mantissa D/A output, exponent D/A output, combined D/A output) analog raw output (electrometer output)		
I/O remote	INPUT: Filament ON/OFF input, degas ON/OFF input, filament inhibit input, range hold 1 input, range hold 2 input, filament switch input, gauge 1/2 switch input (when using the gauge select option) OUTPUT: Filament ON/OFF output, degas ON/OFF output, remote/local output, set point output (2 points), gauge 1/2 select output (when using the gauge selector option), power ON/OFF output, filament 1/2 output, alarm output		
Set point	Two set points set as standard (open collector)		
Dimensions (mm)	H99 x W209 x D330		
Power requirements	100V AC $\pm$ 10%2A, 50/60Hz (also supports 115/200/230V AC)		
Weight	5.4kg		
Standard configuration	Vacuum gauge main unit (measurement gauge and cables not included)		

## ■ Dimensions diagram



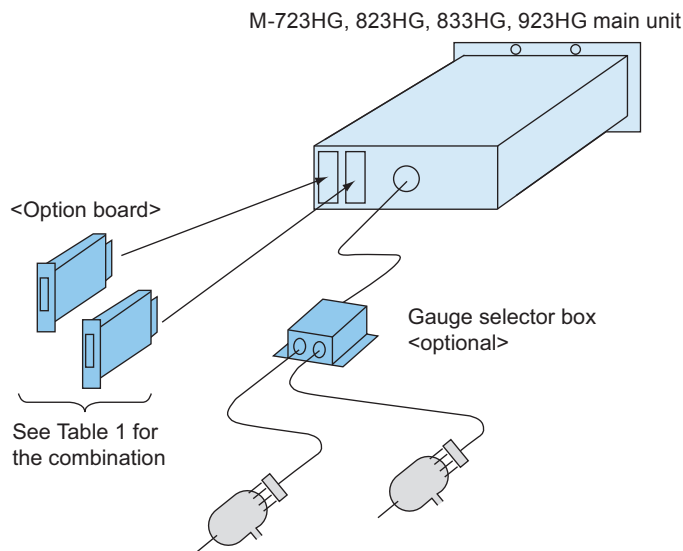
## ■ Accessories

### Option board combinations

Functions can be enhanced using an option board.

	Set point board	CM gauge board	TC gauge board	BCD output board	GP-IB board	RS-232C board	Gauge selector box
Set point board		○	○	○	○	○	○
CM gauge board	○		○	○	○	○	○
TC gauge board	○	○	○	○	○	○	○
BCD output board	○	○	○		○	○	○
GP-IB board	○	○	○	○		×	○
RS-232C board	○	○	○	○	×		○
Gauge selector box	○	○	○	○	○	○	

○: Combination allowed  
 ×: Combination not allowed



Set point output	Expansion and relay output of pressure set points are possible. 4 points 100V AC 1A, 30V DC 1A
CM gauge board	Enables measurement of atmospheric pressure to ultra-high vacuum in combination with a capacitance manometer.
TC gauge board	Enables measurement from roughing pressure to ultra-high vacuum by combining a thermocouple gauge with a B-A gauge. Two units can be measured with one board. However, the standard configuration is one TG550C1 and one cable.
BCD output board	Enables BCD output of pressure values.
GB-IB board	For external control
RS-232C board	For external control (600, 1200, 2400, 4800, 9600, 19200 bps)
Gauge selector box	Capable of connecting and selecting between two B-A gauges.

### Cables

Standard length 5m, 10m, 15m, 20m and bakable cables are available. Refer to the ordering information.

### Measurement gauge

Refer to the section on measurement gauge for details. (Refer to the control unit specifications for the available gauge.)

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-80355	M-723HG	Ion Gauge	JIS rack type	21704
0161-80486	M-823HG	Wide Range Ion Gauge	JIS rack type	21728
0161-71445	M-923HG	UHV Vacuum Gauge	JIS rack type	21747
P13-06804	921-303	Gauge Selector Box (for M-922HG)	For M-923HG, including cable (5m between main unit, 2m between gauge)	21745
P13-08435	721-303	Gauge Selector Box (for M-722HG/M-822HG)	For M-723HG/M-823HG, including cable (5m between main unit, 2m between gauge)	21764
0161-68604	722-TC	TC Gauge Board	TG-550C for M-723HG/823HG/833HG/923HG, with cable 5m	21487
0161-70423	722-CM	CM.XTL Gauge Board	For M-723HG/823HG/833HG/923HG with connector	21481
0161-70465	722-BCD	BCD Output Board	For M-723HG/823HG/833HG/923HG with connector	21483
P23-04131	722-SPB	Set Points Board	For M-723HG/823HG/833HG/923HG with connector	21480
P23-04132	722-232C	RS-232C Board	For M-723HG/823HG/833HG/923HG with connector	21485
P13-14960	820-901	Cable for B-A Gauge (5m)	M-723HG/823HG, standard 5m	21645
P13-14965	820-902	Cable for B-A Gauge (10m)	M-723HG/823HG, standard 10m	21646
P13-14966	820-903	Cable for B-A Gauge (15m)	M-723HG/823HG, standard 15m	21647
P13-14967	820-904	Cable for B-A Gauge (20m)	M-723HG/823HG, standard 20m	21648
P13-14123	921-901	Cable for Nude Ion Gauge (5m)	For M-923HG, 5m	21750
P13-14128	921-902	Cable for Nude Ion Gauge (10m)	For M-923HG, 10m	21751
P13-14129	921-903	Cable for Nude Ion Gauge (15m)	For M-923HG, 15m	21752
P13-14130	921-904	Cable for Nude Ion Gauge (20m)	For M-923HG, 20m	21753
0161-36411	921-911	Bakable Cable for Nude Ion Gauge (5m)	For M-923HG, 5m	21754
P13-22893	921-912	Extension Cable for Nude Ion Gauge (5m)	For 921-911 extension, 5m	21755
0161-36932	921-913	Extension Cable for Nude Ion Gauge (10m)	For 921-911 extension, 10m	21756
0161-36940	921-914	Extension Cable for Nude Ion Gauge (15m)	For 921-911 extension, 15m	21757
P13-15424	921-801	Rack Mount Panel	For M-723HG/823HG/833HG/923HG	21765

Note) Contact us for more information about CE (RoHS).

## Ionization Vacuum Gauge

M-723HG-CC, M-823HG-CC, M-833HG-CC, M-923HG-CC

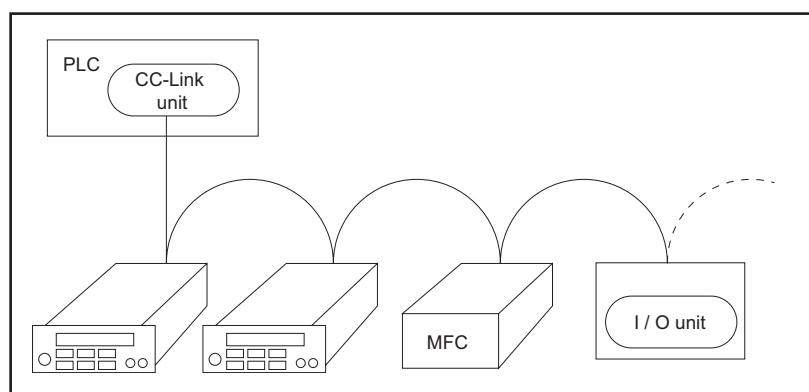


### ■ Summary

The popular ionization vacuum gauges M-723-HG, M-823HG, M-833HG, and M-923HG support CC-Link communication control.

CC-Link is a field network recommended by the CC-Link Association for efficient wired FA control. CC-Link enables multiple connections with a single unit.

CC-Link connection schematic



### ■ Accessories

Combination with other option boards

Only one option board can be added.

TC gauge board	CM gauge board box	Gauge selector board	Set point board	BCD output board	RS-232C board
⊙	⊙	⊙	○	○	×

⊙: Communication with CC-Link allowed ○: Combination allowed ×: Combination not allowed

### ■ Ordering information

Parts Number	Model	Description	Remarks	Code
9009-13579	M-723HG-CC	Ion Gauge (CC-Link)	For UGD-1S	21708
0162-08381	M-823HG-CC	Wide Range Ion Gauge (CC-Link)	For BRG-1B	21729
0161-68777	M-833HG-CC	Wide Range Ion Gauge (CC-Link)	For MG-2 series	21735*
0161-82129	M-923HG-CC	UHV Vacuum Gauge (CC-Link)	For NIG-2F series	21748

Note) \* marked indicates CE (RoHS) compliant. Contact us for other products.

Measurements

# Thermocouple Vacuum Gauge

## M-012DM

### ■ Summary

The M-012DM vacuum gauge uses two types of crossed precious metal wires, using one pair as a thermocouple and the other pair as a heater. The gauge measures the temperature at the center contact point, which changes as the pressure of the gas changes. This small panel meter has a large, easy-to-read LED. It also has a control unit installed at the rear. In addition, its two set points can be easily set using the switches on the front panel.



### ■ Features

#### 1. LED bar graph display

Easy-to-read LED bar graph display. Set points can be easily set using the switches on the front panel.

#### 2. Constant measurement

Capable of measuring pressure from 200Pa to  $5 \times 10^{-1}$ Pa, stable measurement across a wide range of power supply voltages and changes in ambient temperature is assured.

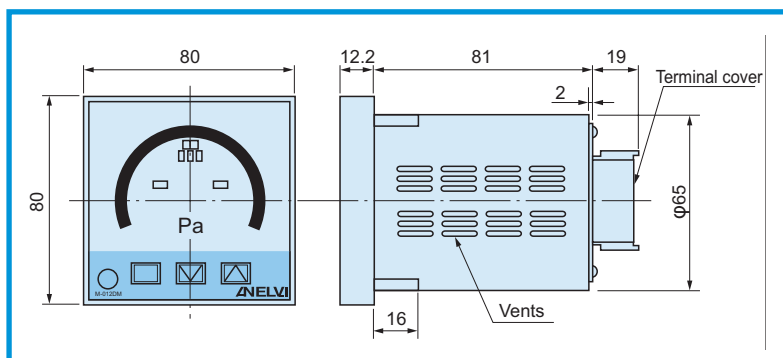
#### 3. Atmospheric pressure operation

Precious metal resistance wires are used to enable operation under atmospheric pressure.

### ■ Applications

- Roughing pump system pressure measurement
- Roughing pump system automatic control

### ■ Dimensions diagram



### ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-68573	M-012DM	Thermo-Couple Gauge (w TG-550B)	TG-550C, with 5m cable	21539
H21-03124	M-012DM	Thermo-Couple Gauge	TG-550C, no cable	21537
B26-01832	012DM-05	Cable for M-012DM (5m)		21526
B26-01834	012DM-10	Cable for M-012DM (10m)		21527
B26-01835	012DM-15	Cable for M-012DM (15m)		21528

Note) Contact us for more information about CE (RoHS).

### ■ Specifications

Type	M-012DM
Measurement gauge	TG-550C Thermocouple Gauge
Pressure measurement range	$5 \times 10^{-1}$ to 200Pa
Pressure display	Bar graph (LED, pseudo analog display format)
Operable pressure	Operable from atmospheric pressure
Analog output	DC0 to 10mV (non-linear with respect to pressure)
Set point	2 points (each point NO, NC) 30V DC 2A, 250V AC 2A
Power requirements	90 to 200V AC 50/60Hz 5W
Weight	0.25kg
Standard configuration	M-012DM (main unit) : x1 Input cable (1.8m) : x1 TG-550C : x1 Gauge cable (5m) : x1

### ■ Accessories

Cable: 5m cable equipped as standard. 10m and 15m cables are available as options. Refer to the ordering information.

Measurement gauge:

Refer to the section on measurement gauge TG-550C for details.

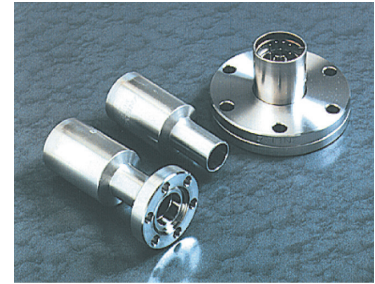


# Measurement gauge

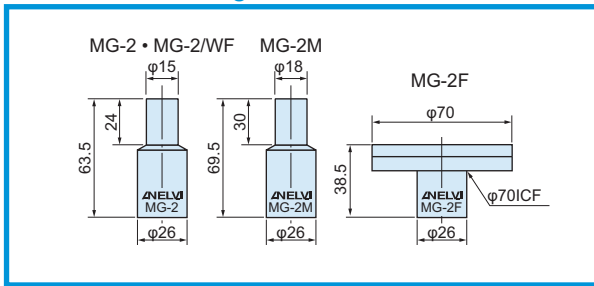
## Miniature Gauge MG-2/MG-2M/MG-2F MG-2/WF

The miniature B-A gauge MG-2/MG-2M/MG-2F (patent pending) is a small metal gauge designed to replace the large, breakable glass gauge of previous gauges. The small size enables the mounting location to be easily selected. Moreover, the reduced size (approx. 1/20 that of previous products) does not sacrifice any sensitivity or measurement range. Pressure from ultimate pressure to process pressure (measurable to 1Pa range), such as for sputtering, can be measured with a single gauge. The MG-2 and MG-2M are con-

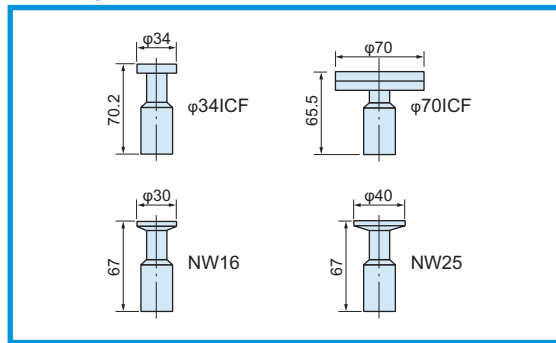
nected to a gauge adapter (O-ring insertion type). The MG-2 is for  $\phi 15\text{mm}$  and the MG-2M is for  $\phi 18\text{mm}$ . With its emphasis on measuring ultimate pressure, the MG-2F is mounted directly to the  $\phi 70\text{ICF}$ .



### ■ Dimensions diagram



### ■ Flange examples



### ■ Specifications

Type	MG-2	MG-2M	MG-2I/NW16, 25	MG-2I/ $\phi 34\text{ICF}$ , $\phi 70\text{ICF}$	MG-2F	MG-2/WF
Body material	SUS304					
Maximum pressure measurement <sup>(Note 1)</sup>	13Pa					$1.3 \times 10^{-1(\text{Note 3})}\text{Pa}$
Minimum pressure measurement <sup>(Note 2)</sup>	Approx. $10^{-6}\text{Pa}$			Approx. $10^{-7}\text{Pa}$		Approx. $1.0 \times 10^{-5(\text{Note 4})}\text{Pa}$
Sensitivity	$0.045\text{Pa}^{-1}$					
Filament	Two filaments built-in Filament material: Yttria coated iridium wire					Two filaments built-in Filament material: Tungsten
Measurement gauge capacity	Approx. 12cc					
Power requirements	Filament	2.3W				2.5W
	Grid degas	1.0W				1.0W
Degassing method	Grid electrical heating					
Attachment method	Can be welded to $\phi 15$ gauge adapter or various flanges	$\phi 18$ gauge adapter	NW25, NW16	$\phi 34\text{ICF}$ , $\phi 70\text{ICF}$	$\phi 70\text{ICF}$ Connected to flange	Can be welded to $\phi 15$ gauge adapter or various flanges

Note 1) Linearity limit

Note 2) Lowest practical pressure that can be measured. Use of MG-2F is recommended for measurement of  $10^{-7}\text{Pa}$ .

Note 3) Inert gases such as nitrogen and argon can be measured up to 13Pa.

Note 4) The lowest measurable value of MG-2/WF is one order of magnitude higher than the standard MG-2.



## ■ Ordering information

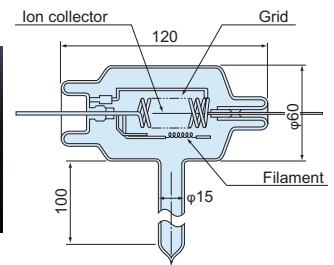
Parts Number	Model	Description	Remarks	Code
0160-01234	MG-2	Miniature B-A Gauge Head	Mount area $\phi 15$ type	21160
0160-01268	MG-2F	Miniature B-A Gauge Head	With $\phi 70$ ICF	21161
0160-01284	MG-2M	Miniature B-A Gauge Head	Mount area $\phi 18$ type	21162
H21-03193	MG-2I/NW16	Ion Gauge (w NW16)	With NW16	21163
H21-03194	MG-2I/NW25	Ion Gauge (w NW25)	With NW25	21164
H21-03195	MG-2I/ICF34	Ion Gauge (w $\phi 34$ Mini Flange)	With $\phi 34$ ICF	21165
P25-04306	MG-2I/ICF70	Miniature B-A Gauge Head with $\phi 70$ ICF	With $\phi 70$ ICF	21166
B23-01688	MG-2WF	Miniature B-A Gauge Head	Tungsten filament type, mount $\phi 15$ type	21170

Note) Contact us for more information about CE (RoHS).

## B-A Gauge UGD-1S

This is a sealed glass tube type B-A ionization vacuum gauge measurement for measuring pressure in the  $10^{-2}$ Pa and under range.

The UGD-1S is a Kovar glass sealed B-A gauge. The grid is made of tungsten and degassing is performed by electrical heating. Therefore, pressure can be measured even during degassing. A connector type (socket type) cable connection is used to provide a simple, firm and safe connection.

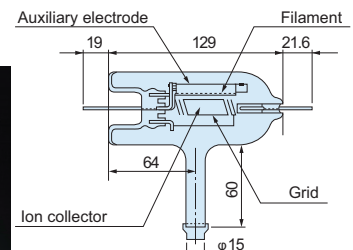


## Wide Range B-A Gauge BRG-1B

This is an improved B-A gauge with a wider measurement range at high pressure. Degassing is performed by grid electrical heating similar to the UGD-1S. A thorium coated iridium filter is used to enable high pressure measurement. A connector type (socket type) cable connection is used to enable easy and secure attachment and removal.

The connection with the vacuum equipment uses a  $\phi 15$  adapter or is glass sealed to a glass adapter with  $\phi 70$  ICF attached.

\* Patent No. 1623097



## ■ Specifications

Type	UGD-1S	BRG-1B
Gauge Type	B-A Gauge	Wide Range B-A Gauge
Shape	Glass tube	
Connection with measured vacuum chamber	φ15 gauge port (O ring)	
Recommended measurement range	10 <sup>-6</sup> to 0.1Pa	10 <sup>-6</sup> to 10Pa
Standard sensitivity	0.075Pa <sup>-1</sup> with respect to N <sub>2</sub>	
X ray limit	Approx. 1.3 x 10 <sup>-8</sup> Pa	
Baking temperature	400°C (150°C or less with O-ring seal)	
Material	Filament	Tungsten (x2)
	Body	Kovar glass (vacuum sealed)
Supported vacuum gauge power supply	M-723HG	M-823HG
Applications	General vacuum use	B-A gauge, sputter etc. measurable up to high pressure (10Pa) B-A gauge, sputter, etc.

## ■ Options

Glass gauge (UGD-1S, BRG-1B, LG-11S) with a glass adapter with φ70ICF attached (welded) are also available. We can customize the connection direction and length according to your specifications.

## ■ Ordering information

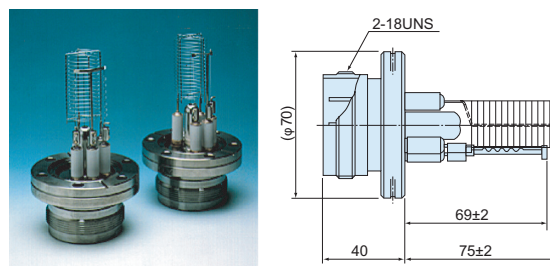
Parts Number	Model	Description	Remarks	Code
P25-05688	BRG-1B	Wide Range B-A Gauge Head	Mount area φ15 type	21225
P25-02463	952-7860	BRG-1 Vertical Type Wide Range B-A Gauge Head	With φ70ICF glass adapter	21133
P21-02260	952-7861	BRG-1 Horizontal Type Wide Range B-A Gauge Head	With φ70ICF glass adapter	21132
783-5285	UGD-1S	B-A Gauge Head	Socket type	21121
VMT-9304	952-7850	UGD-1S Vertical Type B-A Gauge Head	With φ70ICF glass adapter	21130
VMT-9305	952-7851	UGD-1S Horizontal Type B-A Gauge Head	With φ70ICF glass adapter	21131

Note) Contact us for more information about CE (RoHS).

## Nude Ion Gauge NIG-2F/NIG-2TF

This gauge directly mounts a B-A type electrode on a flange. This is directly attached to the equipment making it ideally suited for ultra-high vacuum measurement without any errors due to feedthrough. Platinum-clad molybdenum wires are used for the grid to minimize errors due to gas contamination.

A connector type (Canon plug type) cable connection is used to provide a simple, firm and safe connection. The NIG-2F uses a tungsten filament. In addition, the NIG-2TF uses a yttria coated filament, which lowers the operating temperature, suppresses degassing, and improves ultra-high vacuum measurement.



## ■ Specifications

Type	NIG-2F 954-7902	NIG-2TF 954-7903
Gauge Type	Nude Type B-A	
Shape	Nude Type	
Connection with measured vacuum chamber	φ70ICF	
Recommended measurement range	10 <sup>-9</sup> to 10 <sup>-2</sup> Pa	
Standard sensitivity	0.19Pa <sup>-1</sup> with respect to N <sub>2</sub>	
X ray limit	Approx. 2.7x10 <sup>-9</sup> Pa	
Baking temperature	400°C	
Filament	Filament Material: Tungsten (x2)	Filament material: Yttria-coated iridium (x2)
Supported vacuum gauge power supply	M-923HG	
Applications	Up to 10 <sup>-9</sup> Pa	
	Ultra-high vacuum equipment (for bakable equipment)	

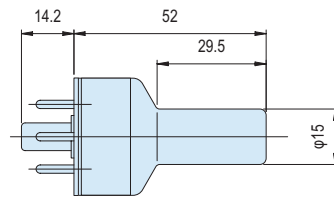
## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
783-2411	954-7902	NIG-2F Nude Ion Gauge Head	Cannon pluggable	21120
A23-04054	NIG-2TF	Nude Ion Gauge (Yttria Coat Filament)		21119
A26-07217		Yttria Coat Filament Kit	For NIG-2TF	21142
794-0609	954-7905	Filament Kit for Nude Ion Gauge	For NIG-2F	21140

Note) Contact us for more information about CE (RoHS).

## Thermocouple Gauge TG-550C

SUS-304 is used for the material. This gauge can be used from atmospheric pressure and is installed with a φ15 adapter. (The maximum heating temperature is 150°C with the connectors removed.)



## ■ Specifications

Type	TG-550C
Gauge Type	Thermocouple Gauge
Shape	Metal vessel
Connection with measured vacuum chamber	φ15 gauge port (O ring)
Measurement range	10 <sup>-1</sup> to 200Pa
Material	Body
	Stainless steel (SUS-304)
Supported vacuum gauge power supply	M-012DM M-723HG/823HG/833HG/923HG
Applications	For measurement during roughing pump

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0161-68109	TG-550C	Thermo-Couple Gauge Head	Mount area φ15 type	21015
0161-68117	TG-550B	Thermo-Couple Gauge Head	Mount area φ15 type	21009

Note) Contact us for more information about CE (RoHS).

## Sensitivity calibration of the measurement gauge

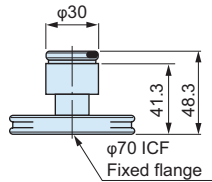
The accuracy of the measurement gauge varies for each gauge and also by time. The sensitivity is calibrated for a standard vacuum gauge. We can calibrate the measurement gauge upon request regardless of whether it is new or used.

## Gauge adapter

SUS-304, gauge seal gasket: Fluorine rubber (Viton)

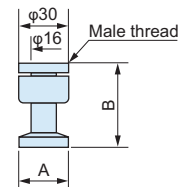
- ICF

φ15 adapter  
952-7806



- Quick-release coupling

	Type	φA	B
NW16	954-7832	30	52
NW25	954-7833	40	52
NW40	954-7834	55	52



### ■ Ordering information

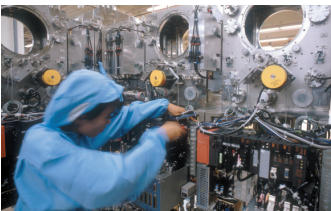
Parts Number	Model	Description	Remarks	Code
0190-05261	952-7806	φ15 Adaptor	With φ70ICF, φ15 gauge mounting port	32150
0190-10054	954-7832	NW16 Gauge Adaptor	With φ15 gauge mounting port	32650
0190-10062	954-7833	NW25 Gauge Adaptor	With φ15 gauge mounting port	32651
0190-10070	954-7834	NW40 Gauge Adaptor	With φ15 gauge mounting port	32652

Note) Contact us for more information about CE (RoHS).

# *Memorandum*

# Helium Leak Detectors

Vacuum equipment



Model:

**M-212LD**

**Compact!**

Highly mobile compact type.



Model:

**M-222LD**

**High power!**

High power type with increased power over the Model 212's roughing pump.



Measurements



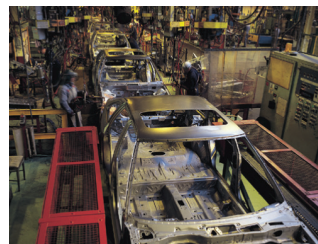


Model:  
**M-222LD-D**

**High power and dry!**  
Portable type equipped with a dry pump.

For a clean environment!

Automotive industry



Medical industry



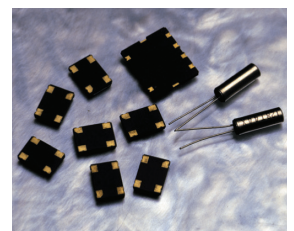
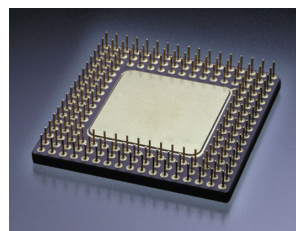
Vacuum components



Model:  
**M-232LD**

**Sniffer**  
Sniffer dedicated type

Electronic devices



## Portable series

### M-212LD/M-222LD(-D)/M-232LD



Measurements

#### ■ Summary

The portable series products have been conceptually developed with emphasis on compactness, lightness, and portability.

The M-212LD is a lightweight, general-purpose model that has been specifically designed for use in the field.

The M-222LD is equipped with a large roughing pump. It can perform leak tests of large vacuum containers by itself without the need of the equipment's pump. A high sensitivity type M-222LD-H is also available. Furthermore, the M-222LD-D uses a dry pump pumping system to keep the vacuum equipment (vacuum components) free of oil contamination.

The M-232LD is a dedicated machine focusing on the sniffer method. It is ideally suited for use in gas pipes and pressurization components.

Select the best model for the intended application from the variety of models provided in this series.

#### **M-212LD ..... Compact!**

- Suitable for inspection and field maintenance of various vacuum equipment
- Compact leak detector for various vacuum components

#### **M-222LD ..... High Power!**

- Maintenance of various vacuum equipment
- Leak test of various large-scale vacuum containers such as accelerators
- Leak system analyzer

#### **M-222LD-D ..... High Power! and DRY!**

- Supports clean room
- Enables oil-free leak tests
- Maintenance of various vacuum equipment

#### **M-232LD ..... Sniffer!**

- Leak test of gas supply systems, vacuum components, and piping components
- Leak test of automotive parts and air conditioning freezers
- Leak test of food and pharmaceutical packages
- Leak test of water and various gas pipes



■ Features

**1. Simple operation**

From equipment startup to measurement with just a touch of a button. Anyone can easily perform leak tests. Simply set the conditions appropriate for the test specimen. Sensitivity calibration is performed automatically.

**2. Industry leading sensitivity, stability, and response**

In addition to using a 180° magnetic deflection mass spectrometer tube, an MCP (Micro-Channel Plate with a secondary-electron multiplier) is installed for amplifying helium ions. As a result, even the standard models can achieve a sensitivity as high as  $10^{-12} \text{Pa} \cdot \text{m}^3/\text{s}$ . This is also coupled with high stability throughout the long-term service period.



Analyzer tube

**3. Portable**

The large casters and handle make the units ideal for field maintenance use.



Portable

**4. Durable robust design**

The units are equipped with a variety of safety features. They respond immediately to operator errors and abnormal environmental conditions.

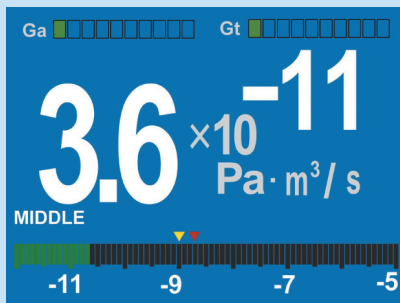
A long life tungsten filament is used to enable long term high-sensitivity measurement. The robust design enables the units to be installed in systems that operate 24/7.

**5. Wide range of functions**

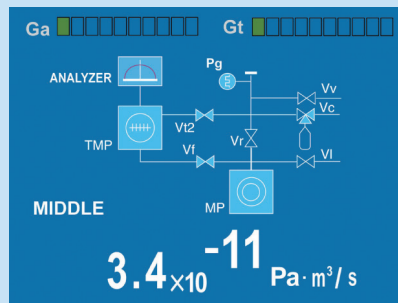
Just like the simple operation of the conventional system, measurements can be performed using the start/stop button. Even those customers requiring complicated configurations to satisfy their specific needs can be easily supported. A 3.8 inch color LCD (320×240) is used for the display unit. A color LCD has been adopted in order to increase legibility. The standard, status, and trend screens are shown below.

As an example of other functions, reading the internal temperature variations and compensating for temperature drift of the preamplifier have improved the measurement accuracy.

■ Hand controller



Standard screen



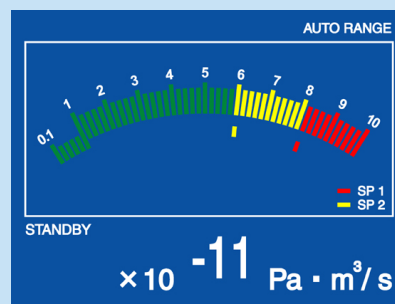
Status screen



Trend screen



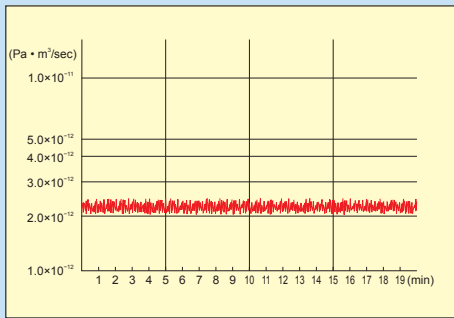
Hand controller



Analog screen

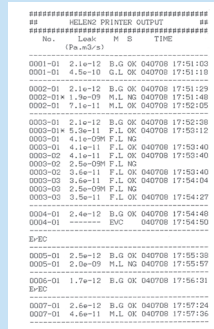
■ Technical data

Minimum detectable leakage data

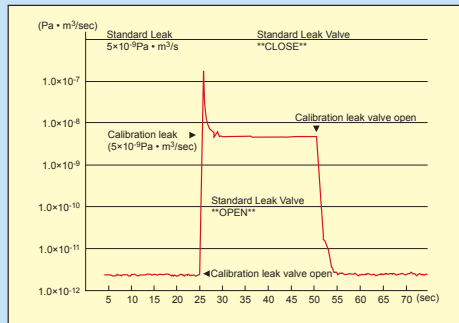


M-212/222LD

Print-out example

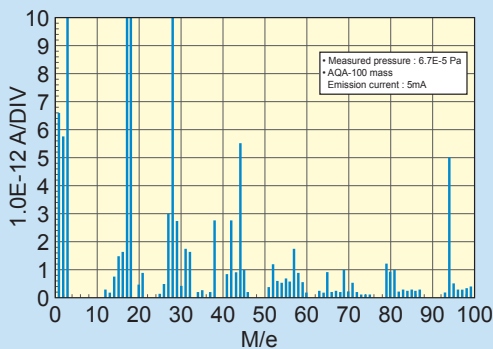


Response/cleanup data

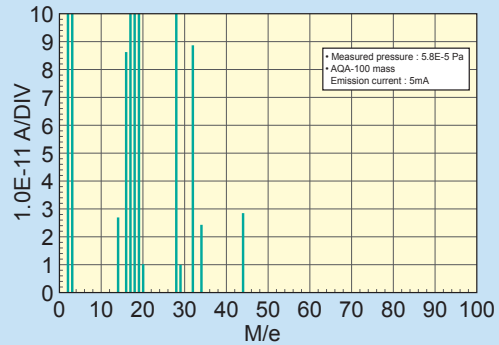


M-212/222LD

Comparison of residual gas analysis (RGA) at inlet port between dry pump specifications and RP specifications



M-222LD



M-222LD-D

## ■ Specifications sheet

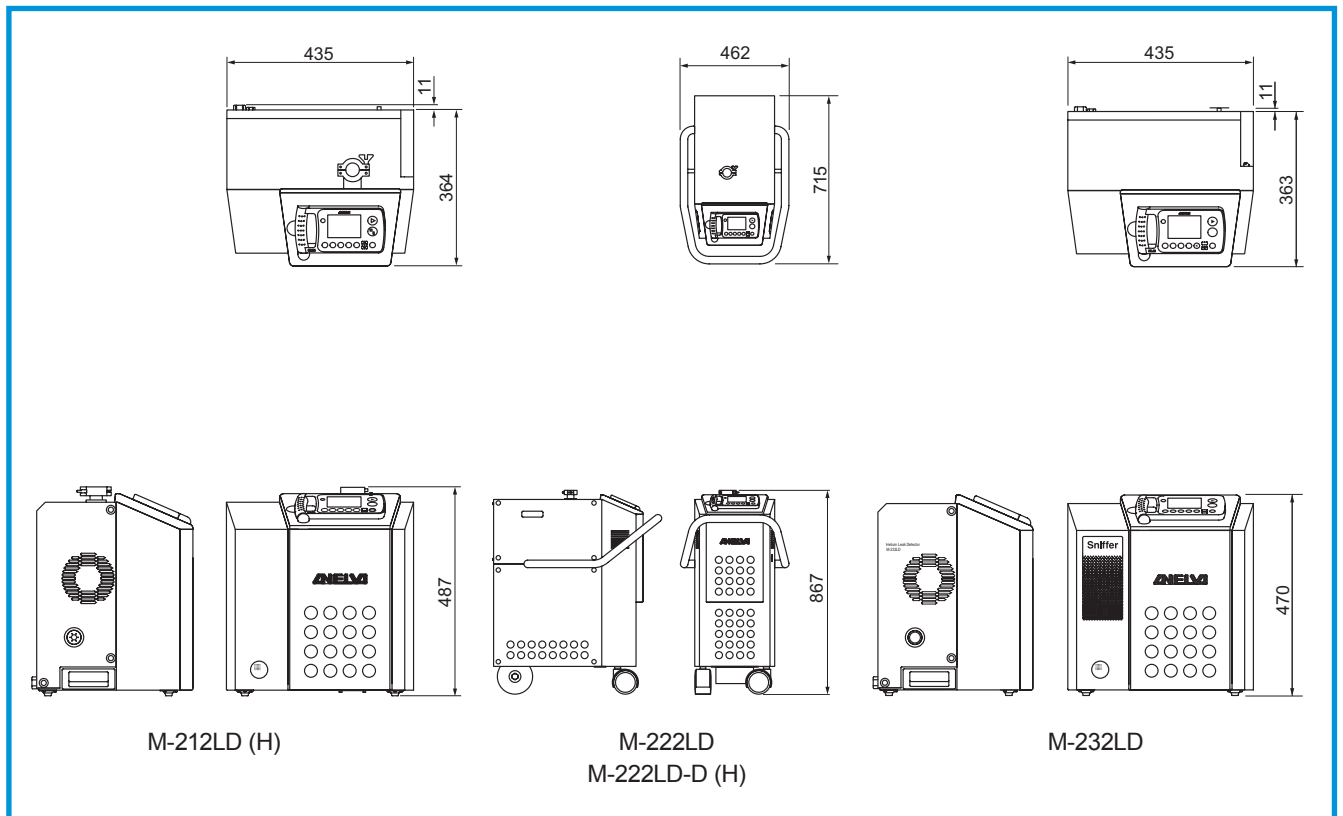
Type	M-212LD (-H) <sup>*3</sup>	M-222LD (-H) <sup>*3</sup>	M-222LD-D (-H) <sup>*3</sup>	M-232LD
Version	Compact	High power	High power & dry	Sniffer
Quantitative measurement range (Pa·m <sup>3</sup> /s)	10 <sup>-12</sup> to 10 <sup>-3</sup> (-H: 10 <sup>-13</sup> to 10 <sup>-3</sup> )	10 <sup>-12</sup> to 10 <sup>-3</sup> (-H: 10 <sup>-13</sup> to 10 <sup>-3</sup> )	10 <sup>-12</sup> to 10 <sup>-3</sup> (-H: 10 <sup>-13</sup> to 10 <sup>-3</sup> )	10 <sup>-8</sup> to 10 <sup>-1</sup> (10 <sup>-2</sup> to 10 <sup>5</sup> ppm)
Inlet port exhaust speed (He) (L/s)	0.5 (Gross Mode) 2.0 (Middle Mode) (5.0 (-H: Fine Mode))	1.8 (Gross Mode) 2.0 (Middle Mode) (5.0 (-H: Fine Mode))	2.0 (Gross Mode) 2.0 (Middle Mode) (5.0 (-H: Fine Mode))	Probe suction speed 0.3Pa·m <sup>3</sup> /s
Inlet port shape	NW25 (ISO)	NW25 (ISO)	NW25 (ISO)	-
Main pump	TMP 50L/s			
Roughing pump	RP 30L/min	RP 142L/min <sup>1</sup>	Dry pump 250L/min	RP30L/min +Diaphragm pump
External interface	RS-232C Analog output (2 points) - Standard I/O			
Display	Color LCD			
Sniffer probe	Options			Standard
Power requirements <sup>2</sup>	100V AC 8A	100V to 115V AC, 15A	100V to 115V AC, 10A	100V AC 8A
Dimensions (WxHxD) (mm)	435x487x364	462x867x715		435x470x363
Weight (kg)	42	75		42

\*1: Optionally changeable to RP up to 275L/min.

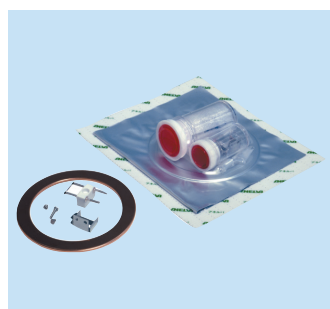
\*2: Supports 115V, 200V, and 230V according to your order specification.

\*3: (-H) is a high sensitivity specification equipment.

## ■ Dimensions diagram



## ■ Accessories



Filament maintenance kit



Various carts



Sniffer probe



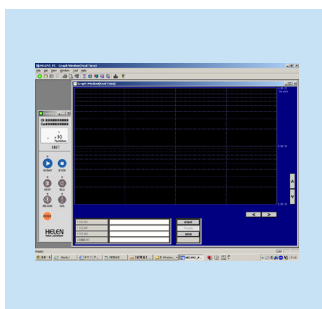
Flexible tube and conversion adapter  
(Various types available)



Calibration leak  
( $5 \times 10^{-9}$  to  $2 \times 10^{-3} \text{ Pa} \cdot \text{m}^3/\text{s}$ )



Pumping system



Dedicated PC software



Helium spray gun

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0160-03587	M-212LD	Helium Leak Detector (212)	100V AC specification, compact	26610
0160-03595	M-222LD	Helium Leak Detector (222)	100V AC specification, high-power type	26620
0160-03600	M-222LD-D	Helium Leak Detector (DRY 222D)	100V AC specification, dry pump type	26621
0160-04787	M-222LD-H	Helium Leak Detector (222H)	100V AC specification, high-power, high sensitivity type	26622
0161-33803	M-222LD-M1	Helium Leak Detector (222M1)	100V AC specification, high-power M1 type	26623
0160-09208	M-232LD	Helium Leak Detector (232)	100V AC specification, sniffer only type	26630
0164-22422		Tool Case (Transport Case)	212/222 transport case	26680
0164-22406		212 Transport Case	With casters	26681
0164-22414		222 Transport Case	With casters	26682
P16-41535	981-9361	ASL25V Helium Standard Leak	NW25, calibrated leak rate with valve: $5 \times 10^{-9}$ to $2 \times 10^{-8} \text{ Pa} \cdot \text{m}^3/\text{s}$	26801
0161-27789		ASL25N2 Helium Standard Leak	NW25, calibrated leak rate without valve: $5 \times 10^{-9}$ to $2 \times 10^{-8} \text{ Pa} \cdot \text{m}^3/\text{s}$	26802
P16-35538	981-9370	Sniffer Probe for 212	Suction rate: $0.1 \text{ Pa} \cdot \text{m}^3/\text{s}$ (compatible with ALD)	26810
P16-34839	981-9371	Sniffer Probe for 222	Suction rate: $0.3 \text{ Pa} \cdot \text{m}^3/\text{s}$ (compatible with ALD)	26811
0164-38504	981-9790	He Spray Gun		26830
P16-37269	981-9351	Filament Maintenance Kit	Filament, gasket, ion chamber: 1 each (compatible with ALD)	26850
P16-21924	981-9350	Filament Assembly	Filament only (compatible with ALD)	26851
0161-97530	981-9352	Filament Maintenance Kit	Filament, O-ring, ion chamber: 1 each (for M-232LD)	26854

Note) Contact us for more information about CE (RoHS).

# THIN FILM DEPOSITION CONTROLLER and MONITOR Film Thickness Meter

Crystal Oscillator

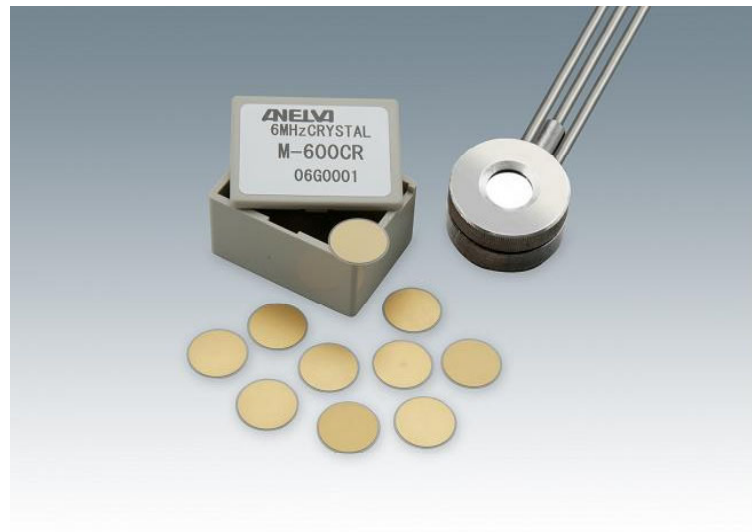
# Crystal Oscillator for Film Thickness Sensor

## 6MHz CRYSTAL

### M-600CR

#### ■ Summary

A new crystal oscillator is used for the crystal film thickness sensor of vacuum deposition equipment. This crystal oscillator offers high-grade performance and high quality, where you can actually feel the difference.



#### ■ Features

##### 1. Initial oscillation frequency with minimum tolerance

For applications that use a narrow range from the initial oscillation frequency such as optical film deposition, this product, which has a small initial oscillation frequency tolerance ( $5990\text{kHz} \pm 5\text{kHz}$ ), can be used for strictly controlling the crystal oscillator replacement interval.

##### 2. More stable life

The oscillation strength of crystal film thickness meters will always decay (although dependent on the deposition conditions), as the film deposits on the crystal oscillator and the oscillating frequency shifts toward lower frequency.

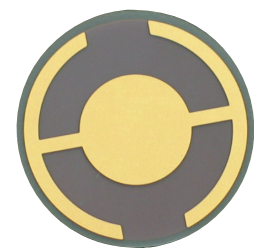
Under the same deposition conditions, decrease in the oscillation strength at the resonant frequency of the crystal oscillator is considered to be one of the factors determining the life of the crystal oscillator. To prolong the life of the crystal oscillator, it is important to keep the resonance resistance of the crystal oscillator at a small, strong oscillation strength. This product has succeeded in keeping the resonance resistance small by using high quality crystal material and high processing technology.

#### ■ Specifications

Item	Specifications
Crystal cut direction	AT cut
Initial oscillation frequency	$5990\text{kHz} \pm 5\text{kHz}$
Electrode	Deposition surface: Gold electrode (fully round surface) Electrode surface: Gold electrode (patterned)
Outer diameter	$\phi 14\text{mm}$
Cross-section shape	Plano-convex
Quantity/1 pack	Contains 10
Case outer dimensions	W30 x H20 x D40mm
Case Material	ABS resin



Deposition surface



Electrode surface

#### ■ Ordering Information

Parts Number	Model	Description	Remarks	Code
9007-67148	M-600CR	6MHz Quartz Crystal	10 per set	22071

Note) Contact us for more information about CE (RoHS).

# CONSTRUCTION COMPONENTS & EB GUNS

## Vacuum Components

### Piping Parts

- Ultra-High Vacuum Flanges
- Connecting Components with ICF
- Quick-release Couplings
- Vacuum Switches
- Ancillary Materials

### Valves

- Ultra-High Vacuum Type-L All-metal Valves
- Ultra-High Vacuum Type-L Polyimide Valves
- “V Series” Roughing Pump Valves
- “V Series” Type-L Valves
- Ultra-High Vacuum Variable Leak Valves
- Gas Inlet Valves
- Isolate Valves

### Ultra-High Vacuum Gate Valve

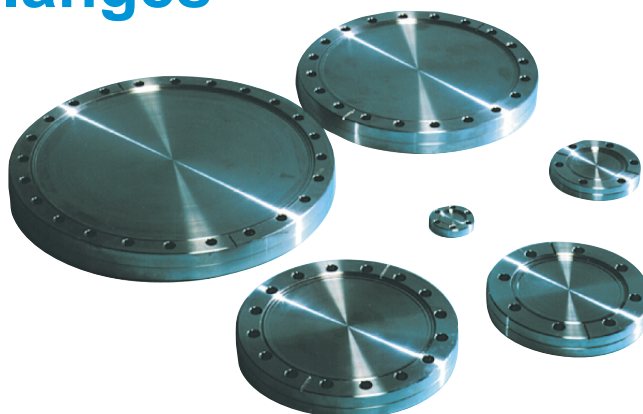
- MSB series
- STD series

### Feedthroughs

- Rotary Feedthroughs
- Linear Feedthroughs
- R/L Feedthroughs
- Current Terminals
- Ultra-high Vacuum Viewing Ports

### E-type Electron Guns

# Ultra-High Vacuum Flanges



## ■ Summary

We provide ICF flanges as ultra-high vacuum flanges. ICF flanges are metal seal flanges that are easy to handle and highly reliable among the existing ultra-high vacuum flanges. ICF flanges use custom gaskets made of oxygen-free copper.

## ICF flanges

### ■ Features

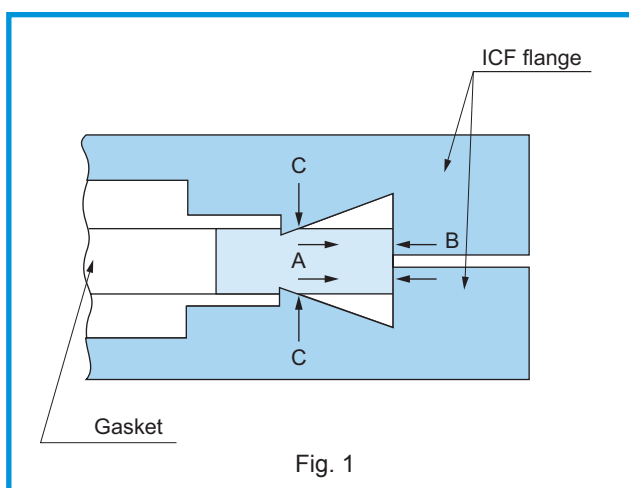
1. Gaskets are elastically sealed based on the "Capturing" theory.
2. Capable of withstanding pressure up to  $10^{-10}$  Pa.
3. Leak-free within the temperature range of  $-196^{\circ}\text{C}$  to  $+450^{\circ}\text{C}$ .
4. Flanges are completely symmetrical without gender.
5. Capable of connecting to any flange with the same diameter. Flanges can be rotated for installation in any direction.
6. Flanges are made of stainless steel (SUS304).

### ● Capturing

The seal edge of the ICF flange is shaped like a cone in order to "Capture" the gasket.

As shown in Fig. 1, the cone shaped seal edge of the flange squeezes the gasket to push the cold flow into

the material (A). This cold flow pushes the outer surface of the gasket to the flange wall resulting in a reactive force (B). This creates a high surface pressure (C) to form a highly reliable vacuum seal. Furthermore, high surface pressure is maintained due to "capturing" even if the gasket softens due to high temperature.





● **Test data**

1. Heat cycle test

No leakage occurs after tightening the  $\phi 70$ ICF flange with a torque of 7.8 to 9.8N·m (bolts and washers coated with molybdenum disulfide paste) and repeating 60 or more heat cycles under the conditions shown in Fig. 2.

2. Low-temperature cycle test

No leakage occurs after tightening the  $\phi 70$ ICF flange with a torque of approximately 7.8N·m (bolts and washers coated with molybdenum disulfide paste) and repeating 30 or more low temperature cycles under the conditions shown in Fig. 3.

3. Continuous heating test

No leakage occurs after tightening the  $\phi 70$ ICF flange with a torque of approximately 9.8N·m (bolts and washers coated with molybdenum disulfide paste) and heating at 450°C several hours every day for a total of 150 hours.

4. Comparison with metal gasket seal flanges

Table 1 compares the sealing line load per unit circumferential length of the gasket.

5. Tightening torque (Reference value)

Table 2 lists the tightening torque of the flange for each size.

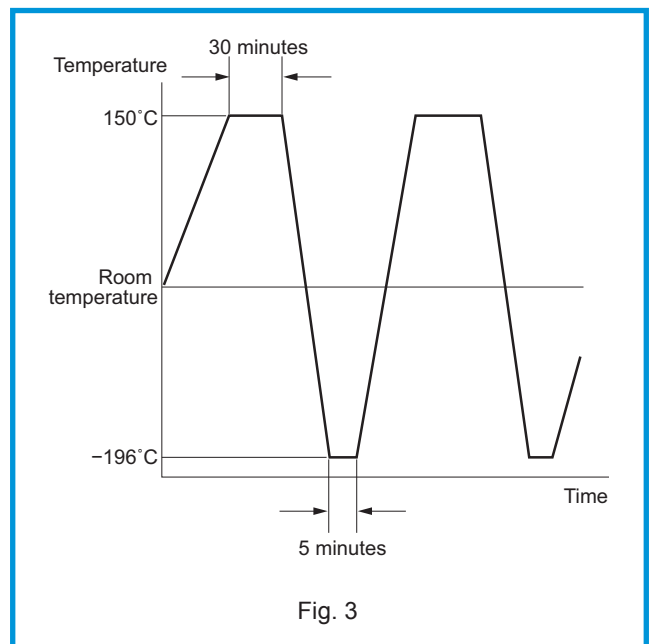
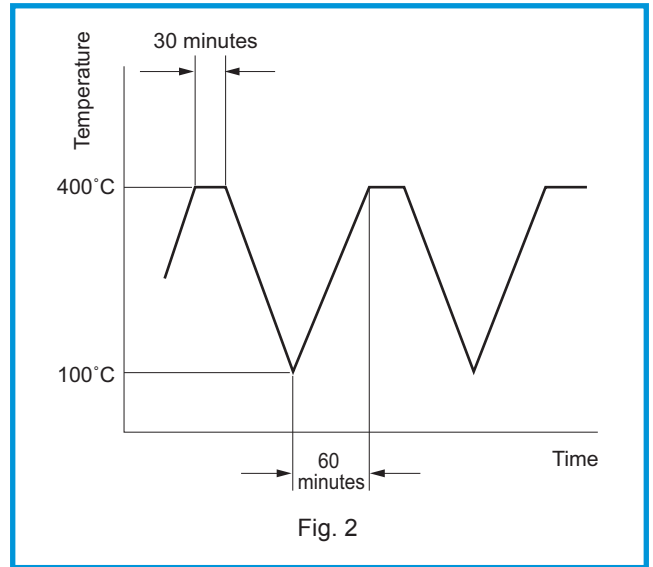


Table 1

Flange type	Seal line load (N/cm)
ICF	3528
Step	3675
Knife-edge	4381

Table 2

Flange	Bolt used	Tightening torque per bolt (N·m)
$\phi 34$ ICF	M4	2 to 3
$\phi 70$ ICF	M6	6.9 to 9.8
$\phi 114$ ICF	M8	9.8 to 14.7
$\phi 152$ ICF	M8	9.8 to 14.7
$\phi 203$ ICF	M8	9.8 to 14.7
$\phi 253$ ICF	M8	9.8 to 14.7
$\phi 305$ ICF	M8	9.8 to 14.7
$\phi 356$ ICF	M10	19.6 to 24.5
$\phi 406$ ICF	M10	19.6 to 24.5

Note) Torque when bolts and washers are coated with molybdenum disulfide paste.

## ■ ICF flange standards

The standard dimensions are divided into six types based on the external diameter. Pipes up to  $\phi 203\text{mm}$  can be connected.

A standard flange modified to fit the compatible pipe is available for each size of flange. (Table 3)

Table 3 ICF fixed flanges

No.	Flange type	Shape	A	B	B1	C	T	T1	$\phi H$	n	P.C.D.	Applicable bolt	Applicable gasket pack	Applicable pipe					
1	954-9401	a	34	Blank	-	-	7.5	-	4.5	6	27	M4x20L	953-9210	-					
2	954-9402	b		6										$\phi 6 \times \phi 4$					
3	954-9403			8										$\phi 8 \times \phi 5.6$					
4	954-9404			10										$\phi 10 \times \phi 8$					
5	954-9405			12.8										$\phi 12.7 \times \phi 10.7$					
6	954-9427			c										16	19.2	13.2	M4	M4x16	953-5014
7	954-1091																		
8	954-7051	d	70	Blank	-	-	12.7	-	6.7	6	58.9	M6x35L	953-5014	-					
9	954-1101	e		20										$\phi 19.1 \times \phi 16.7$					
10	954-1102			26.5										$\phi 25.4 \times \phi 23$					
11	954-1103			33										$\phi 32 \times \phi 29.6$					
12	954-1104			39										$\phi 38 \times \phi 35$					
13	954-1105			42										$\phi 41 \times \phi 38$					
14	954-1191													38.5	M6	M6x22L			
15	954-7052	d	114	Blank	-	-	17.5	-	8.4	8	92.2	M8x45L	953-5015	-					
16	954-1201	e		64.5										61	9.5	M8	M8x30L	953-5016	$\phi 63.5 \times \phi 60.2$
17	954-1291																		
18	954-7053	d	152	Blank	-	-	20	-	8.4	16	130.3	M8x50L	953-5016	-					
19	954-1301	e		103										97	11	M8	M8x40L	953-5017	$\phi 101.6 \times \phi 95.6$
20	954-1391																		
21	954-7054	d	203	Blank	-	-	22	-	8.4	20	181.1	M8x55L	953-5017	-					
22	954-1401	e		155.5										148.5	12.5	M8	M8x40L	953-5048	$\phi 153 \times \phi 147$
23	954-1491																		
24	954-7055	d	253	Blank	-	-	25	-	8.4	24	231.9	M8x60L	953-5048	-					
25	954-1501	e		205.5										198.5	12.5	M8	M8x45L	953-5048	$\phi 203 \times \phi 197$
26	954-1591																		

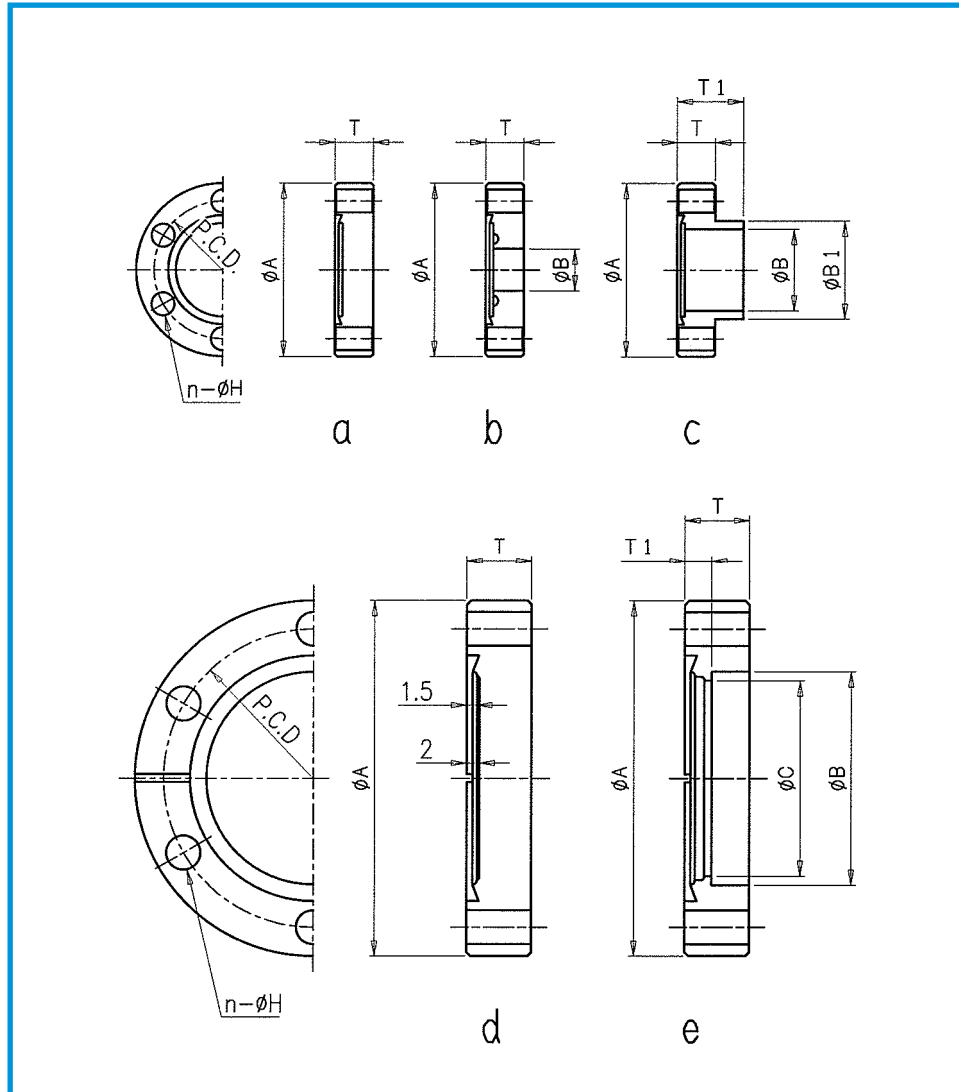
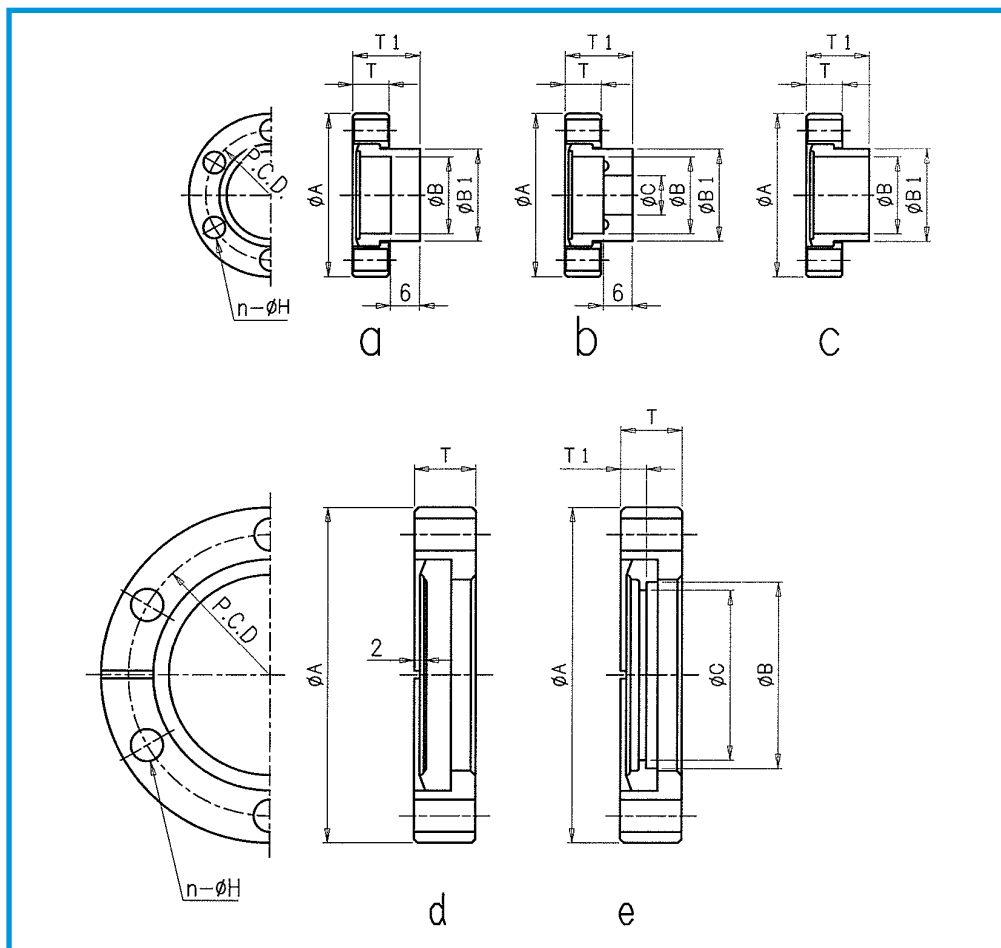


Table 4 ICF rotatable flanges

No.	Flange type	Shape	A	B	B1	C	T	T1	H	n	P.C.D.	Applicable pipe
1	954-9420	a	34	16	19.2	Blank	7.5	14	4.5	6	27	-
2	954-1052	b				6						$\phi 6 \times \phi 4$
3	954-1053	b				8.2						$\phi 8 \times \phi 5.6$
4	954-1051	c				-						$\phi 19.1 \times \phi 16.7$
5	954-1150	d	70	Blank	-	-	12.7	5.3	6.7	6	58.7	-
6	954-1151	e		20		$\phi 19.1 \times \phi 16.7$						
7	954-1152	e		26.5		23.5						$\phi 25.4 \times \phi 23$
8	954-1153	e		33		30						$\phi 32 \times \phi 29.6$
9	954-1154	e		39		35.5						$\phi 38 \times \phi 35$
10	954-1250	d	114	Blank	-	-	19	-	8.4	8	92.2	-
11	954-1251	e		64.5		61						$\phi 63.5 \times \phi 60.2$
12	954-1350	d	152	Blank	-	-	21	-	8.4	16	130.3	-
13	954-1351	e		103		97						$\phi 101.6 \times \phi 95.6$
14	954-1450	d	203	Blank	-	-	24	-	8.4	20	181.1	-
15	954-1451	e		155.5		148.5						$\phi 153 \times \phi 147$
16	954-1550	d	253	Blank	-	-	25	-	8.4	24	231.9	-
17	954-1551	e		205.5		198.5						$\phi 203 \times \phi 197$



## Large-diameter ICF flanges

The dimensions of the large-diameter ICF flanges are divided into three types based on the external diameter as shown in Table 6. Pipes up to  $\phi 350\text{mm}$  can be connected. A blank flange and a flange with a short

pipe are available as standard products (Table 6, Fig. 7). Contact us if you need to connect pipes with specific dimensions. See Table 7 and Fig. 8 for the rotary flanges.

Table 6 Large diameter ICF fixed flange list

No.	Flange type	Shape	$\phi A$	$\phi B$ (Note 2)	$\theta$ (Angle)	T	$T_1$ (Note 3)	$\phi H$	n	P.C.D.	Applicable bolt/nut/washer		Applicable gasket type (Note 5)	Applicable pipe Outside diameter x Inside diameter
											Type	Dimensions		
1 (Note 1)	954-1611	a	305	Blank	$11^\circ 15'$	28	-	8.4	32	284	953-7801	M8x70L	953-7131	-
2 (Note 2)	954-1612	b	305	250	$11^\circ 15'$	28	150	8.4	32	284	953-7801	M8x70L	953-7131	$\phi 250 \times \phi 244$
3 (Note 3)	954-1622	c	305	250	$11^\circ 15'$	28	150	M8 (Note 4)	32	284	953-7811	M8x50L	953-7131	$\phi 250 \times \phi 244$
4	954-1701	a	356	Blank	$12^\circ$	28.5	-	10.5	30	325.4	953-7802	M10x70L	953-7132	-
5	954-1712	b	356	295	$12^\circ$	28.5	150	10.5	30	325.4	953-7802	M10x70L	953-7132	$\phi 295 \times \phi 289$
6	954-1722	c	356	295	$12^\circ$	28.5	150	M10 (Note 4)	30	325.4	953-7812	M10x50L	953-7132	$\phi 295 \times \phi 289$
7	954-1801	a	406	Blank	$12^\circ$	28.5	-	10.5	30	381	953-7802	M10x70L	953-7133	-
8	954-1812	b	406	350	$12^\circ$	28.5	150	10.5	30	381	953-7802	M10x70L	953-7133	$\phi 350 \times \phi 344$
9	954-1822	c	406	350	$12^\circ$	28.5	150	M10 (Note 4)	30	381	953-7812	M10x50L	953-7133	$\phi 350 \times \phi 344$

- Note 1. No.1 to No.3 are flanges that conform to the shapes and dimensions of bakable flanges for vacuum equipment (JVIS 003).  
 2. Winding pipes are used for the pipes. The  $\phi B$  dimensional tolerance is circumference tolerance  $\pi D_{-3}^{\text{mm}}$  and the radial thickness is 3mm.  
 3. The standard  $T_1$  dimension is 150mm. However, special orders can be accepted.  
 4. Thread size of tapped flange.  
 5. The thickness of the large-diameter ICF flange gasket is 3mm.  
 6. The allowable heating temperature of large-diameter ICF flanges is  $250^\circ\text{C}$ .

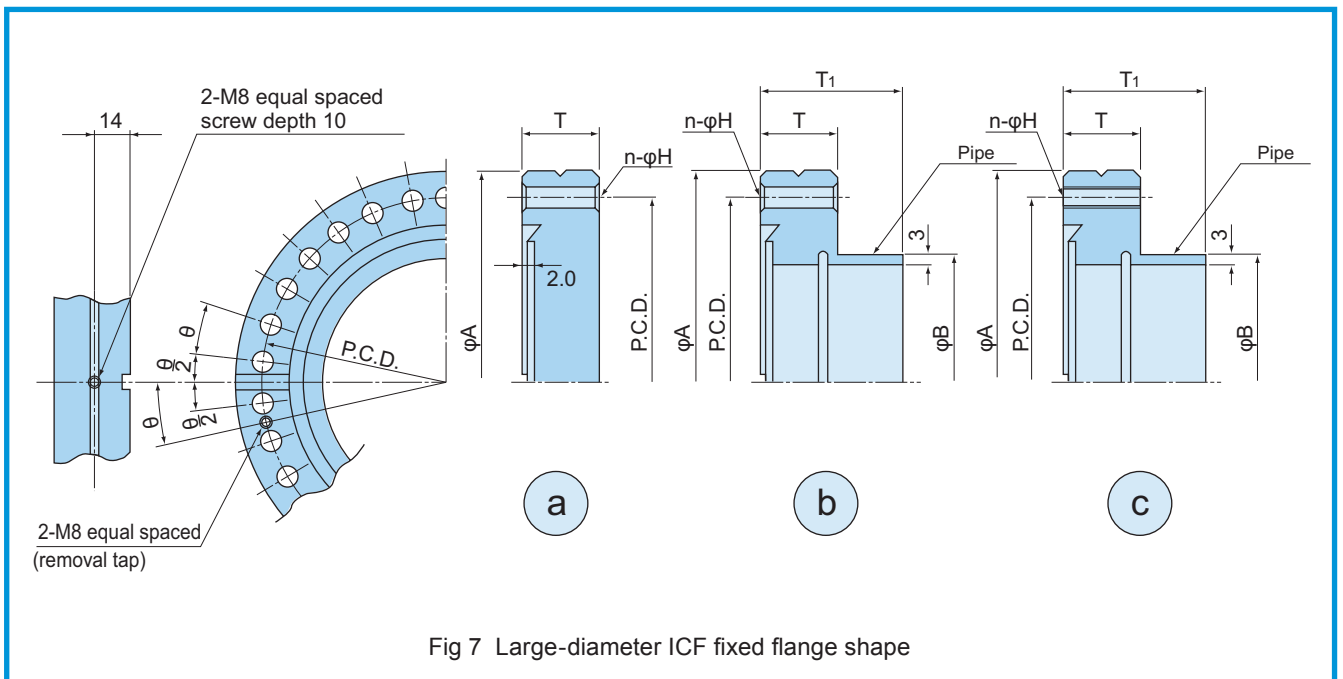


Fig 7 Large-diameter ICF fixed flange shape

Table 7 Large-diameter ICF rotary flanges

No.	Assembly type	Receive flange		Inside flange		$\phi A$	$\phi B$ (Note 3)	$\theta$ (Angle)	T	$T_1$ (Note 4)	$\phi H$	n	P.C.D.	Applicable pipe Outside diameter x Inside diameter
		Type	Shape	Type	Shape									
1 (Note 2)	954-1661	954-1670	R	954-1681	a	305	Blank	11°15'	28	-	8.4	32	284	-
2 (Note 2)	954-1662	954-1670	R	954-1682	b	305	250	11°15'	28	150	8.4	32	284	$\phi 250 \times \phi 244$
3	954-1751	954-1760	R	954-1771	a	356	Blank	12°	28.5	-	10.5	30	325.4	-
4	954-1752	954-1760	R	954-1782	b	356	295	12°	28.5	150	10.5	30	325.4	$\phi 295 \times \phi 289$
5	954-1851	954-1860	R	954-1871	a	406	Blank	12°	28.5	-	10.5	30	381	-
6	954-1852	954-1860	R	954-1882	b	406	350	12°	28.5	150	10.5	30	381	$\phi 350 \times \phi 344$

Note 1. The applicable gaskets, bolts, nuts, and washers are the same as those of fixed flanges.

2. No. 1 and No. 2 are flanges that conform to the shapes and dimensions of bakable flanges for vacuum equipment (JVIS 003).

3. Winding pipes are used for the pipes. The  $\phi B$  dimensional tolerance is circumference tolerance  $\pi D - 0.3$  mm and the radial thickness is 3mm.

4. The allowable heating temperature of large-diameter ICF flanges is 250°C.

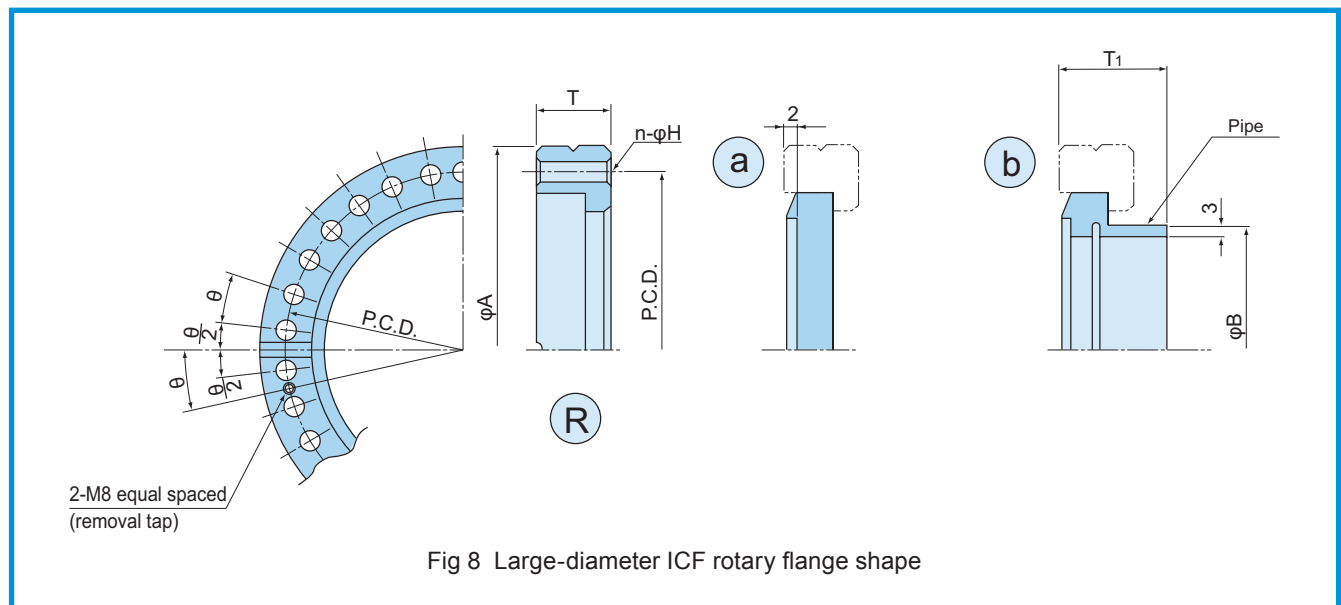


Fig 8 Large-diameter ICF rotary flange shape

### • Gasket bolts

Based on the flange standards, nine types of copper gaskets are provided as standard products. As a general rule, gaskets can be used only once.

Standard bolts and nuts are also available for each flange size (see Tables 3 to 7). Dry type bolts and washers baked with molybdenum disulfide, which do not require the application of molybdenum disulfide paste, are available upon request.

### • Ordering

To order an ICF flange, gasket, bolts, nuts, or washers, please specify the type name and product code. For details on flanges with pipes welded, refer to the section on connection elements.

### ■ 953-7601 gasket clip

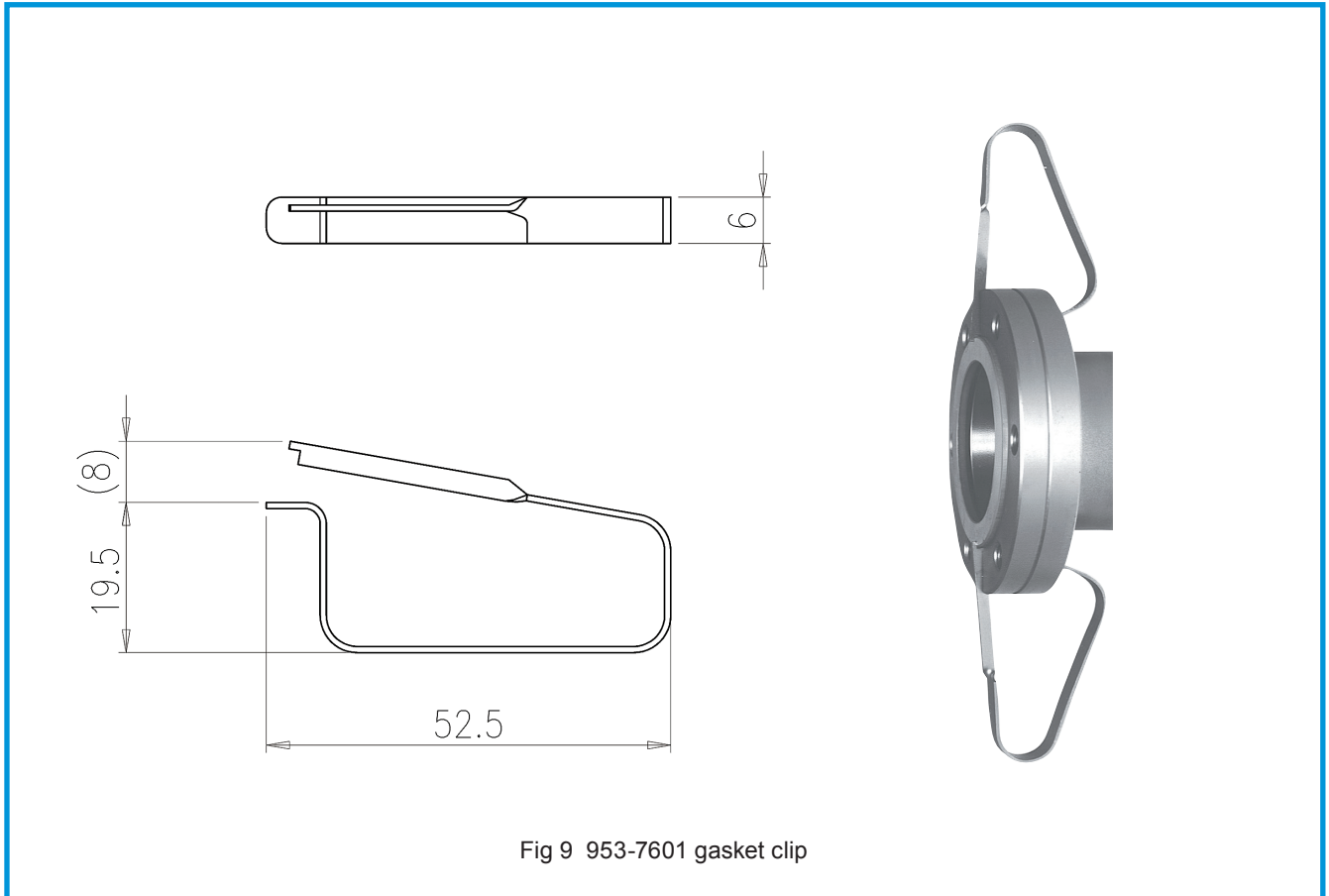
A gasket clip is used to ensure the gasket remains attached to the ICF flange when joining flanges.

Fig. 9 shows an example of its use and dimensions.

When flanges are joined vertically, the gasket clip can

prevent the gasket from dropping and improve operation.

The gasket clip can be used on all ICF flanges except for the  $\phi 34$ ICF.



Note) • After joining the flanges, remove the gasket clip before tightening the bolts.

- The gasket clip is inserted in the leak groove (leak finding groove) of the ICF flange. Therefore, it cannot be used on conflat flanges without a leak groove.
- Gasket clips are not provided as a set of two. Therefore, specify the necessary quantity when ordering.

## ■ Conversion ICF flanges

Use a conversion ICF flange when joining ICF flanges with different diameters.

A standard series of 15 types is available (see Fig. 11 and Table 8).

For copper gaskets, standard gaskets can be used.

The locations of the screws for joining the II flange (M) are arranged with the leak groove at the center.

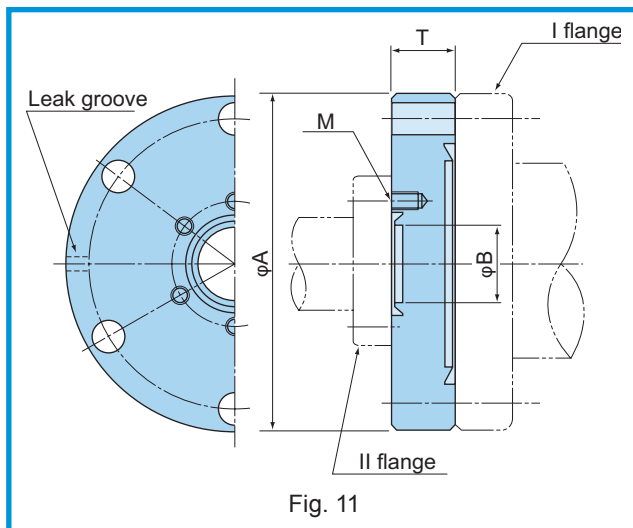


Fig. 11

Table 8 ICF rotatable flanges

No.	Conversion ICF type	I flange			II flange			φA	φB	T	M
		ICF size	Applicable gasket	Applicable bolt*	ICF size	Applicable gasket	Applicable bolt				
1	952-7010	φ70ICF	953-5014	M6x35L	φ34ICF	953-9210	M4x12L	70	17	12.7	6-M4 (Depth 6)
2	952-7020	φ114ICF	953-5015	M8x45L	φ34ICF	953-9210	M4x14L	114	17	17.5	6-M4 (Depth 9)
3	952-7021	φ114ICF	953-5015	M8x45L	φ70ICF	953-5014	M6x22L	114	38	17.5	6-M6 (Depth 10)
4	952-7030	φ152ICF	953-5016	M8x50L	φ34ICF	953-9210	M4x14L	152	17	20	6-M4 (Depth 9)
5	952-7031	φ152ICF	953-5016	M8x50L	φ70ICF	953-5014	M6x22L	152	38	20	6-M6 (Depth 10)
6	952-7032	φ152ICF	953-5016	M8x50L	φ114ICF	953-5015	M8x25L	152	65	20	8-M8 (Depth 10)
7	952-7040	φ203ICF	953-5017	M8x55L	φ34ICF	953-9210	M4x14L	203	17	22	6-M4 (Depth 9)
8	952-7041	φ203ICF	953-5017	M8x55L	φ70ICF	953-5014	M6x22L	203	38	22	6-M6 (Depth 10)
9	952-7042	φ203ICF	953-5017	M8x55L	φ114ICF	953-5015	M8x25L	203	65	22	8-M8 (Depth 10)
10	952-7043	φ203ICF	953-5017	M8x55L	φ152ICF	953-5016	M8x30L	203	103	22	16-M8 (Depth 10)
11	952-7050	φ253ICF	953-5048	M8x60L	φ34ICF	953-9210	M4x14L	253	17	25	6-M4 (Depth 9)
12	952-7051	φ253ICF	953-5048	M8x60L	φ70ICF	953-5014	M6x22L	253	38	25	6-M6 (Depth 10)
13	952-7052	φ253ICF	953-5048	M8x60L	φ114ICF	953-5015	M8x25L	253	65	25	8-M8 (Depth 12)
14	952-7053	φ253ICF	953-5048	M8x60L	φ152ICF	953-5016	M8x30L	253	103	25	16-M8 (Depth 12)
15	952-7054	φ253ICF	953-5048	M8x60L	φ203ICF	953-5017	M8x30L	253	154	25	20-M8 (Depth 12)

\* The I flange side bolt hole is a through-hole.

## ■ ICF flange welding

TIG welding used to weld the ICF flange (see Fig. 12). The flange and pipe must be degreased before welding.

When additionally working on a blank flange to weld a pipe, keep the weld location away from the seal edge

as much as possible. In addition, avoid welding pipes larger than the applicable pipe diameter. Note that when welding by additionally working on a large-diameter ICF blank flange, the flange may become deformed, preventing the gasket from being attached.

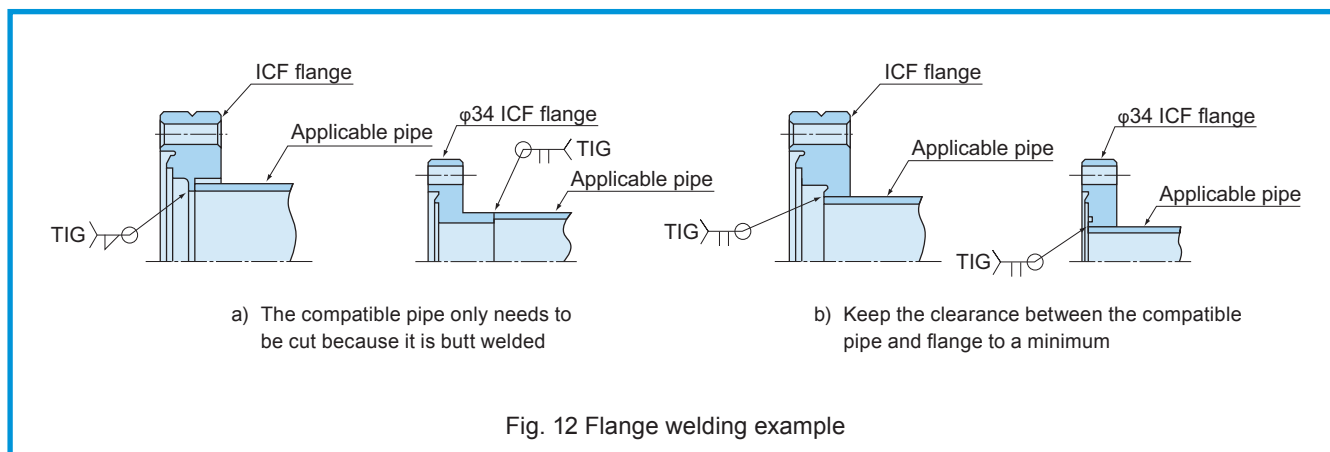


Fig. 12 Flange welding example



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
4-368029	954-9401	φ34 Mini ICF Flange	Blank	34000
4-368030	954-9402	φ34 Mini ICF Flange	(Applicable pipe) φ6xφ4	34001
4-368031	954-9403	φ34 Mini ICF Flange	(Applicable pipe) φ8xφ5.6	34002
4-368032	954-9404	φ34 Mini ICF Flange	(Applicable pipe) φ10xφ8	34003
4-368033	954-9405	φ34 Mini ICF Flange	(Applicable pipe) φ12.7xφ10.7	34004
4-368171	954-9427	φ34 Mini ICF Flange	(Applicable pipe) φ19.1xφ16.7	34005
804-3850	954-1091	φ34 Mini ICF Flange	(Applicable pipe) φ19.1xφ16.7 with M4 tap	34020
A26-20341	954-9420	φ34 Mini ICF Rotatable Flange	Blank	34040
B26-00882	954-1051	φ34 Mini ICF Rotatable Flange	(Applicable pipe) φ19.1xφ16.7	34041
P21-03183	954-1052	φ34 Mini ICF Rotatable Flange	(Applicable pipe) φ6xφ4	34042
P21-03184	954-1053	φ34 Mini ICF Rotatable Flange	(Applicable pipe) φ8xφ5.6	34043
803-0156	954-7051	φ70 ICF Flange	Blank	34100
804-3853	954-1103	φ70 ICF Flange	(Applicable pipe) φ32xφ29.6	34101
804-3854	954-1104	φ70 ICF Flange	(Applicable pipe) φ38xφ35	34102
804-3855	954-1105	φ70 ICF Flange	(Applicable pipe) φ41xφ38	34103
804-3851	954-1101	φ70 ICF Flange	(Applicable pipe) φ19.1xφ16.7	34106
804-3852	954-1102	φ70 ICF Flange	(Applicable pipe) φ25.4xφ23	34107
804-3856	954-1191	φ70 ICF Flange	(Applicable pipe) φ41xφ38, with M6 tap	34110
0190-03285	954-1150	φ70 ICF Rotatable Flange	Blank	34140
P21-03188	954-1153	φ70 ICF Rotatable Flange	(Applicable pipe) φ32xφ29.6	34143
B26-00883	954-1154	φ70 ICF Rotatable Flange	(Applicable pipe) φ38xφ35	34144
P25-05139	954-1151	φ70 ICF Rotatable Flange	(Applicable pipe) φ19.1xφ16.7	34145
P25-05619	954-1152	φ70 ICF Rotatable Flange	(Applicable pipe) φ25.4xφ23	34146
P25-06545	954-7052	φ114 ICF Flange	Blank	34200
803-1721	954-1201	φ114 ICF Flange	(Applicable pipe) φ63.5xφ60.2	34201
803-1722	954-1291	φ114 ICF Flange	(Applicable pipe) φ63.5xφ60.2, with M8 tap	34210
0190-03366	954-1250	φ114 ICF Rotatable Flange	Blank	34240
A26-20338	954-1251	φ114 ICF Rotatable Flange	(Applicable pipe) φ63.5xφ60.2	34241
803-0158	954-7053	φ152 ICF Flange	Blank	34300
803-1723	954-1301	φ152 ICF Flange	(Applicable pipe) φ101.6xφ95.6	34301
803-1724	954-1391	φ152 ICF Flange	(Applicable pipe) φ101.6xφ95.6, with M8 tap	34310
P21-03192	954-1350	φ152 ICF Rotatable Flange	Blank	34340
A26-20339	954-1351	φ152 ICF Rotatable Flange	(Applicable pipe) φ101.6xφ95.6	34341
803-0159	954-7054	φ203 ICF Flange	Blank	34400
803-1725	954-1401	φ203 ICF Flange	(Applicable pipe) φ153xφ147	34401
803-1726	954-1491	φ203 ICF Flange	(Applicable pipe) φ153xφ147, with M8 tap	34410
P21-03195	954-1450	φ203 ICF Rotatable Flange	Blank	34440
A26-20340	954-1451	φ203 ICF Rotatable Flange	(Applicable pipe) φ153xφ147	34441
803-0160	954-7055	φ253 ICF Flange	Blank	34500
803-1727	954-1501	φ253 ICF Flange	(Applicable pipe) φ203xφ197	34501
803-1728	954-1591	φ253 ICF Flange	(Applicable pipe) φ203xφ197, with M8 tap	34510

Note) Contact us for more information about CE (RoHS).

Parts Number	Model	Description	Remarks	Code
P21-03197	954-1550	φ253 ICF Rotatable Flange	Blank	34540
P21-03198	954-1551	φ253 ICF Rotatable Flange	(Applicable pipe) φ203xφ197	34541
P21-04187	954-1611	φ305 ICF Flange	Blank	34602
P21-04188	954-1612	φ305 ICF Flange	(Applicable pipe) φ250xφ244	34603
P21-04189	954-1622	φ305 ICF Flange	(Applicable pipe) φ250xφ244, with M8 tap	34604
P21-04190	954-1661	φ305 ICF Rotatable Flange	Blank	34612
M21-01140	954-1662	φ305 ICF Rotatable Flange	(Applicable pipe) φ250xφ244	34613
P25-06074	954-1701	φ356 ICF Flange	Blank	34620
P21-04192	954-1712	φ356 ICF Flange	(Applicable pipe) φ295xφ289	34622
P21-04193	954-1722	φ356 ICF Flange	(Applicable pipe) φ295xφ289, with M10 tap	34623
P21-04194	954-1751	φ356 ICF Rotatable Flange	Blank	34630
0190-08772	954-1752	φ356 ICF Rotatable Flange	(Applicable pipe) φ295xφ289	34631
P25-06416	954-1801	φ406 ICF Flange	Blank	34640
P21-04196	954-1812	φ406 ICF Flange	(Applicable pipe) φ350xφ344	34642
P21-04197	954-1822	φ406 ICF Flange	(Applicable pipe) φ350xφ344, with M10 tap	34643
P21-04198	954-1851	φ406 ICF Rotatable Flange	Blank	34650
0190-08780	954-1852	φ406 ICF Rotatable Flange	(Applicable pipe) φ350xφ344	34651
A26-13554	952-7010	Conversion ICF Flange	φ34 ICF-φ70 ICF	34900
A23-06496	952-7020	Conversion ICF Flange	φ34 ICF-φ114 ICF	34901
A23-06497	952-7021	Conversion ICF Flange	φ70 ICF-φ114 ICF	34902
A23-06498	952-7030	Conversion ICF Flange	φ34 ICF-φ152 ICF	34903
793-5893	952-7031	Conversion ICF Flange	φ70 ICF-φ152 ICF	34904
793-5894	952-7032	Conversion ICF Flange	φ114 ICF-φ152 ICF	34905
0191-14921	952-7040	Conversion ICF Flange	φ34 ICF-φ203 ICF	34906
A23-06502	952-7041	Conversion ICF Flange	φ70 ICF-φ203 ICF	34907
A23-06503	952-7042	Conversion ICF Flange	φ114 ICF-φ203 ICF	34908
803-0887	952-7043	Conversion ICF Flange	φ152 ICF-φ203 ICF	34909
0191-14955	952-7050	Conversion ICF Flange	φ34 ICF-φ253 ICF	34910
A23-06506	952-7051	Conversion ICF Flange	φ70 ICF-φ253 ICF	34911
P25-02740	952-7052	Conversion ICF Flange	φ114 ICF-φ253 ICF	34912
P25-04860	952-7053	Conversion ICF Flange	φ152 ICF-φ253 ICF	34913
0191-14963	952-7054	Conversion ICF Flange	φ203 ICF-φ253 ICF	34914
0190-03748	953-9210	Gasket Pack	For mini φ34 ICF, 5 per set	38000
0190-03756	953-5014	Gasket Pack	For mini φ70 ICF, 5 per set	38002
0190-03764	953-5015	Gasket Pack	For mini φ114 ICF, 5 per set	38003
0190-03772	953-5016	Gasket Pack	For mini φ152 ICF, 5 per set	38004
0190-03829	953-5017	Gasket Pack	For mini φ203 ICF, 5 per set	38005
0190-03837	953-5048	Gasket Pack	For mini φ253 ICF, 5 per set	38006
A26-13403	953-7131	Gasket Pack for PY305 · 3T	For mini φ305 ICF, 1 per set	38024
A26-13406	953-7132	Gasket Pack for PY356 · 3T	For mini φ356 ICF, 1 per set	38025
A26-13409	953-7133	Gasket Pack for PY406 · 3T	For mini φ406 ICF, 1 per set	38026
A26-04805	953-7601	Gasket Clip	For φ70 ICF to φ406 ICF gasket fixture (x1)	38029

Note) Contact us for more information about CE (RoHS).

*Memorandum*

# Connecting Components with ICF

**Fitting**  
**Metal adapter**  
**Glass adapter**

## ■ Summary

A wide variety of elements are used to connect the pipes when the equipment is being assembled. The series of connection elements listed here utilize ICF flanges for connecting the pipes. They are used in the main body of the ultra-high vacuum equipment and its roughing pump system.

## ■ Features

1. Several types are available to satisfy any need.
2. ICF flanges ensure use up to ultra-high vacuum.

## ■ Fitting

The fitting is an all-stainless steel (SUS-304) connection element using an ICF flange. It is nonmagnetic and can be baked up to 450°C, making it ideal for connection pipes for ultra-high vacuum equipment and the like.

We also manufacture flexible tubes with ICF flanges. Please ask us.



## ● Specifications

Allowable heating temperature: 450°C

Leak:  $1.33 \times 10^{-11} \text{Pa} \cdot \text{m}^3/\text{sec}$  or less

## ● Nipples (Material: SUS-304)

Type	A	B	C	D
952-7100	φ70	φ38	φ35	120
952-7104	φ70	φ38	φ35	210
952-7103	φ34	φ19	φ16	76

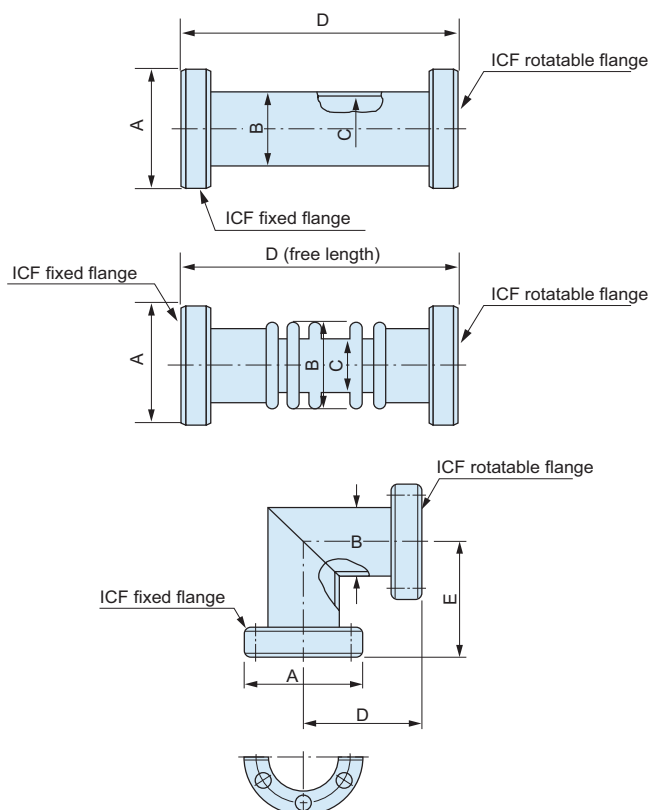
## ● Bellows nipples (Material: SUS-304)

Type	A	B	C	D	Extension/shrinkage
952-7200	φ70	φ48	φ32	94	Expansion 2, shrinkage 3
952-7201	φ34	φ22	φ15	76	Expansion 4, shrinkage 6

## ● Elbows (Material: SUS-304)

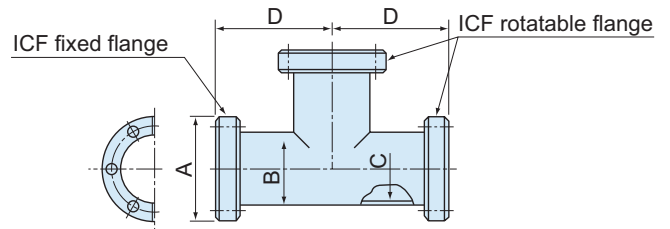
Type	A	B	C	D	E
952-7305	φ70	φ38	φ35	54.2	54.2
952-7306	φ70	φ38	φ35	54.2	189
*952-7307	φ34	φ21.7	φ17.5	51.3	51.3

(Note) \* indicates a bulge product.



● **Tees** (Material: SUS-304)

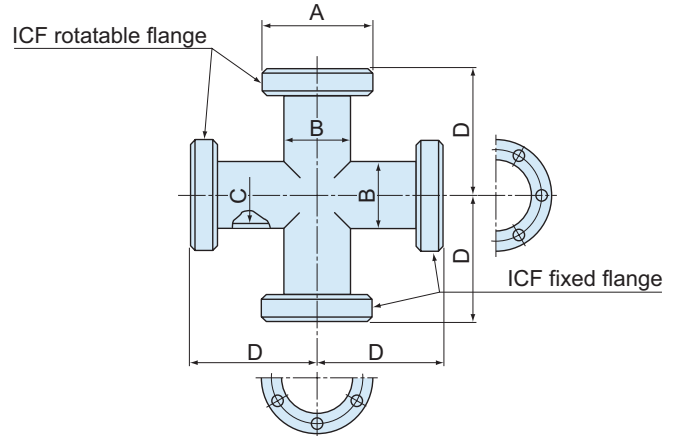
Type	A	B	C	D
952-7605	φ70	φ38	φ35	54.2
952-7606	φ34	φ19	φ16	38.6



● **Crosses** (Material: SUS-304)

Type	A	B	C	D
952-7500	φ70	φ38	φ35	60
952-7501	φ34	φ19	φ16	38

\* Ask for availability of fittings with shapes and sizes other than the above.



■ **Metal adapters**

The metal adapter is an all-stainless steel (SUS-304) adapter using an ICF flange. It is nonmagnetic and can be baked up to 450°C. It can be welded onto the vacuum container for instance.

● **Specifications**

Allowable heating temperature: 450°C

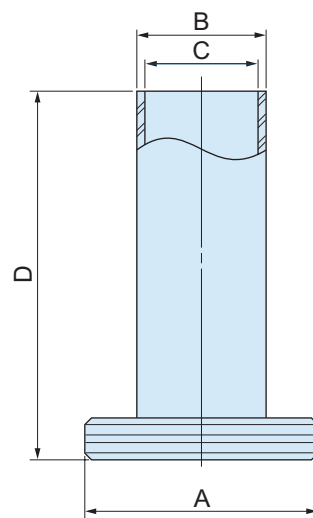
Leak:  $1.33 \times 10^{-11} \text{ Pa} \cdot \text{m}^3/\text{sec}$  or less

● **Metal adapters** (Material: SUS-304)

Type	A	B	C	D
952-7800	φ70	φ38	φ35	114.8
952-7801	φ70	φ41	φ38	33
952-7802	φ114	φ50.8	φ46.8	49.5
952-7825	φ114	φ60.5	φ54.9	49.5
952-7803	φ152	φ101.6	φ95.6	61
952-7804	φ203	φ153	φ147	60

(Note) The ICF flange for the 952-7801 metal adapter is with M6tap.

\* Ask for availability of metal adapters with shapes and sizes other than the above.



Dimensions

## ■ Glass adapters

The glass adapter is Kovar glass sealed with Kovar alloy and welded onto an ICF flange. Two types are available: all Kovar glass and Kovar glass sealed with Pyrex glass. You can select either type to match the glass material of the other side.

### ● Specifications

Allowable heating temperature: 300°C

Temperature change: 25°C/min or less

Leak:  $7 \times 10^{-11} \text{Pa} \cdot \text{m}^3/\text{sec}$  or less

Withstand pressure: 0.1MPa (inside vacuum, outside atmosphere)

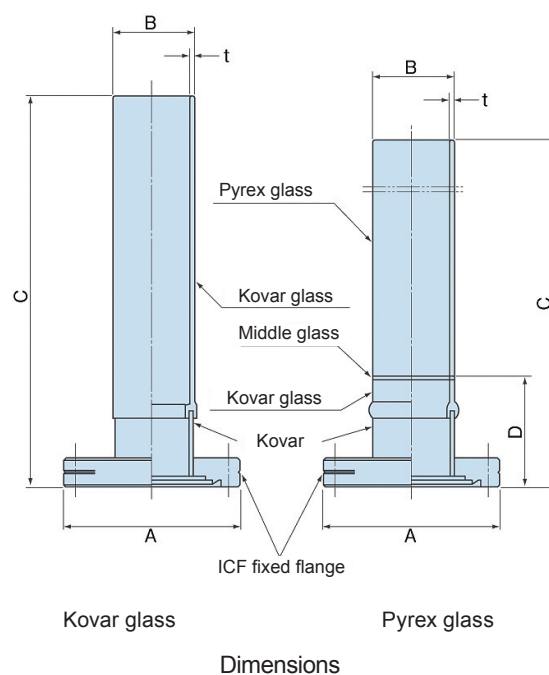


### ● Glass adapters (Material: Kovar glass)

Type	A	B	C	t	Minimum inner diameter
952-7810	φ70	φ32	155	1.5	φ27
952-7822	φ34	φ19	145	1.2	φ15.5
952-7823	φ34	φ7	51.5	0.8	φ4.4

### ● Glass adapters (Material: Pyrex glass)

Type	A	B	C	t	D	Minimum Inner diameter
952-7811	φ70	φ32	155	1.8	43	φ27
952-7824	φ34	φ20	145	1.2	53.2	φ15.5



## ■ 952-7806, φ15 adapter

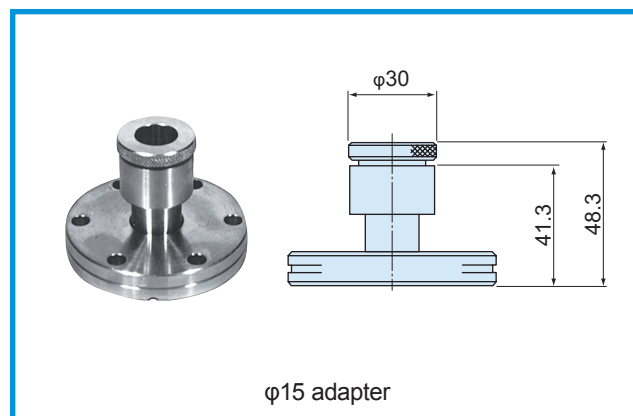
(Material: SUS-304, gauge seal gasket is fluorine rubber (Viton))  
This adapter is used exclusively for vacuum gauges such as B-A, Shultz, or thermo couple (applicable gauge diameter φ15).

### ● Specifications

Allowable heating temperature: 125°C

Leak:  $6.7 \times 10^{-11} \text{ Pa} \cdot \text{m}^3/\text{sec}$  or less

(Excluding gas permeation of the fluoro rubber (Viton))



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
B26-00777	952-7100	φ70 Nipple	With φ70 ICF	32000
4-340142	952-7104	φ70 Nipple	With φ70 ICF	32001
B26-00779	952-7103	Mini Nipple	With φ34 ICF	32002
B26-00862	952-7200	φ70 Bellows Nipple	With φ70 ICF	32010
B26-00863	952-7201	Mini Bellows Nipple	With φ34 ICF	32011
B26-00763	952-7305	φ70 Elbow	With φ70 ICF	32030
B23-00777	952-7306	φ70 Elbow Different Length Elbow	With φ70 ICF	32031
B26-00761	952-7307	Mini Elbow	With φ34 ICF	32032
B23-00778	952-7605	φ70 Tee	With φ70 ICF	32040
B26-00762	952-7606	Mini Tee	With φ34 ICF	32041
B23-00846	952-7500	Cross	With φ70 ICF	32050
B26-00792	952-7501	Mini Cross	With φ34 ICF	32051
0190-04079	952-7810	φ32 Glass Adapter	With φ70 ICF, Kovar glass	32100
0190-04100	952-7811	φ32 Glass Adapter	With φ70 ICF, Pyrex® glass	32101
VMT-236	952-7820	φ60 Glass Adapter	With φ114 ICF, Kovar glass	32102
VMT-237	952-7821	φ60 Glass Adapter	With φ114 ICF, Pyrex® glass	32103
VMT-238	952-7840	φ110 Glass Adapter	With φ152 ICF, Kovar glass	32104
VMT-239	952-7841	φ110 Glass Adapter	With φ152 ICF, Pyrex® glass	32105
0190-04087	952-7822	φ19 Mini Glass Adapter	With φ34 ICF, Kovar glass	32106
0190-04095	952-7823	φ7 Mini Glass Adapter	With φ34 ICF, Kovar glass	32107
0190-04118	952-7824	φ20 Mini Glass Adapter	With φ34 ICF, Pyrex® glass	32108
0190-04053	952-7800	φ38 Metal Adapter	With φ70 ICF	32120
P25-12482	952-7801	φ41 Metal Adapter	With φ70 ICF, M6 tap	32121
VMT-287	952-7802	φ50 Metal Adapter	With φ114 ICF	32122
VMT-9040	952-7825	φ60 Metal Adapter	With φ114 ICF	32123
VMT-288	952-7803	φ102 Metal Adapter	With φ152 ICF	32124
VMT-289	952-7804	φ153 Metal Adapter	With φ203 ICF	32125
0190-05261	952-7806	φ15 Adapter	With φ70 ICF, φ15 gauge mounting port	32150

Note) Contact us for more information about CE (RoHS).



# Quick-release Couplings

## ■ Summary

We also offer easy-to-use ISO compliant vacuum flanges.

These flanges are referred to as Quick-release Couplings by ISO. We offer five types of small flanges with standardized diameters of 10, 16, 25, 40, and 50. These couplings are functional quick release flanges with clamps. No bolts are used. A wide variety of connection elements using these flanges are also available.



## ■ Features

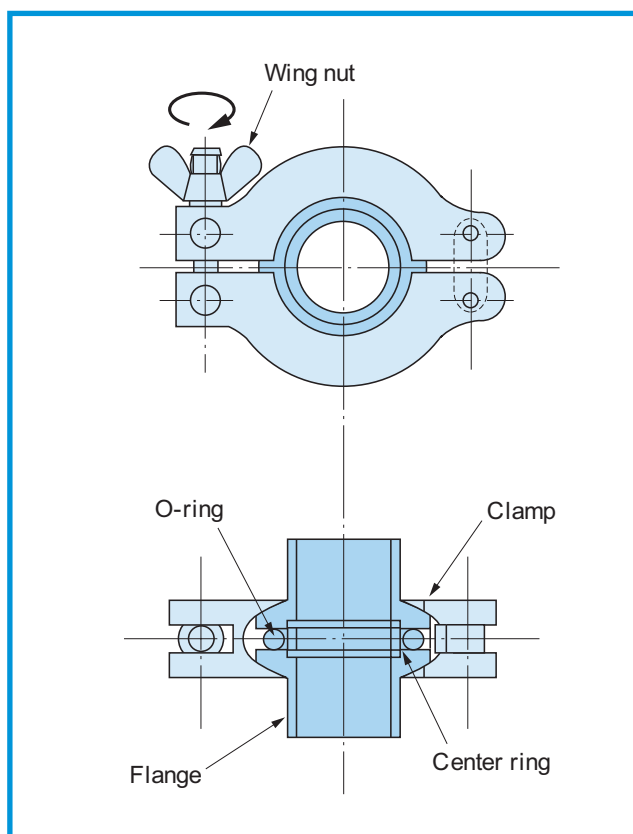
1. Easy attachment and removal. No bolts or nuts are used.
2. Completely symmetrical flange without gender.
3. Can be installed in any direction (functions the same as a rotatable flange).
4. The entire circumference of the flange can be continuously and uniformly tightened.
5. Al alloy coated with Ni makes the clamp highly corrosion-resistant.
6. The O-ring can be swapped depending on the heating temperature. (Neoprene: 70°C, Viton:150°C)
7. Leakage is  $1.3 \times 10^{-9} \text{Pa} \cdot \text{m}^3/\text{sec}$  or less. (Except gas permeation of the O-ring)

## ■ Principle

The quick-release coupling method is the most simplest type of coupling.

The flange seal is flat and the other side is tapered for both.

By inserting a clamp in this tapered area and tightening the thumbscrew, a force is created toward the center of the flange, crushing the O-ring to create a seal. The center ring guides the O-ring at this time. This quick-release coupling is superior to any other coupling method because only a single thumbscrew needs to be tightened, reducing the assembly time and simplifying handling.



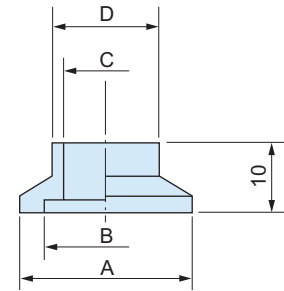


## ■ Specifications

### ● Flanges (Material: SUS-304)

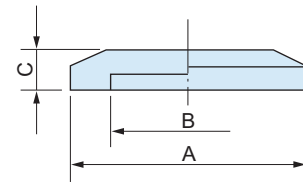
	Type	φA	φB	φC	φD
NW10	954-7731	30	12.2	10	13.0
NW16	954-7732	30	17.2	16	19.1
NW25	954-7733	40	26.2	24	28.0
NW40	954-7734	55	41.2	38.5	42.7
NW50	954-7895	75	52.2	47	51.0

Applicable pipe NW10: φ13.0xφ11.0 NW16: φ19.1xφ16.7 NW25: φ28.0xφ25.0  
NW40: φ42.7xφ39.4 NW50: φ51.0xφ47.0



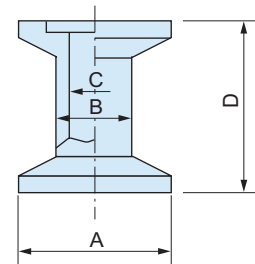
### ● Blank flanges (Material: SUS-304)

	Type	φA	φB	C
NW10	954-7741	30	12.2	6
NW16	954-7742	30	17.2	6
NW25	954-7743	40	26.2	6
NW40	954-7744	55	41.2	6
NW50	954-7745	75	52.2	6



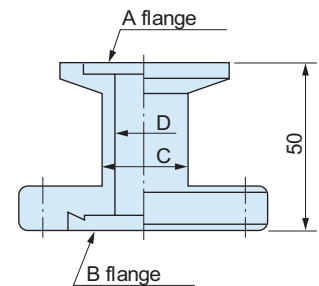
### ● Nipples (Material: SUS-304)

	Type	φA	φB	φC	D
NW10	954-7781	30	13.8	10.5	60
NW16	954-7782	30	20	16	80
NW25	954-7783	40	27.2	23	100
NW40	954-7784	55	42.7	37.1	130



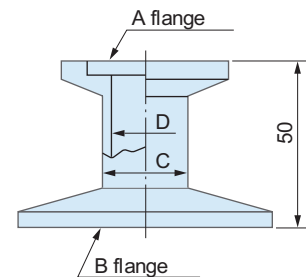
### ● NW-ICF conversion nipples (Material: SUS-304)

	Type	A flange	B flange	φC	φD
NW10-φ34ICF	954-7461	NW10	φ34ICF	12.7	9.7
NW10-φ70ICF	954-7462	NW10	φ70ICF	13.8	10.5
NW16-φ34ICF	954-7463	NW16	φ34ICF	19	16
NW16-φ70ICF	954-7464	NW16	φ70ICF	19	16
NW25-φ70ICF	954-7465	NW25	φ70ICF	27.2	24
NW40-φ70 ICF	954-7466	NW40	φ70ICF	38	35



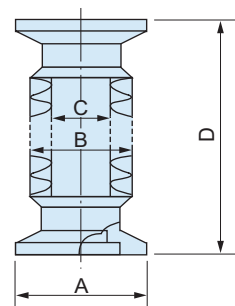
### ● NW conversion nipples (Material: SUS-304)

	Type	A flange	B flange	φC	φD
NW10-16	954-7451	NW10	NW16	13.8	10.5
NW10-25	954-7452	NW10	NW25	13.8	10.5
NW10-40	954-7453	NW10	NW40	13.8	10.5
NW10-50	954-7454	NW10	NW50	13.8	10.5
NW16-25	954-7455	NW16	NW25	20	16
NW16-40	954-7456	NW16	NW40	20	16
NW16-50	954-7457	NW16	NW50	20	16
NW25-40	954-7458	NW25	NW40	27.2	23
NW25-50	954-7459	NW25	NW50	27.2	23
NW40-50	954-7460	NW40	NW50	42.7	37.1



• **Bellows nipples** (Material: SUS-304)

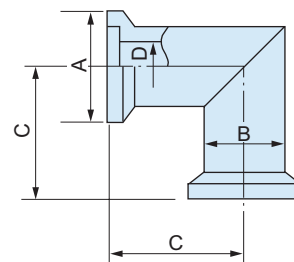
	Type	φA	φB	φC	D			Minimum inner diameter
					Free length	MAX	MIN	
NW10	954-7771	30	24±2	15.5±2	60	64	54	10
NW16	954-7772	30	22±2	15±2	80	84	76	15
NW25	954-7773	40	48±2	32.0±2	100	102	97	24
NW40	954-7774	55	48±2	32.0±2	130	132	127	32



• **Elbows** (Material: SUS-304)

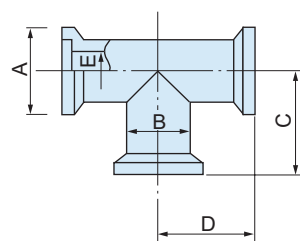
	Type	φA	φB	C	φD
NW10	954-7791	30	13.8	30	10.5
NW16	954-7792	30	20	40	16
NW25	954-7793	40	27.2	50	23
*NW40	954-7794	55	42.7	65	37.1

Note) \* indicates a bulge product.



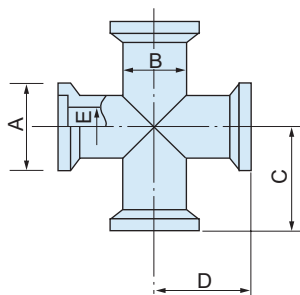
• **Tees** (Material: SUS-304)

	Type	φA	φB	C	D	φE
NW10	954-7811	30	13.8	30	30	10.5
NW16	954-7812	30	20	40	40	16
NW25	954-7813	40	27.2	50	50	23
NW40	954-7814	55	42.7	65	65	37.1



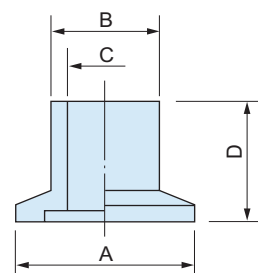
• **Crosses** (Material: SUS-304)

	Type	φA	φB	C	D	φE
NW10	954-7821	30	13.8	30	30	10.5
NW16	954-7822	30	20	40	40	16
NW25	954-7823	40	27.2	50	50	23
NW40	954-7824	55	42.7	65	65	37.1



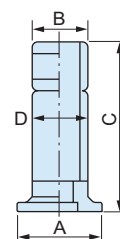
• **Metal adapters** (Material: SUS-304)

	Type	φA	φB	φC	D
NW10	954-7761	30	13.8	10.5	70
NW16	954-7762	30	20	16	70
NW25	954-7763	40	27.2	23	70
NW40	954-7764	55	42.7	37.1	70



• **Rubber tube adapters** (Material: SUS-304)

	Type	φA	φB	C	φD
NW10	954-7751	30	19	60	19
NW16	954-7752	30	19	60	19
NW25	954-7753	40	22	80	24
NW40	954-7754	55	38.0	80	38

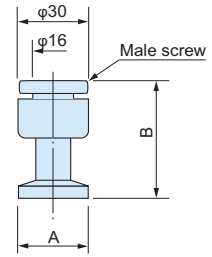


● **Gauge adapters**

(Material: SUS-304 (male screw Ni-plated copper alloy), Gauge seal gasket fluoro rubber (Viton))

	Type	φA	B
NW16	954-7832	30	52
NW25	954-7833	40	52
NW40	954-7834	55	52

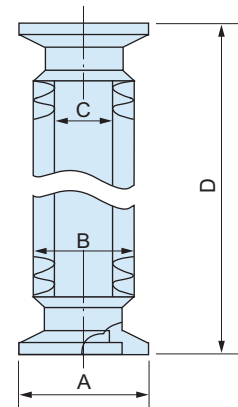
Usage: Installation of B-A gauge, Shultz gauge. (Applicable gauge glass tube Outside diameter φ15)



● **Flexible tubes** (Material: SUS-316)

	Type			
	D=500	D=1000	D=1500	D=2000
NW10	954-7475	954-7476	954-7477	954-7478
NW16	954-7480	954-7481	954-7482	954-7483
NW25	954-7485	954-7486	954-7487	954-7488
NW40	954-7490	954-7491	954-7492	954-7493

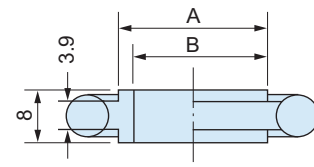
	φA	φB	φC	Minimum bend radius	Repeated bending radius
NW10	30	19.4±2	15±2	30	80
NW16	30	24.8±2	20±2	35	115
NW25	40	31.5±2	25.4±2	60	125
NW40	55	48.2±2	40±2	90	150



● **Center rings**

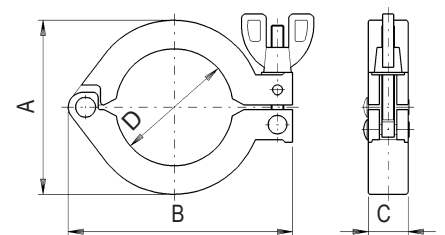
(Material: AL for neoprene O-ring, SUS-304 for fluoro rubber (Viton) O-ring)

	Type		φA	φB
	With neoprene O-ring	With fluoro rubber (Viton) O-ring		
NW10	954-7871	954-7841	12	10
NW16	954-7872	954-7842	17	16
NW25	954-7873	954-7843	26	24
NW40	954-7874	954-7844	41	39
NW50	954-7717	954-7847	52	50



● **Clamps** (Material: AL, Ni-plated)

Size	Type	A	B	C	D
NW10/16	954-7885	42.5	63.0	16.0	22.0
NW20/25	954-7886	54.0	72.0	16.0	33.0
NW32/40	954-7887	70.0	90.0	16.0	46.0
NW50	954-7888	90.0	114.0	20.0	62.0

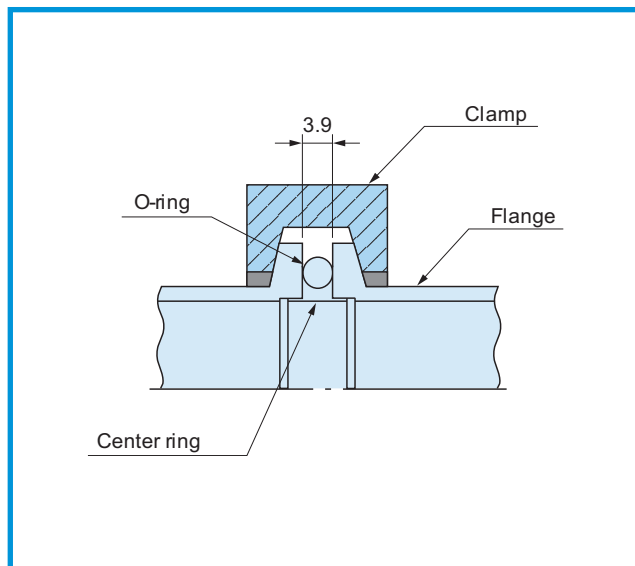


## ■ Options

1. Note during design that the mounting dimensions are as shown at right.

## ■ Usage notes

1. Tighten the clamp by hand. Do not use any tool to tighten the clamp.
2. Do not use the clamp to support the load when piping. (Make sure no moment is applied).  
When forced to apply a load, distribute it over the bellows nipple and flexible tube.



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
764-8152	954-7741	NW10 Blank Flange	SUS product	35000
764-8148	954-7731	NW10 Flange	SUS product	35001
764-8153	954-7742	NW16 Blank Flange	SUS product	35010
764-8149	954-7732	NW16 Flange	SUS product	35011
764-8154	954-7743	NW25 Blank Flange	SUS product	35020
764-8150	954-7733	NW25 Flange	SUS product	35021
764-8155	954-7744	NW40 Blank Flange	SUS product	35030
764-8151	954-7734	NW40 Flange	SUS product	35031
804-4658	954-7745	NW50 Blank Flange	SUS product	35040
A26-00414	954-7895	NW50 Flange	SUS product	35041
B26-00820	954-7781	NW10 Nipple	SUS product	32500
B26-00822	954-7782	NW16 Nipple	SUS product	32501
B26-00823	954-7783	NW25 Nipple	SUS product	32502
B26-00824	954-7784	NW40 Nipple	SUS product	32503
A26-14921	954-7461	NW10-φ34 Conversion Nipple	SUS product	32470
B26-00851	954-7462	NW10-φ70 Conversion Nipple	SUS product	32471
B26-00852	954-7463	NW16-φ34 Conversion Nipple	SUS product	32472
B26-00853	954-7464	NW16-φ70 Conversion Nipple	SUS product	32473
B26-00854	954-7465	NW25-φ70 Conversion Nipple	SUS product	32474
B26-00855	954-7466	NW40-φ70 Conversion Nipple	SUS product	32475
A26-12825	954-7451	NW10-16 Conversion Nipple	SUS product	32483
A26-12826	954-7452	NW10-25 Conversion Nipple	SUS product	32484
A26-12827	954-7453	NW10-40 Conversion Nipple	SUS product	32485
A26-12828	954-7454	NW10-50 Conversion Nipple	SUS product	32486
B26-00839	954-7455	NW16-25 Conversion Nipple	SUS product	32487

Note) Contact us for more information about CE (RoHS).

Parts Number	Model	Description	Remarks	Code
B26-00840	954-7456	NW16-40 Conversion Nipple	SUS product	32488
B26-00841	954-7457	NW16-50 Conversion Nipple	SUS product	32489
B26-00842	954-7458	NW25-40 Conversion Nipple	SUS product	32490
B26-00843	954-7459	NW25-50 Conversion Nipple	SUS product	32491
B26-00844	954-7460	NW40-50 Conversion Nipple	SUS product	32492
764-8171	954-7771	NW10 Bellows Nipple	SUS product	32510
B26-00717	954-7772	NW16 Bellows Nipple	SUS product	32511
B26-00860	954-7773	NW25 Bellows Nipple	SUS product	32512
B26-00861	954-7774	NW40 Bellows Nipple	SUS product	32513
764-8187	954-7791	NW10 Elbow	SUS product	32530
B26-00829	954-7792	NW16 Elbow	SUS product	32531
B26-00830	954-7793	NW25 Elbow	SUS product	32532
B26-00791	954-7794	NW40 Elbow	SUS product	32533
774-0004	954-7811	NW10 Tee	SUS product	32540
B26-00832	954-7812	NW16 Tee	SUS product	32541
B26-00833	954-7813	NW25 Tee	SUS product	32542
B26-00834	954-7814	NW40 Tee	SUS product	32543
774-0014	954-7821	NW10 Cross	SUS product	32550
P25-11753	954-7822	NW16 Cross	SUS product	32551
B26-00814	954-7823	NW25 Cross	SUS product	32552
B26-00819	954-7824	NW40 Cross	SUS product	32553
B26-00846	954-7761	NW10 Metal Adapter	SUS product	32620
B26-00847	954-7762	NW16 Metal Adapter	SUS product	32621
B26-00848	954-7763	NW25 Metal Adapter	SUS product	32622
B26-00849	954-7764	NW40 Metal Adapter	SUS product	32623
B26-00787	954-7751	NW10 Rubber Hose Adapter	SUS product	32640
B26-00788	954-7752	NW16 Rubber Hose Adapter	SUS product	32641
B26-00789	954-7753	NW25 Rubber Hose Adapter	SUS product	32642
B26-00790	954-7754	NW40 Rubber Hose Adapter	SUS product	32643
0190-10054	954-7832	NW16 Gauge Adapter	SUS product, $\phi 15$ gauge mounting port	32650
0190-10062	954-7833	NW25 Gauge Adapter	SUS product, $\phi 15$ gauge mounting port	32651
0190-10070	954-7834	NW40 Gauge Adapter	SUS product, $\phi 15$ gauge mounting port	32652
594-3457	954-7475	NW10 Flexible Tube (D=500mm)	D=500mm	32660
594-3458	954-7476	NW10 Flexible Tube (D=1000mm)	D=1000mm	32661
594-3459	954-7477	NW10 Flexible Tube (D=1500mm)	D=1500mm	32662
594-3460	954-7478	NW10 Flexible Tube (D=2000mm)	D=2000mm	32663
594-3461	954-7480	NW16 Flexible Tube (D=500mm)	D=500mm	32664
594-3462	954-7481	NW16 Flexible Tube (D=1000mm)	D=1000mm	32665
594-3463	954-7482	NW16 Flexible Tube (D=1500mm)	D=1500mm	32666
594-3464	954-7483	NW16 Flexible Tube (D=2000mm)	D=2000mm	32667
594-3465	954-7485	NW25 Flexible Tube (D=500mm)	D=500mm	32668
594-3466	954-7486	NW25 Flexible Tube (D=1000mm)	D=1000mm	32669
594-3467	954-7487	NW25 Flexible Tube (D=1500mm)	D=1500mm	32670

Note) Contact us for more information about CE (RoHS).

Parts Number	Model	Description	Remarks	Code
594-3468	954-7488	NW25 Flexible Tube (D=2000mm)	D=2000mm	32671
594-3469	954-7490	NW40 Flexible Tube (D=500mm)	D=500mm	32672
594-3470	954-7491	NW40 Flexible Tube (D=1000mm)	D=1000mm	32673
594-3471	954-7492	NW40 Flexible Tube (D=1500mm)	D=1500mm	32674
594-3472	954-7493	NW40 Flexible Tube (D=2000mm)	D=2000mm	32675
A26-20301	954-7871	NW10 Center Ring	Al center ring, with neoprene O-ring	32820
0194-19096	954-7872	NW16 Center Ring	Al center ring, with neoprene O-ring	32821
0194-19101	954-7873	NW25 Center Ring	Al center ring, with neoprene O-ring	32822
0194-19119	954-7874	NW40 Center Ring	Al center ring, with neoprene O-ring	32823
A26-20305	954-7717	NW50 Center Ring	Al center ring, with neoprene O-ring	32824
0194-19135	954-7841	NW10 Stainless Steel Center Ring	SUS center ring, with Viton O-ring	32830
0194-19143	954-7842	NW16 Stainless Steel Center Ring	SUS center ring, with Viton O-ring	32831
0194-19151	954-7843	NW25 Stainless Steel Center Ring	SUS center ring, with Viton O-ring	32833
0194-19185	954-7844	NW40 Stainless Steel Center Ring	SUS center ring, with Viton O-ring	32835
0194-19193	954-7847	NW50 Stainless Steel Center Ring	SUS center ring, with Viton O-ring	32836
0194-07007	954-7885	NW10/16 Clamp	Al product	32870
0194-07015	954-7886	NW20/25 Clamp	Al product	32871
0194-07023	954-7887	NW32/40 Clamp	Al product	32872
0194-07031	954-7888	NW50 Clamp	Al product	32873

Note) Contact us for more information about CE (RoHS).

*Memorandum*

# Vacuum Switches

## ■ Summary

With a single-pole double-throw contact, these vacuum switches enable ON and OFF point control signals to be simultaneously received at the maximum or minimum operating pressure, while keeping the change in operating pressure very small. Additionally, the entire vacuum side is made of SUS-304, and the welded air seal allows connection to high vacuum. Thus, these vacuum switches can also be used as protection for automated vacuum equipment and as a switch for safety circuits.



## ■ Features

1. With a single-pole double-throw contact, ON and OFF point control signals can be simultaneously received at the maximum or minimum operating pressure.
2. Additionally, the entire vacuum side is made of SUS-304, and the welded air seal allows connection to high vacuum.
3. Has a long life of over 10,000 times, while keeping the change in operating pressure very small.
4. Can be used up to 0.2MPa even when the inside of

the vacuum switch is pressurized.

5. The 954-7720 vacuum switch is a quick-release type with a  $\phi 15$  gauge adapter.
6. The 954-7730 vacuum switch can be heated up to 250°C, allowing it to be used in ultra-high vacuum equipment.

## ■ Applications

Protection of automated vacuum equipment and as a switch for safety circuits. Retrieval of control signals for various vacuum systems.

Type	954-7700	954-7720	954-7730
Operating pressure (At black - yellow lead wire)	OFF Atmospheric pressure minus $2.7 \pm 2.7 \times 10^3$ Pa ON Atmospheric pressure minus $16 \pm 2.7 \times 10^3$ Pa		OFF Atmospheric pressure minus $2.7 \pm 2.7 \times 10^3$ Pa ON Atmospheric pressure minus $14 \pm 2.7 \times 10^3$ Pa
Operating degree of vacuum	Approx. $10^{-7}$ Pa		Approx. $10^{-8}$ Pa
Leak	$1.33 \times 10^{-11}$ Pa·m <sup>3</sup> /sec or less		
Fluid	air, gas (excluding corrosive gases affecting SUS-304)		
Withstand pressure	* 0.2MPa		
Allowable heating temperature	40°C		250°C
Operating environment temperature	-10°C to +40°C		
Material	Vacuum side all SUS-304		
Life	10,000 times or more		
Connection flange	$\phi 70$ ICF	954-7806 $\phi 15$ adapter 954-7832 gauge adapter 954-7833 gauge adapter 954-7834 gauge adapter	$\phi 70$ ICF
Weight	510g	220g	580g

\* When you add pressure inside the vacuum switch, take measures to prevent it from venting out of the  $\phi 15$  adapter.



## Specifications

### Electrical ratings

954-7700, 7720 Vacuum switch

Rated voltage (V)	Non-inductive current (A)		Inductive load (A)	
	Resistance load	Lamp load	Inductive load	Motor load
DC125	0.6	0.1	0.6	0.1
DC250	0.3	0.05	0.3	0.05
AC125	15	3	10	4
AC250	15	2	10	3

The inductive load shall be greater than or equal to power factor 0.5 (AC), and greater than or equal to time constant 7msec (DC).

The lamp load has x10 inrush current.

The motor load has x6 inrush current.

954-7730 Vacuum switch

Rated voltage (V)	Non-inductive current (A)		Inductive load (A)	
	Resistance load	Lamp load	Inductive load	Motor load
DC125	0.4	0.05	0.4	0.05
AC125	1	0.45	1	0.75
AC250	1	0.3	1	0.3

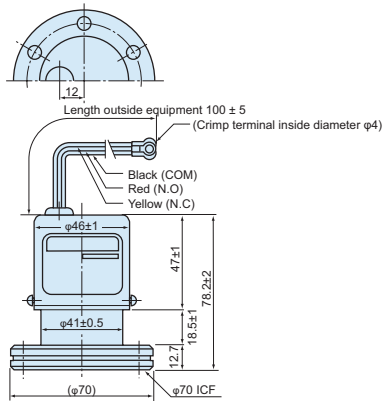


Fig. 1 954-7700 dimensions

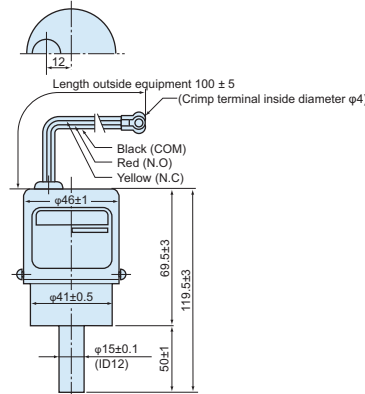


Fig. 2 954-7720 dimensions

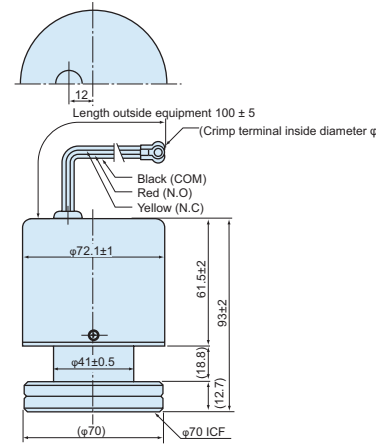


Fig. 3 954-7730 dimensions

### Contact structure

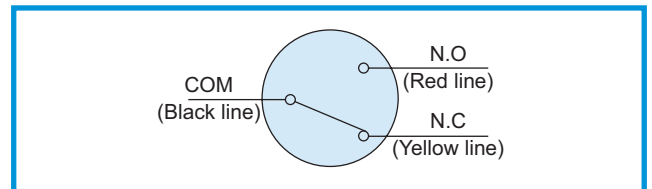
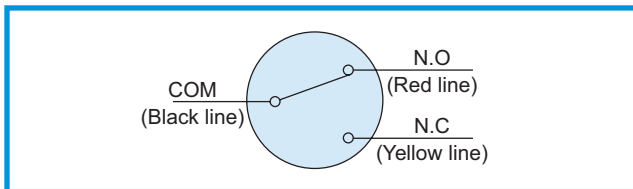
954-7700, 7720, 7730 Vacuum switch

Atmospheric pressure minus  $5.4 \times 10^3$  Pa or more (Atmospheric pressure state)

954-7700, 7720 Vacuum switch

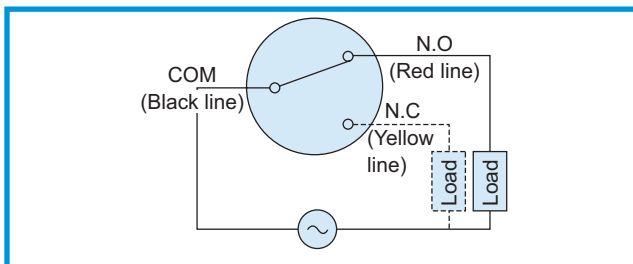
Atmospheric pressure minus  $13.3 \times 10^3$  Pa or lower (vacuum state)

954-7730 Vacuum switch Atmospheric pressure minus  $11.3 \times 10^3$  Pa or lower (vacuum state)

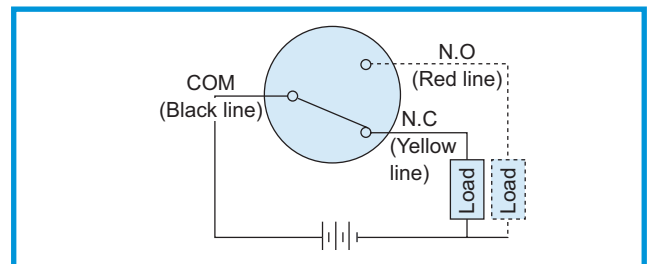


### Wiring method

If AC



If DC



### Usage notes

Be sure to read the included "Usage notes" before using.

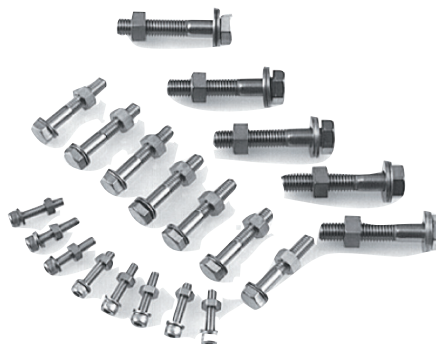
### Ordering information

Parts Number	Model	Description	Remarks	Code
753-0387	954-7700	Vacuum Switch	With φ70ICF	29200
A23-05138	954-7720	Vacuum Switch	For φ15 gauge port	29201
P25-02873	954-7730	Vacuum Switch	With φ70ICF Bakable to 250°C	29202

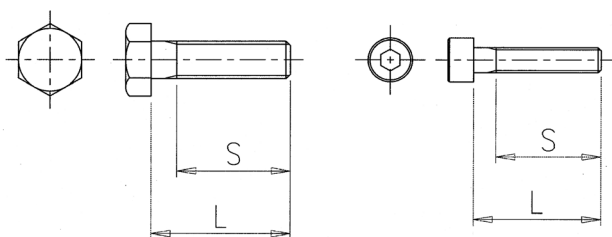
Note) Contact us for more information about CE (RoHS).

# Ancillary Materials

## Bolts, Nuts, Washers



## Bolts, Nuts, Washers



Note) Bolt dimensions are based on JIS B1180.

Bolts, nuts, and washers (Material: SUS304)

Type	Bolt			Remarks
	Size	L	S	
953-9120	M4 <sup>*3)</sup>	20	14	Each set of 25 <sup>*1)</sup> 1 bag
953-0085	M6	32	18	
953-9107	M6	35	18	
953-0088	M6	45	18	
953-0091	M6	55	18	
953-9100	M8	40	22	
953-9101	M8	45	22	
953-9106	M8	50	22	
953-9102	M8	55	22	
953-9103	M8	60	22	
953-7801	M8	70	35	
953-7802	M10	70	35	

Bolts, and washers (Material: SUS304)

Type	Bolt			Remarks
	Size	L	S	
953-9104	M6	18	18	Each set of 25 <sup>*2)</sup> 1 bag
953-9105	M6	22	18	
953-9110	M8	25	22	
953-9111	M8	30	22	
953-9122	M4 <sup>*3)</sup>	16	16	
953-7811	M8	50	35	Each set of 35 <sup>*2)</sup> 1 bag
953-7812	M10	50	35	

\*1) A set contains 1 bolt and 2 washers .

\*2) A set contains 1 bolt and 1 washer.

\*3) Size M4 is a hexagon socket bolt.

Note) Bolts and washers baked with molybdenum disulfide are available as a special order.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
4-365017	953-9120	M4x20 Bolt · Nut · Washer	M4x20 (25 sets), for $\phi$ 34 ICF, hexagon socket bolt	38700
MOD-41480	953-0085	M6x32 Bolt · Nut · Washer	M6x32 (25 sets)	38701
794-0509	953-9107	M6x35 Bolt · Nut · Washer	M6x35 (25 sets), for $\phi$ 70 ICF	38703
MOD-41481	953-0088	M6x45 Bolt · Nut · Washer	M6x45 (25 sets)	38704
MOD-41482	953-0091	M6x55 Bolt · Nut · Washer	M6x55 (25 sets)	38705
MOD-41483	953-9100	M8x40 Bolt · Nut · Washer	M8x40 (25 sets), for tapped $\phi$ 152 ICF	38706
MOD-41484	953-9101	M8x45 Bolt · Nut · Washer	M8x45 (25 sets), for $\phi$ 114 ICF	38707
4-365020	953-9106	M8x50 Bolt · Nut · Washer	M8x50 (25 sets)	38708
MOD-41485	953-9102	M8x55 Bolt · Nut · Washer	M8x55 (25 sets), for $\phi$ 203 ICF	38709
4-365021	953-9103	M8x60 Bolt · Nut · Washer	M8x60 (25 sets), for $\phi$ 253 ICF	38710
A26-06376	953-7801	M8x70 Bolt · Nut · Washer	M8x70 (35 sets), for $\phi$ 305 ICF	38716
P21-04823	953-7802	M10x70 Bolt · Nut · Washer	M10x70 (35 sets), for $\phi$ 356 ICF · $\phi$ 406 ICF	38717
MOD-41594	953-9104	M6x18 Bolt · Washer	M6x18 (25 sets)	38711
MOD-41486	953-9105	M6x22 Bolt · Washer	M6x22 (25 sets), for tapped $\phi$ 70 ICF	38712
MOD-41592	953-9110	M8x25 Bolt · Washer	M8x25 (25 sets)	38713
MOD-41593	953-9111	M8x30 Bolt · Washer	M8x30 (25 sets)	38714
A26-02723	953-9122	M4x16 Bolt · Washer	M4x16 (25 sets), for tapped $\phi$ 34 ICF, hexagon socket bolt	38715
P25-02830	953-7811	M8x50 Bolt · Washer	M10x50 (35 sets), with tapped $\phi$ 305 ICF	38718
P25-02831	953-7812	M10x50 Bolt · Washer	M10x50 (35 sets), for tapped $\phi$ 356 ICF and $\phi$ 406 ICF	38719

Note) Contact us for more information about CE (RoHS).

# Ultra-High Vacuum Type-L All-metal Valves



## ■ Summary

These all-metal ultra-high vacuum type-L valves can be used up to  $10^{-8}$ Pa or lower. The valve body is made of austenitic stainless steel and the shaft seals are made of austenitic stainless steel bellows. These valves have an all-welded structure and the parts that are exposed to vacuum are oil-free and clean. Fur-

thermore, the valve sealing has a highly reliable capturing seal structure similar to the ICF flange. These valves can be baked out up to  $400^{\circ}\text{C}$  or  $450^{\circ}\text{C}$ , making them ideal for ultra-high vacuum equipment subject to hard baking.

## ■ Features

### 1. Ultra-high vacuum range

The all-metal valve can be used in an ultra-high vacuum range of up to  $10^{-8}$ Pa or lower.

### 2. Capturing seal structure

For the valve seal, a highly reliable capturing seal structure similar to the flange, is adopted (see Fig. 1).

### 3. High heat tolerance

The valve can be baked out up to  $400^{\circ}\text{C}$  or  $450^{\circ}\text{C}$ .

### 4. Quick, easy gasket replacement

The valve sealing copper alloy gasket can be replaced using the included handle or gasket remover.

### 5. Parallel pipes can be connected (excluding the 951-7148 mini metal valve)

Because the valve a 3-port type valve, pipes can connected with the side port side parallel.

### 6. Simple, easy maintenance

Maintenance such as replacing the gasket or reapplying the atmosphere side lubricant is simple and easy.

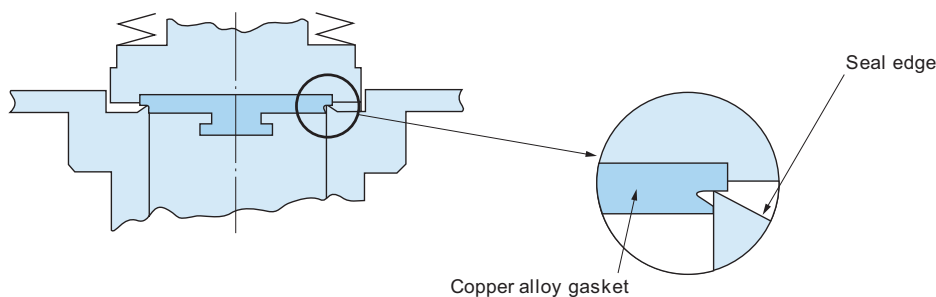


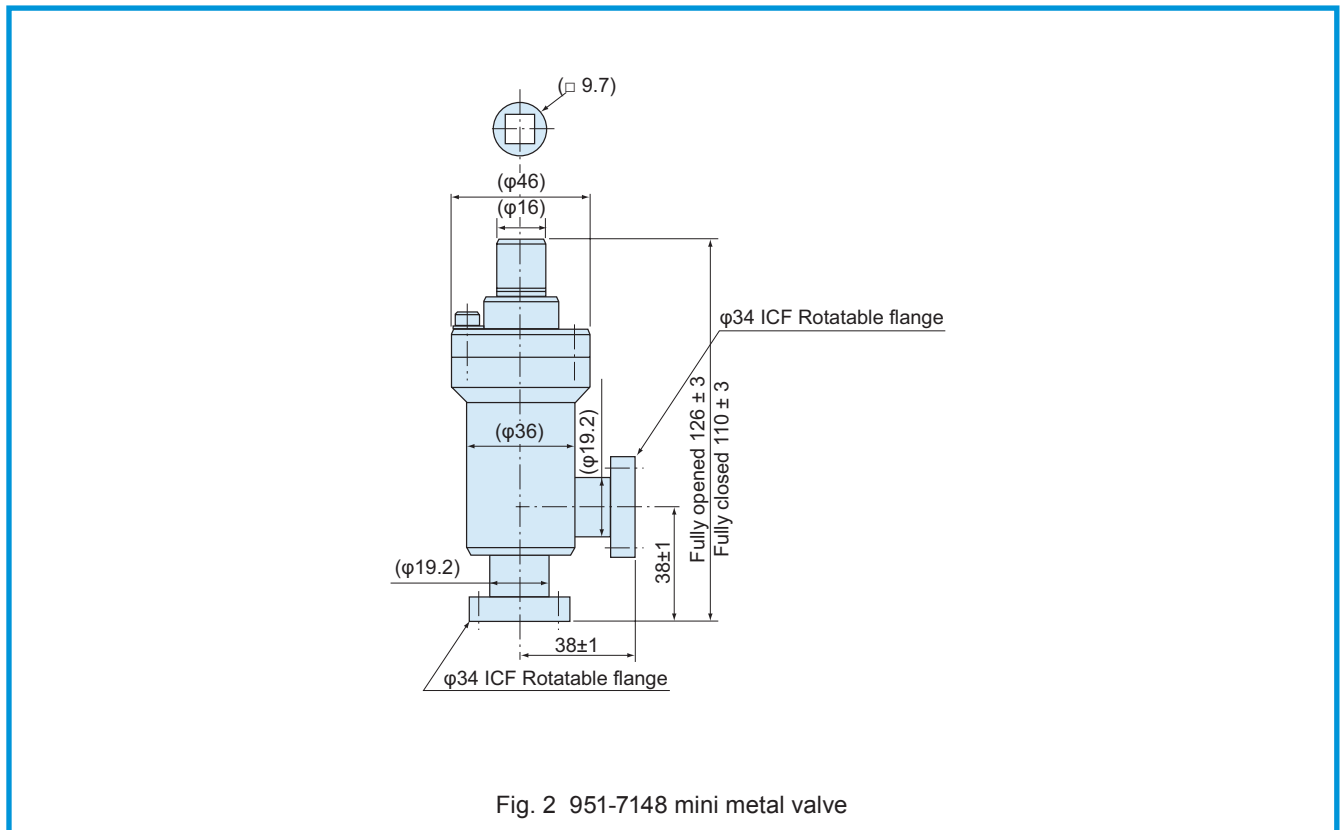
Fig. 1 Valve sealing structure

## ■ Specifications

Type	951-7148
Operating vacuum range	Atmospheric to $10^{-8}$ Pa or less
Leak	$6.7 \times 10^{-11}$ Pa·m <sup>3</sup> /sec or less
Conductance when fully opened	4L/sec
Allowable heating temperature	400°C
Initial sealing torque	Approx. 15.7N·m
Maximum sealing torque	23.5N·m
Main component material	Body: SUS-304 Bellows: SUS-304 Valve sealing gasket: Copper alloy Bonnet gasket: SUS-321 silver plated metal Hollow O-ring
Connection flange	φ34ICF flange
Weight	0.7kg
Dimensions	See Fig. 2
Applicable torque wrench (Option)	460F (Angular drive dimension <sup>□</sup> 9.53mm) (JIS B4650 plate type nominal 450 equivalent)
Attachments	Gasket remover: 1S Handle: x1 Nominal 2.5 hexagonal wrench: x1 Nominal 4 hexagonal wrench: x1 Wire brush: x1 Spare washer: Large x1, small x1, 2 total Spare gasket: x1

\* All values are based on a valve with the inside replaced with a vacuum or inert gas such as Ar gas.

## ■ Dimensions diagram

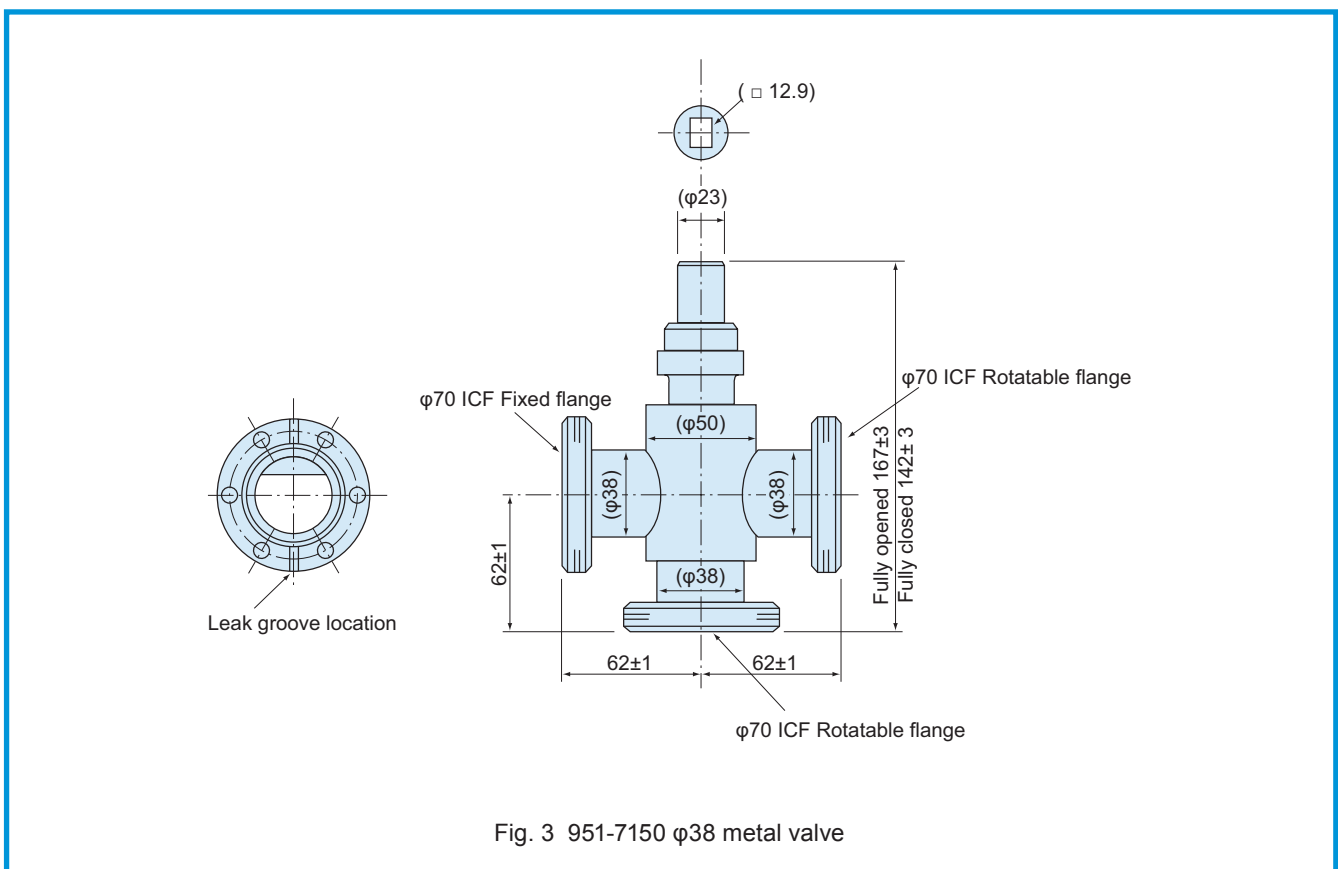


## ■ Specifications

Type	951-7150	951-7152
Operating vacuum range	Atmospheric to $10^{-8}$ Pa or less	
Leak	$6.7 \times 10^{-11}$ Pa·m <sup>3</sup> /sec or less	
Conductance when fully opened	30L/sec	100L/sec
Allowable heating temperature*	450°C	
Initial sealing torque	29.4 to 34.3N·m	78.4 to 127.4N·m
Maximum sealing torque	127.4N·m	225.4N·m
Main component material	Body: SUS-304 Bellows: SUS-304 Valve sealing gasket: Copper alloy	
Connection flange	φ70ICF flange	φ114ICF flange
Weight	1.6kg	7kg
Dimensions	See Fig. 3	See Fig. 4
Applicable torque wrench	1300F (Angular drive dimension <sup>□</sup> 12.7mm)	2800F (Angular drive dimension <sup>□</sup> 19.05mm)
	(JIS B4650 plate type nominal 1300 equivalent)	(JIS B4650 plate type nominal 2800 equivalent)
Attachments	Handle: x1 Nominal 2.5 hexagonal wrench: x1 Nominal 6 hexagonal wrench: x1 Wire brush: x1 Spare washer: Large x1, small x1, 2 total Spare gasket: x1	Handle: x1 Nominal 10 hexagonal wrench: x1 BS ball point driver: x1 Wire brush: x1 Spare washer: Large x1, small x1, 2 total Spare gasket: x1

\* All values are based on a valve with the inside replaced with a vacuum or inert gas such as Ar gas.

## ■ Dimensions diagram



## ■ Dimensions diagram

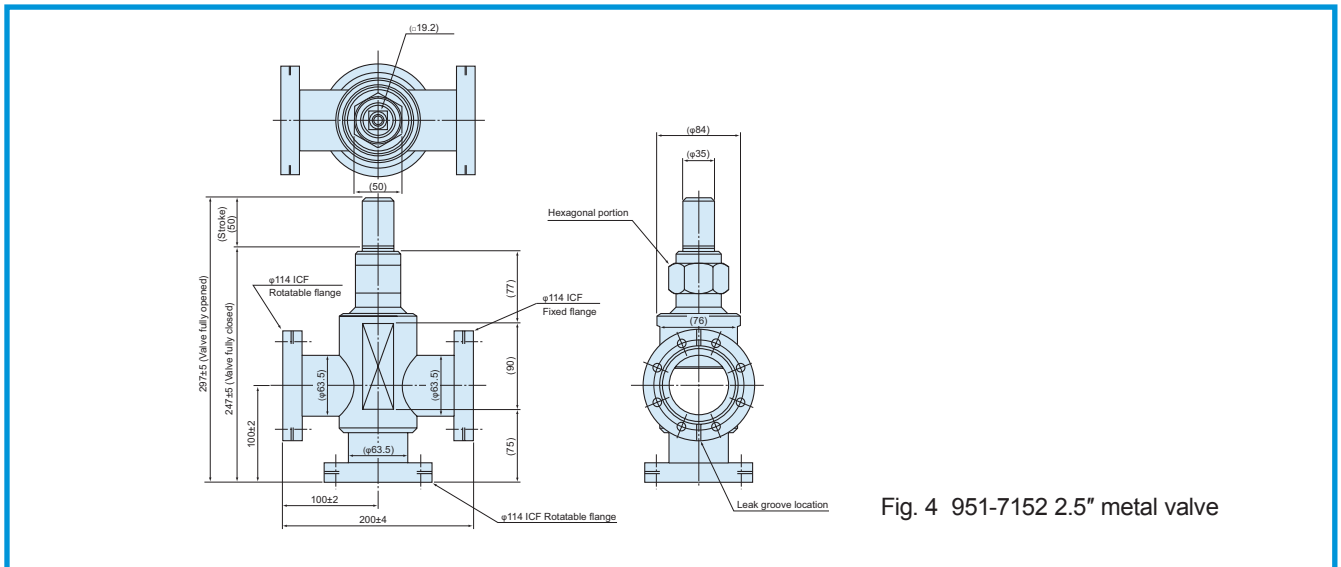


Fig. 4 951-7152 2.5" metal valve

## ■ Options (maintenance and consumable parts)

Replace the following maintenance/consumable parts at the end of their product life.

Type			Name	Quantity per unit
Nominal diameter 3/4"	Nominal diameter 1.5"	Nominal diameter 2.5"		
951-7148	951-9150	951-7152	Gasket	1 (For valve seat seal)
951-7148	951-9150	951-7152	Washer (1)	1
951-7148	951-7150	951-7152	Washer (2)	1

### ● Usage notes

- Note the following when baking this valve.
  - (1) Depending on the baking temperature and interval, lubricant must be reapplied to the atmo-

sphere side moving parts. If lubricant is not reapplied as needed, lubrication will lose its effect, which can result in galling. Lubricants must be ordered separately (Name: Threebond 1901).

- (2) Do not bake with atmosphere or active gas inside the valve. Otherwise, the seal may oxidize and become irreparable. Therefore, bake with the inside of the valve replaced with a vacuum or inert gas such as Ar gas.
2. Make sure there are no foreign particles such as metal dust inside the valve.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0190-06152	951-7150	φ38 Metal Valve	With φ70 ICF, 450°C heat resistance	30010
0190-07158	951-7152	2.5"Metal Valves	With φ114 ICF, 450°C heat resistance	30020
P25-04506	951-7148	Mini Metal Valve	With φ34 ICF, 400°C heat resistance	30030
0191-25794		Three Bond 1901 Lubricator (500g Can)	For 951-7148/7150/7152	39730
MOD-70277	951-9150	Washer(1)	For 951-7150, service parts	30800
MOD-70281	951-9150	Washer(2)	For 951-7150, service parts	30801
MOD-70283	951-9150	Gasket	For 951-7150 valve seat seal, service parts	30802
824-8385	951-7152	Washer(1)	For 951-7152, service parts	30803
824-8386	951-7152	Washer(2)	For 951-7152, service parts	30804
823-4344	951-7152	Gasket	For 951-7152 valve seat seal, service parts	30805
A26-09208	951-7148	Washer(1)	For 951-7148, service parts	30814
A26-09209	951-7148	Washer(2)	For 951-7148, service parts	30815
A26-09203	951-7148	Gasket	For 951-7148 valve seat seal, service parts	30816
P25-15028		1300F Torque Wrench	For 951-7150 (for φ38 metal valve)	38634
N48092136		2800F Torque Wrench	For 951-7152 (for 2.5" metal valve)	38635

Note) Contact us for more information about CE (RoHS).

# Ultra-High Vacuum Type-L Polyimide Valves

## ■ Summary

These type-L valves can be used at an ultra-high vacuum range of up to  $10^{-8}$ Pa. The valve body is made of austenitic stainless steel and the shaft seals are made of austenitic stainless steel bellows. The vacuum seal is made of polyimide resin, which has high heat tolerance and low gas emission. These valves are ideal for ultra high-vacuum equipment with a bake-out temperature of 150°C or more.



951-7120

951-7145

## ■ Features

### 1. High heat tolerance

Whether opened or closed, the polyimide seal can endure repeated baking from room temperature to a maximum of 300°C.

### 2. Seal material with low gas emission

Since the gas emission of polyimide resin is lower

than fluoro rubber (Viton), it can easily achieve ultra-high vacuum of about  $10^{-8}$ Pa. (See Fig. 1, 2)

### 3. Low tightening torque

Polyimide seals do not require as much tightening torque as metal seals.

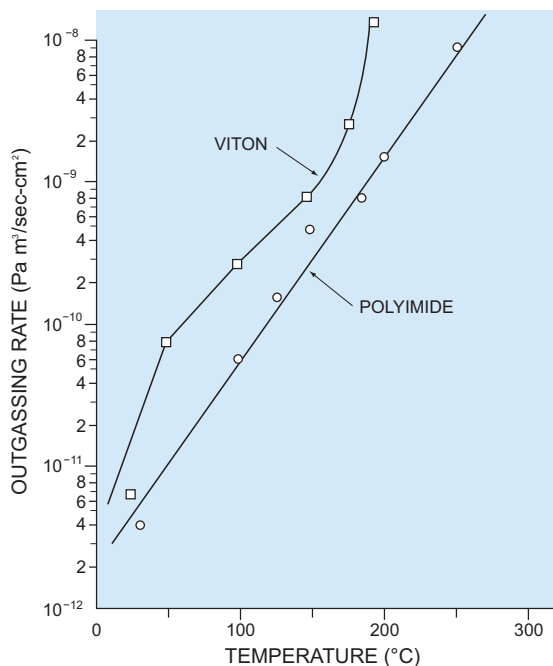


Fig. 1 Gas emissions

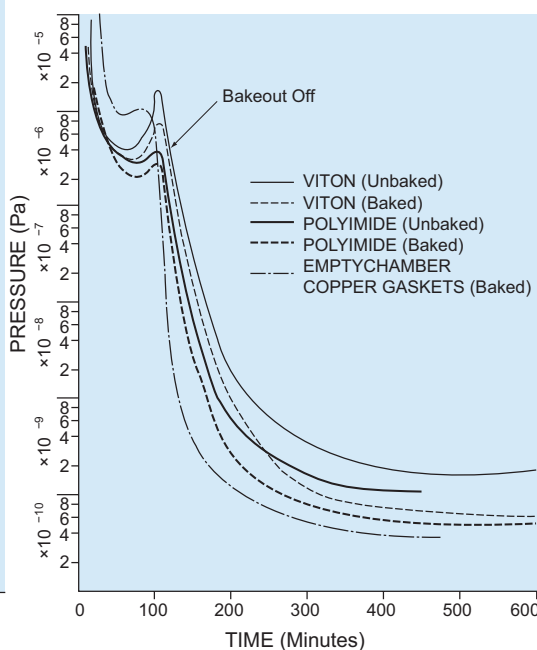


Fig. 2 Seal material comparison (ultimate pressure)



## ■ Specifications

Type	951-7145	951-7120
Operating vacuum range	Atmospheric to approx. $10^{-8}$ Pa	
Allowable heating temperature <sup>*1,2</sup>	300°C	300°C
Seal material (gasket)	Polyimide resin	Polyimide resin <sup>*4</sup>
Recommended sealing force (sample tightening torque <sup>*5</sup> )	1225 to 1921N (2 to 3.4N•m)	3920 to 4900N (4.9 to 5.9N•m)
Maximum sealing force (sample tightening torque <sup>*5</sup> )	2626N (5.9N•m)	7840N (14.7N•m)
Operation	Manual	Manual ( If baked several times use adjustable pin face wrench )
Conductance	1L/sec	30L/sec
Leak <sup>*3</sup>	$6.7 \times 10^{-11}$ Pa•m <sup>3</sup> /sec or less	$6.7 \times 10^{-11}$ Pa•m <sup>3</sup> /sec or less
Dimensions	Fig. 3	Fig. 3
Material used	Main body: SUS-304 Bellows: SUS-304L Handle: AL alloy (black alumite)	Main body: SUS-304 Bellows: SUS-304L Handle: AL alloy (black alumite)
Connection flange	φ34ICF flange	φ70ICF flange
Weight	0.41kg	1.6kg
Attachments	-	Adjustable pin face wrench, hexagonal wrench

\*1. All values are based on a valve with the inside replaced with a vacuum or inert gas such as Ar gas.

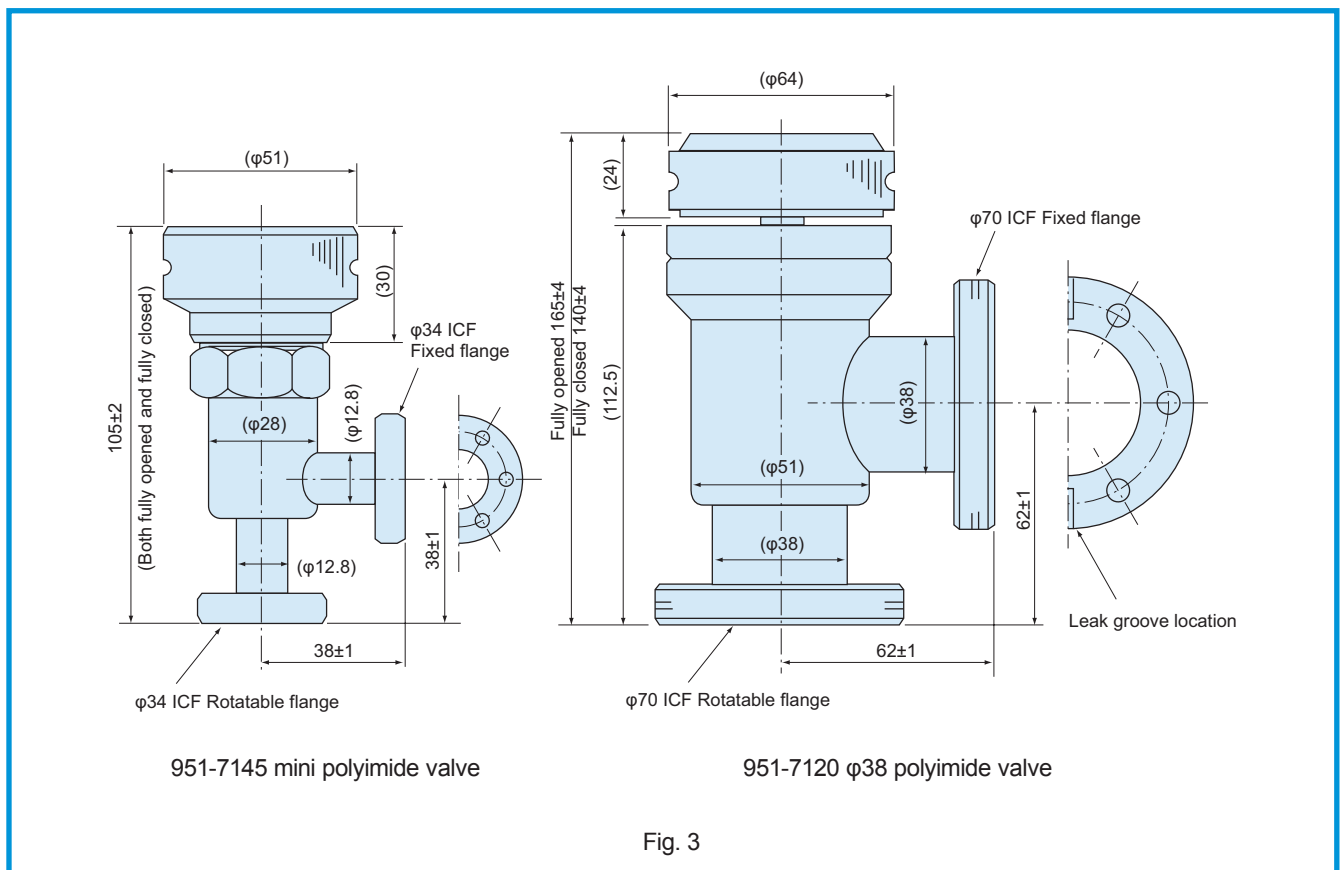
\*2. 260°C if heated continuously.

\*3. Gas permeation of polyimide resin is not within specifications.

\*4. Please consult with us about upgrading the bonnet seal to a metal seal (SUS321 silver plated O-ring).

\*5. The tightening torque is a reference value only because baking increases the friction coefficient of the driving screws and changes the balance between the tightening torque and tightening seal force.

## ■ Dimensions diagram



## ■ Maintenance and consumable parts

	951-7145 mini polyimide valve	951-7120 $\phi$ 38 polyimide valve
Main seal (valve seat)	951-7145 gasket	951-7120 gasket
Bonnet seal	951-7145 bellows gasket	951-7120 bellows gasket

## ■ Usage notes

1. Avoid damaging the seal surface with foreign particles such as metal dust because polyimide resin is used for the valve vacuum seal.
2. Solid lubricant is applied to the valve open/close screws to prevent "galling" at high temperature.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0190-04841	951-7145	Mini Polyimide Valve	With $\phi$ 34 ICF	30200
3-340209	951-7120	$\phi$ 38 Polyimide Valve	With $\phi$ 70 ICF	30210
4-350844	951-7145	Bellows Gasket (Polyimide)	For 951-7145 bonnet seal	30806
4-350848	951-7145	Gasket (Polyimide)	For 951-7145 valve seat seal	30807
4-350795	951-7120	Gasket (Polyimide)	For 951-7120 valve seat seal	30809
4-350794	951-7120	Bellows Gasket (Polyimide)	For 951-7120 bonnet seal	30810

Note) Contact us for more information about CE (RoHS).

*Memorandum*

Small size and low price!

# "V Series" Roughing Pump Valves

V-025RV



## ■ Summary

These type-L valves can be used in a high vacuum range of up to  $10^{-4}$ Pa. These valves use a fluoro rubber (Viton) O-ring for the vacuum seal and shaft seal, making them ideal for high vacuum equipment or as a roughing pump valve for ultra-high vacuum equipment.

## ■ Features

### 1. High vacuum range supported

A high vacuum range up to approximately  $10^{-4}$ Pa is supported. (Fluorine grease is used only on the shaft seal.)

### 2. Open/Close position sensor switch

The air cylinder used in the compressed air driven valves has a position sensor switch for opening and closing.

## ■ Type and name notation

### Display example

V-025RV-□N roughing pump valve

Valve drive system	
C	Compressed air driven+open/close sensor x2
M	Manual

## ■ Roughing valve specifications

Drive system		Air pressure	Manual
Type		V-025RV-CN	V-025RV-MN
Pressure range		Atmospheric pressure to approx. $10^{-4}$ Pa	
He leak <sup>*1</sup>	Stationary	6.7x10 <sup>-11</sup> Pa·m <sup>3</sup> /sec or less	
	Open/close	Up to 10 <sup>-5</sup> Pa·m <sup>3</sup> /sec	
Conductance		7L/sec	
Allowable heating temperature		60°C	
Main component material	Main unit	SUS-304	
	Moving part	AL alloy (air cylinder)	Nylon 66, polypropylene (handle)
	Vacuum seal material	Fluoro rubber (Viton) O ring (main seal, shaft seal, bonnet seal)	
		Shaft seal lubricant: Perfluoropolyether grease	
Operating air pressure		0.4 to 0.6 MPa	---
Air consumption (L /cycle) <sup>*2</sup>		0.024	---
Air supply inlet		M5	---
Open/close sensor		See the ■ Sensor switch specifications	---
Used fluid		Atmosphere or gas (excluding corrosive gas)	
Dimensions		See the ■ Dimensions diagram	
Weight		0.63kg	0.58kg
Connection flange <sup>*3</sup>		NW25 flange	

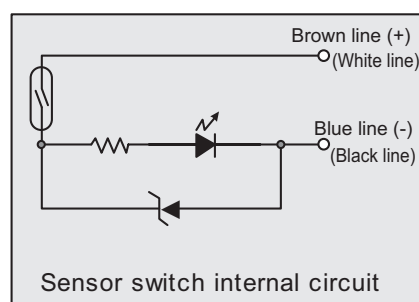
\*1. Gas permeation of the fluoro rubber (Viton) O-ring is not within specifications.

\*2. Air consumption for one cycle (open-close) at an air pressure of 0.5MPa.

\*3. The NW25 flange is a clamp flange for vacuum equipment. It uses an elastomer gasket (mainly fluoro rubber). For details, refer to the Quick Coupling section in our Vacuum Components Piping Parts Catalog.

## ■ Sensor switch specifications

Item	Specifications	
Applications	Program controller (sequencer), for relay	
Type, wiring method	Contact, 2-wire	
Load voltage	12/24V DC	100V AC
Load current	5 to 50mA	7 to 20mA
Internal voltage drop	2.4 V or less	
Lamp	LED (lit when ON)	
Leak current	0mA	
Internal circuit	See figure at right	
Lead wire length	1m (Oil resistant vinyl cabtire cord 2-core 0.2 <sup>2</sup> )	
Maximum collision	294m/s <sup>2</sup> (30G)	
Insulating resistance	20MΩ or more with 500V DC ohmmeter	
Withstand voltage	1000V AC for 1 minute	
Environment temperature	-10 to +60°C	
Protection structure	IEC standard IP67, JIS C0920 (watertight), oil proof	



Note 1. The sensor switch is sensitive to magnetic fields. Therefore, avoid using the switch near strong external magnetic fields or high-current power lines.

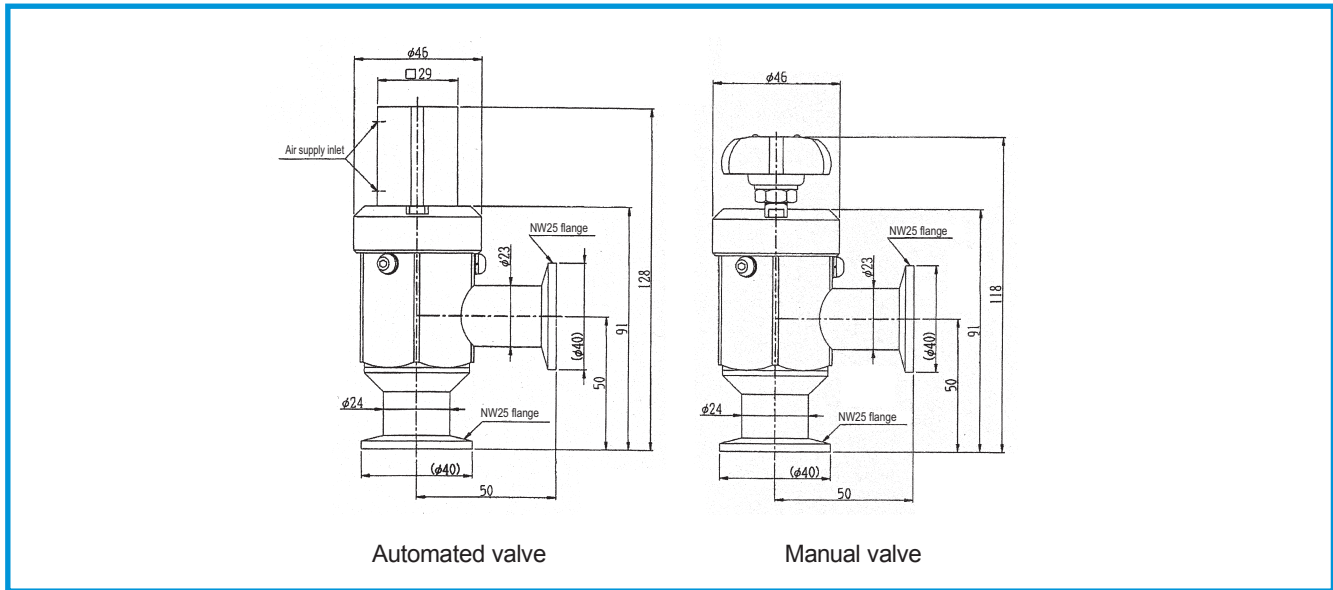
2. Do not connect the sensor switch directly to the power supply. Be sure to connect the load in series and use within the specified load current.

3. When connecting an inductive load (such as an electromagnetic relay), be sure to provide a contact protection circuit because surge voltage (inductive surge) will occur when the sensor switch is turned OFF.

DC: Normal rectifier diode, AC: CR (0.033 to 0.1μF capacitor, 1 to 3KΩ resistor)

4. When using with DC, connect so that the brown wire (white wire) is the positive side and the blue wire (black wire) is the negative side.

## ■ Dimensions diagram



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0190-00253	V-025RV-CN	NW25 Pneumatic L Type Valve	Nominal diameter: 25, with double-acting pneumatic actuation+open/close sensorx2	30000
0190-00237	V-025RV-MN	NW25 Manual L Type Valve	Nominal diameter: 25, manual	30001

Note) Contact us for more information about CE (RoHS).

*Memorandum*

Super long life and improved maintenance!

# "V Series" Type-L Valves

V-040LV/V-065LV/V-100LV



## ■ Summary

These type-L valves have been designed to have a longer lifespan and improved ease of maintenance. Because hastelloy alloy is used, the bellows inside the valve has a longer lifespan (compared with our existing product \*1). In addition, the MSB series uses a metal hollow O-ring for the bonnet, which prevents gas permeation of the air, making it ideal for gas analysis vacuum equipment. A large assortment of sizes and connection flanges are available for both manual and compressed air powered valves.

## ■ Features

### 1. Ultra-high vacuum supported

The STD series\*<sup>2</sup> can be used in an ultra-high vacuum range up to approximately  $10^{-7}$ Pa\*<sup>3</sup>. The MSB series\*<sup>4</sup> can be used up to approximately  $10^{-8}$ Pa\*<sup>3</sup>. In addition, if after purchasing the STD series, only a few parts need to be replaced to upgrade to the ultra-high vacuum compatible MSD series.

### 2. Long-life valve

The built-in bellows is a molded bellows. It is made of hastelloy alloy considering cost and product life\*<sup>5</sup>.

### 3. Open/Close position sensor switch

Each standard air cylinder used in the valves has a position sensor switch (magnetic sensor) for opening and closing.

### 4. High heat tolerance

The air cylinder for compressed air powered valves is heat-resistant up to 120°C. Therefore, bake-outs are possible with the valve body heating up to 150°C for the STD series and 200°C for the MSB series when the valves are opened. (However, please ensure that the air cylinder does not exceed 120°C and the sensor switch does not exceed 60°C.)

### 5. Variety of connection flanges

The valve body is made of stainless steel so that even a special connection flange can be welded easily to the body.

### 6. Simple, easy maintenance

No special tools are needed. Since the bellows can be easily removed from the valve drive, the parts inside the valve can be quickly cleaned and the maintenance parts easily replaced.

\*1: Bellows product life comparison with our 951 series type-L valve (about 5 times longer).

\*2: Standard specification using a fluoro rubber O-ring for the bonnet flange.

\*3: The vacuum rate is only a reference value because there is emission of gas such as moisture from inside the valve at the beginning of usage. Also note that the ultimate pressure varies depending on the pump to be used.

\*4: Metal seal specification using a metal hollow O-ring for the bonnet flange seal. (The part that separates the passage is made using a fluoro rubber O-ring.)

\*5: The bellows product life varies depending on the condition of use. Check the maintenance timing of the actual equipment.



## Type and name notation

Valve size	
040	Connection flange φ70ICF, NW40, former JIS 40A etc.
065	Connection flange φ114ICF, NW63, former JIS 65A etc.
100	Connection flange φ152ICF, NW80, former JIS 80A etc.

Former JIS flange	
I	ICF flange
N	NW flange
A	Former JIS flange (VF-VG)
B	Former JIS flange (VG-VF)
D	Customer specified flange

Note) 1. See ■ Dimensions Diagram, ■ Dimensions Table, ■ Connection Flange for details.  
2. The ICF flange is the standard specification for the MSB series.

V - □ □ □ LV - □ □ □ L-type valve

Bonnet gasket type	
S	STD series: Fluorine rubber
M	MSB series: Hollow metal O-ring

Note) The bonnet section gasket is used to seal the valve body and the open/close drive unit. See the Dimensions Diagram for the location.

Valve drive system	
C	With one air pressure drive double-acting valve and one open/close sensor
D	With one air pressure drive single-acting valve (NC) and one open/close sensor
M	Manual valve

Note) 1. Air pressure double-acting system: Open and close air must be supplied to open/close the valve.  
2. Air pressure single-acting system: Air supply is necessary only to open the valve. The valve is closed by a built-in spring. However, an internal leak can occur if the pressure fluctuates greatly inside the valve. There is no single-acting system for size 100 and the MSB series (all sizes).  
3. The open/close sensor is a magnetic induction switch.

### Display example V-040LV-SCN

Valve size: 40  
Bonnet  
Gasket: STD series (fluorine rubber)  
Valve drive system: Double-acting compressed air driven  
Connection flange: NW40 flange  
Open/close sensor: two included

## Valve specifications

Size	STD series			MSB series			
	40	65	100	40	65	100	
Type	See ■ Type name notation						
Pressure range	Atmospheric to approximately $10^{-7}\text{Pa}^{-1}$			Atmospheric to approximately $10^{-8}\text{Pa}^{-1}$			
He leak	Valve seat	$6.7 \times 10^{-11} \text{Pa} \cdot \text{m}^3 / \text{sec}$ or less <sup>2</sup>					
	External	$6.7 \times 10^{-11} \text{Pa} \cdot \text{m}^3 / \text{sec}$ or less <sup>2</sup>			$1.3 \times 10^{-11} \text{Pa} \cdot \text{m}^3 / \text{sec}$ or less <sup>2</sup>		
Allowable heating temperature	Valve opened	$150^\circ\text{C}^3$			$200^\circ\text{C}^3$		
	Valve closed	$125^\circ\text{C}^3$					
Main component material	Valve body	SUS-304					
	Bellows	Hastelloy C-22					
	Moving part	Air cylinder (pneumatic drive valve): Aluminum alloy, fluoro rubber Handle (manual valve): Aluminum alloy					
	Vacuum seal material	Fluoro rubber O-ring			Fluoro rubber O-ring (main seal) SUS321 silver plated metal tube O-ring (Bonnet seal)		
Operating air pressure	0.4 to 0.6MPa						
Air consumption (L/cycle) <sup>4</sup>	0.12	0.47	1.22	0.12	0.47	1.22	
Air supply inlet	Rc1/8	Rc1/4		Rc1/8	Rc1/4		
Used fluid	Atmosphere or gas (excluding corrosive gas)						
Dimensions	See ■ Dimensions diagram						
Weight	See ■ Dimensions table						
Connection flange <sup>5</sup>	Size	40		65		100	
	ICF flange	φ70ICF rotation		φ114ICF rotation		φ152ICF rotation	
	NW flange	NW40		NW63		NW80	
	Former JIS flange	Former JIS 40A		Former JIS 65A		Former JIS 100A	

\*1: The vacuum rate is only a reference value, because there is emission of gas such as moisture from inside the valve at the beginning of usage. Also note that the ultimate pressure varies depending on the pump to be used.

\*2 Gas permeation of the fluoro rubber (Viton) O-ring is not within specifications.

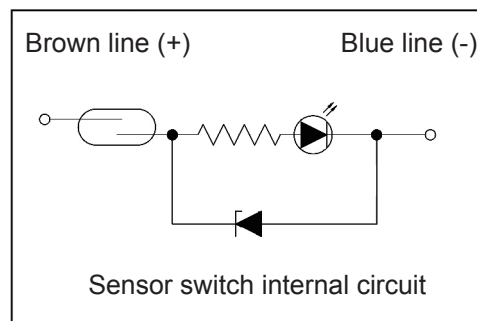
\*3. The maximum withstand temperature of the sensor switch is 60°C. Please remove the sensor switch when heating up to 120°C. If heating of the air cylinder can be kept under 120°C, the valve body can be heated up to 150°C for the STD (with the valve open) and 200°C for the MSB (continuously for four hours with the valve open).

\*4. Air consumption for one cycle (open-close) at an air pressure of 0.5MPa. About half the value of NC valves.

\*5. For details of the connection flanges, see ■ Dimensions diagram, ■ Dimensions table, and ■ Connection flange.

## ■ Sensor switch specifications

Item	Specifications	
Applications	Program controller (sequencer), for relay	
Type, wiring method	Contact, 2 wire	
Load voltage	12/24V DC	100V AC
Load current	5 to 50mA	7 to 20mA
Internal voltage drop	2.4V or less	
Lamp	LED (lit when ON)	
Leak current	0mA	
Internal circuit	See figure at right.	
Lead wire length	1m (Oil resistant vinyl cabtire cord 2 core 0.2mm <sup>2</sup> )	
Maximum collision	294m/s <sup>2</sup> (30G)	
Insulating resistance	20MΩ or more with 500V DC ohmmeter	
Withstand voltage	1000V AC for 1 minute	
Environment temperature	-10 to +60°C	
Protection structure	IEC standard IP67, JIS C0920 (watertight), oil proof	



- Note 1. The sensor switch is sensitive to magnetic fields. Therefore, avoid using the switch near strong external magnetic fields or high-current power lines.
- Do not connect the sensor switch directly to the power supply. Be sure to connect the load in series and use within the specified load current.
  - When connecting an inductive load (such as an electromagnetic relay), be sure to provide a contact protection circuit because surge voltage (inductive surge) will occur when the sensor switch is turned OFF.  
DC: Normal rectifier diode, AC: CR (0.033 to 0.1μF capacitor, 1 to 3KΩ resistor)
  - When using with DC, connect so that the brown wire (white wire) is the positive side and the blue wire (black wire) is the negative side.

## ■ Dimensions diagram table

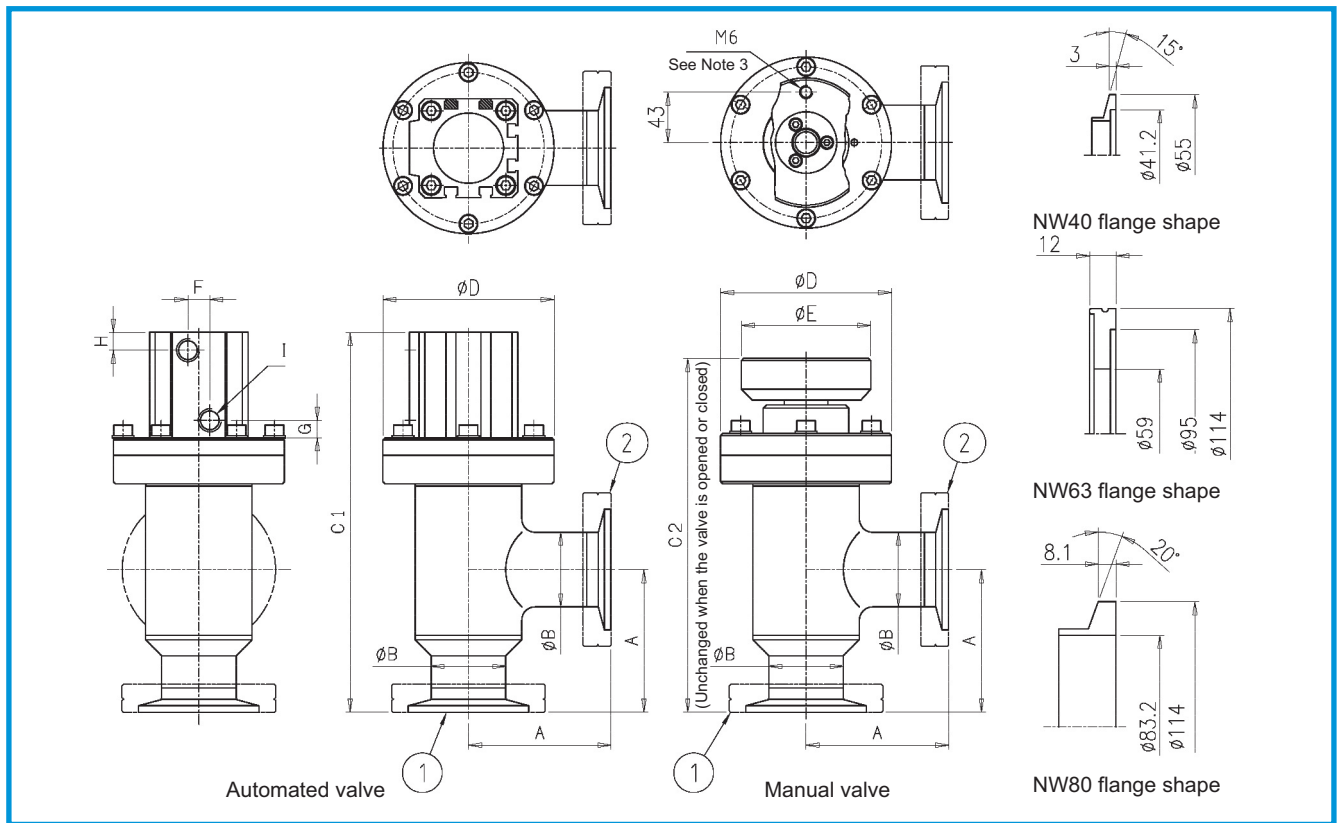
Type	Connection flange		A	B	C1	C2	D	E	F	G	H	I	Weight (kg)		
	(1) Flange	(2) Flange													
V-040LV-□□I	φ70ICF	φ70ICF	63	34	171	159	78	60	10	8	8	Rc 1/8	2.0		
V-040LV-□□N	NW40	NW40	65		173	161							1.6		
V-040LV-□□B	JIS 40A (VF)	JIS 40A (VG)	63		171	159							2.7		
V-040LV-□□A	JIS 40A (VG)	JIS 40A (VF)	63	60.5	235	201	114	70	15	10.5	10.5	Rc 1/4	6.0		
V-065LV-□□I	φ114ICF	φ114ICF	102.5										220.5	186.5	4.5
V-065LV-□□N	NW63	NW63	88										232.5	198.5	6.0
V-065LV-□□B	JIS 65A (VF)	JIS 65A (VG)	102.5	89.2	327	283	150	100	15	13	11	Rc 1/4	11.5		
V-065LV-□□A	JIS 65A (VG)	JIS 65A (VF)	102.5										297	253	8.7
V-100LV-□□I	φ152ICF	φ152ICF	135										327	283	11.5
V-100LV-□□N	NW80	NW80	105	135	327	283	150	100	15	13	11	Rc 1/4	8.7		
V-100LV-□□B	JIS 100A (VF)	JIS 100A (VG)	135										297	253	11.5
V-100LV-□□A	JIS 100A (VG)	JIS 100A (VF)	135										327	283	11.5

Note 1. ICF is a rotatable flange.

Note 2. The JIS flange is a maintenance flange for JIS B 2290 (1998) (commonly called a former JIS flange).  
The bolt holes are distributed around the center.

Note 3 Use the M6 female screw on the manual valve's handle (V-100LV only) to attach the handle grip.

## ■ Dimensions diagram



## ■ Connection flanges

### ● ICF flange

The ICF flange is an ultra-high vacuum flange that uses a metal gasket. It is a JVIS-003 compliant conflat flange. Refer to the ultra-high vacuum flange in our catalog for details.

### ● NW flange

The NW flange is a clamp flange for vacuum equipment. It uses elastomer gaskets (mainly fluoro rubber). The flange shape is the shape on the side of the ■ Dimensions figure. For details about the NW40 flange, refer to the Quick Coupling section in our catalog.

### ● Former JIS flange

This flange complies to the standards specified in JIS B 2290:1968 and were widely adopted in the vacuum industry until the standards were revised in 1998. The flange is used for the combination of the VF flange without the O-ring groove and the VG flange with the O-ring groove.

Note that the flange is not compatible with JIS B 2290:1998.

### ● Customer specified flange

Contact us if you need a valve that combines the above flanges or special flanges other than the above.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0190-00164	V-040LV-SCN	DN40 Pneumatic L Type Valve	STD+compressed air driven+sensor+NW40 flange	30103
0190-00203	V-040LV-SCA	DN40 Pneumatic L Type Valve	STD+compressed air driven+sensor+JIS (C) flange	30102
0190-00229	V-040LV-SCB	DN40 Pneumatic L Type Valve	STD+compressed air driven+sensor+JIS (B) flange	30101
0190-00318	V-040LV-SDN	DN40 Pneumatic NC L Type Valve	STD+NC type+sensor+NW40 flange	30107
0190-00350	V-040LV-SDA	DN40 Pneumatic NC L Type Valve	STD+NC type+sensor+JIS (C) flange	30106
0190-00376	V-040LV-SDB	DN40 Pneumatic NC L Type Valve	STD+NC type+sensor+JIS (B) flange	30105
0190-00465	V-040LV-SMN	DN40 Manual L Type Valve	STD>manual+NW40 flange	30115
0190-00481	V-040LV-SMA	DN40 Manual L Type Valve	STD>manual+JIS (C) flange	30114
0190-00499	V-040LV-SMB	DN40 Manual L Type Valve	STD>manual+JIS (B) flange	30113
0190-00431	V-040LV-MCI	DN40 Pneumatic L Type Valve MSB	MSB + compressed air driven + sensor + $\phi$ 70 ICF flange	30109
0190-00512	V-040LV-MMI	DN40 Manual L Type Valve MSB	MSB + manual + $\phi$ 70 ICF flange	30111
0190-00546	V-065LV-SCN	DN65 Pneumatic L Type Valve	STD+compressed air driven+sensor+NW63 flange	30123
0190-01186	V-065LV-SCA	DN65 Pneumatic L Type Valve	STD+compressed air driven+sensor+JIS (C) flange	30122
0190-00601	V-065LV-SCB	DN65 Pneumatic L Type Valve	STD+compressed air driven+sensor+JIS (B) flange	30121
0190-00643	V-065LV-SDN	DN65 Pneumatic NC L Type Valve	STD+NC type+sensor+NW63 flange	30127
0190-00685	V-065LV-SDA	DN65 Pneumatic NC L Type Valve	STD+NC type+sensor+JIS (C) flange	30126
0190-00708	V-065LV-SDB	DN65 Pneumatic NC L Type Valve	STD+NC type+sensor+JIS (B) flange	30125
0190-00805	V-065LV-SMN	DN65 Manual L Type Valve	STD>manual+NW63 flange	30135
0190-00821	V-065LV-SMA	DN65 Manual L Type Valve	STD>manual+JIS (C) flange	30134
0190-00839	V-065LV-SMB	DN65 Manual L Type Valve	STD>manual+JIS (B) flange	30133
0190-00782	V-065LV-MCI	DN65 Pneumatic L Type Valve MSB	MSB + compressed air driven + sensor + ICF flange	30129
0190-00855	V-065LV-MMI	DN65 Manual L Type Valve MSB	MSB + manual + ICF flange	30131
0190-00889	V-100LV-SCN	DN100 Pneumatic L Type Valve	STD+compressed air driven+sensor+NW flange	30143
0190-00928	V-100LV-SCA	DN100 Pneumatic L Type Valve	STD+compressed air driven+sensor+JIS (C) flange	30142
0190-00944	V-100LV-SCB	DN100 Pneumatic L Type Valve	STD+compressed air driven+sensor+JIS (B) flange	30141
0190-01699	V-100LV-SMN	DN100 Manual L Type Valve	STD>manual+NW flange	30155
0190-01712	V-100LV-SMA	DN100 Manual L Type Valve	STD>manual+JIS (C) flange	30154
0190-01720	V-100LV-SMB	DN100 Manual L Type Valve	STD>manual+JIS (B) flange	30153
0190-01681	V-100LV-MCI	DN100 Pneumatic L Type Valve MSB	MSB + compressed air driven + sensor + ICF flange	30149
0190-01738	V-100LV-MMI	DN100 Manual L Type Valve MSB	MSB + manual + ICF flange	30151

Note) Contact us for more information about CE (RoHS).

*Memorandum*

# Ultra-High Vacuum Variable Leak Valves



951-7172

## ■ Summary

These variable leak valves are designed for vacuum equipment for which the amount of introduced gas flow must be controlled. These valves enable the introduction of remarkably small amounts of gas. The minimum controllable leakage is less than

$6.7 \times 10^{-9} \text{Pa} \cdot \text{m}^3/\text{sec}$ .

In addition, the valves are all-metal and can be baked up to  $450^\circ\text{C}$ , making them ideal for ultra-high vacuum equipment.

## ■ Features

### 1. Seal with high resistance to heat and external shock

WC-type cemented carbide combined with copper alloy is used for sealing. No cracking from thermally or mechanical vibrations will occur; unlike sealing using a sapphire and copper alloy combination.

### 2. Stable control of minute gas flow

Introduction of remarkably small amounts of gas is possible. The minimum controllable leakage is less than  $6.7 \times 10^{-9} \text{Pa} \cdot \text{m}^3/\text{sec}$  (He gas introduced, primary side gauge pressure at 0.2MPa).

### 3. High heat tolerance

Made of all-metal and can be baked up to  $450^\circ\text{C}$ .

### 4. Wide gas flow control range.

The gas flow can be controlled over a wide range.

### 5. Connectable to ultra-high pressure

The material of each component has been thoroughly reviewed so that it can be connected to ultra-high vacuum equipment.

## ■ Applications

Vacuum equipment for which the amount of introduced gas flow must be controlled.

Sputtering equipment, gas analysis equipment.

Physics experiment/research equipment.

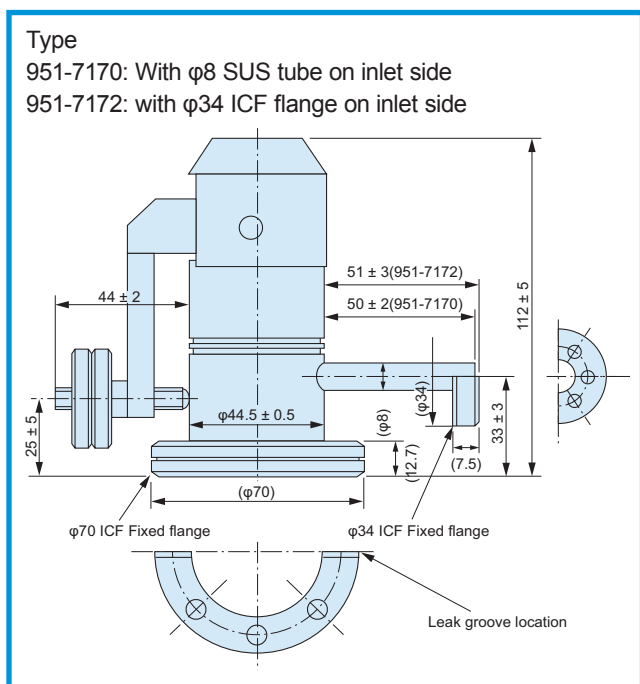
## ■ Specifications

Operating vacuum range		Atmospheric to approx. $10^{-8} \text{Pa}$
Adjustable Minimum leak*1		$6.7 \times 10^{-9} \text{Pa} \cdot \text{m}^3/\text{sec}$ or less
Leak when valve is closed		$6.7 \times 10^{-11} \text{Pa} \cdot \text{m}^3/\text{sec}$ or less
Allowable heating temperature*2		$450^\circ\text{C}$ (open or closed)
Gasket life		Approx. 300 seals (at room temperature) Approx. 30 seals (with baking) (Gasket replaceable)
Component material		Main body: SUS-304 Seal: WC type cemented carbide Gasket: Cu alloy
Connection flange	Gas outlet side	$\phi 70 \text{ICF}$ fixed flange
	Gas inlet side	$\phi 8 \times \phi 6$ SUS-304 tube (951-7170) $\phi 34 \text{ICF}$ with fixed flange (951-7172)
Attachments		951-9160 gasket x2 951-9160 ring x2 951-9160 wrench x1 Nominal bore 5 hexagonal wrench x1 Nominal bore 8 hexagonal wrench x1
Weight		1.3kg

\*1. Values with 0.2MPa pressure He gas connected to the gas inlet side.

\*2. Values with the gas inlet side and  $\phi 70 \text{ICF}$  side replaced with a vacuum or inert gas such as Ar gas.

## ● Dimensions diagram



## ■ Usage notes

- Note the following when baking this variable leak valve.
  - Depending on the baking temperature and interval, lubricant must be reapplied to the atmosphere side moving parts. If lubricant is not reapplied as needed, lubrication will lose its effect, which can result in galling. Lubricants must be ordered separately (Name: Threebond 1901).
  - Do not bake with atmosphere or active gas inside the valve (including the gas inlet side). Otherwise, the seal may oxidize and become irreparable. Therefore, bake with the gas inlet side and  $\phi 70$ ICF side replaced with a vacuum or inert gas such as Ar gas.

## ■ Maintenance and consumable parts

Replace the following maintenance/consumable parts at the end of their product life.

Type	Name	Quantity per unit
951-9160	Gasket	1
951-9160	Ring	1
951-9160	Spring washer	5

- Make sure there are no foreign particles such as metal dust inside the valve. In addition, if there is such risk in the gas introduced from the primary side, a filter should be placed in the piping.
- Be careful of the thermal effects of the valve. Thermal effects of the valve appear significantly when introducing a small gas flow and the flow rate changes as the temperature changes. Therefore, maintain the valve at a constant temperature in order to perform precise control of the gas flow.
- This variable leak valve cannot be used to introduce corrosive gas.

## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
753-0378	951-7170	Variable Leak Valve	With $\phi 70$ ICF, inlet side $\phi 8$ SUS tube	31000
803-0666	951-7172	Variable Leak Valve	With $\phi 70$ ICF, inlet side $\phi 34$ ICF tube	31001
MOD-70344	951-9160	Gasket	For 951-7170/7172	30824
MOD-70345	951-9160	Ring	For 951-7170/7172	30825
MOD-70333	951-9160	Spring Washer	For 951-7170/7172	31802
0191-25794		Three Bond 1901 Lubricator (500g Can)	For 951-7170/7172	39730

Note) Contact us for more information about CE (RoHS).

# Gas Inlet Valves

- 951-7179 Inlet Valve
- 951-7180 Inlet Valve
- 951-7177 Leak Valve
- 951-7178 Leak Valve
- 951-7190 Leak Valve
- 951-7192 Leak Valve

## ■ 951-7179 Inlet Valve

This leak valve is used for introducing specified gases into vacuum equipment. The shaft seal is made of an austenitic stainless steel bellows. The vacuum seal is made of fluoro rubber (Viton). This valve is ideal as a gas introduction valve for leaking high vacuum or ultra-high vacuum equipment.

### ● Features

#### 1. Ultra-high vacuum range

An ultra-high vacuum range of up to approximately  $10^{-7}$ Pa is supported.

#### 2. No atmospheric air mixing

The shaft seal uses a bellows to prevent atmospheric air from being mixed into the gas being introduced.

#### 3. High heat tolerance

The valve can be baked up to 150°C.

#### 4. Simple, easy maintenance

### ● Specifications

Item	Specifications
Type	951-7179, 951-7180
Operating vacuum range	Atmospheric to approx. $10^{-7}$ Pa
Leak when valve is closed	$6.7 \times 10^{-11}$ Pa·m <sup>3</sup> /sec or less <sup>*1</sup>
Orifice diameter	φ8.5mm
Allowable heating temperature <sup>*2</sup>	150°C when valve opened, 125°C when valve closed
Main component material	Vacuum seal: Fluoro rubber (Viton) <sup>*3</sup> Valve body: SUS304 Bellows: SUS304L Handle: Phenol resin
Connection flange	φ70ICF, NW25 flange
Weight	0.5kg
Dimensions	See Fig. 1, 2

\*1. Gas permeation of the fluoro rubber (Viton) is not with specifications.

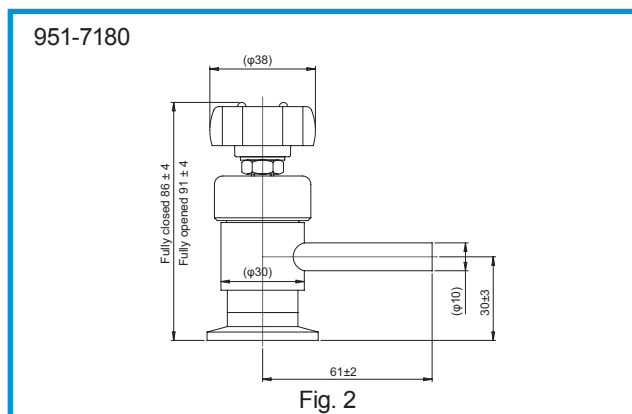
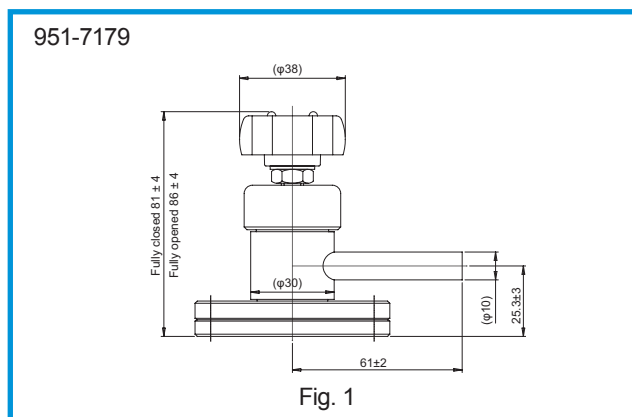
\*2. Remove the handles before baking.

\*3. The main seal and bonnet seal.



951-7179

### ● Dimensions diagram





## ■ 951-7177 Leak Valve

## ■ 951-7178 Leak Valve

These leak valves are used for introducing specified gases into vacuum equipment. The vacuum seal and shaft seal are made of fluoro rubber (Viton).

These valves are ideal as an atmospheric air/specified gas introduction valve for leaking high vacuum or ultra-high vacuum equipment.

### ● Features

#### 1. Ultra-high vacuum range

An ultra-high vacuum range of up to approximately  $10^{-7}$ Pa is supported.

#### 2. High heat tolerance

The valve can be baked up to 125°C.

#### 3. Simple, easy maintenance

#### 4. Specific gases can be introduced

### ● Specifications

Item	Specifications
Type	951-7177, 951-7178
Operating vacuum range	Atmospheric to approx. $10^{-7}$ Pa
Leak when valve is closed	$6.7 \times 10^{-11}$ Pa·m <sup>3</sup> /sec or less <sup>*1</sup>
Orifice diameter	φ3.5mm
Allowable heating temperature	125°C <sup>*2</sup>
Main component material	Vacuum sealing material: Fluorine rubber (Viton)
	Shaft sealing material: Fluorine rubber (Viton)
	O-ring
	Shaft seal lubricant: For high vacuum Silicone grease
	Valve body
	Shaft: SUS304 Valve body: Brass (Ni-plated) Handle: Phenol resin
Connection flange	φ70ICF, NW25 flange
Weight	0.4kg
Dimensions	See Fig. 3, 4

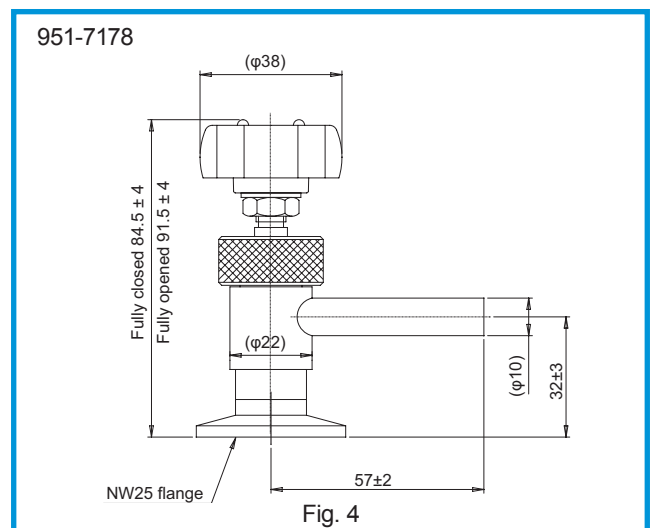
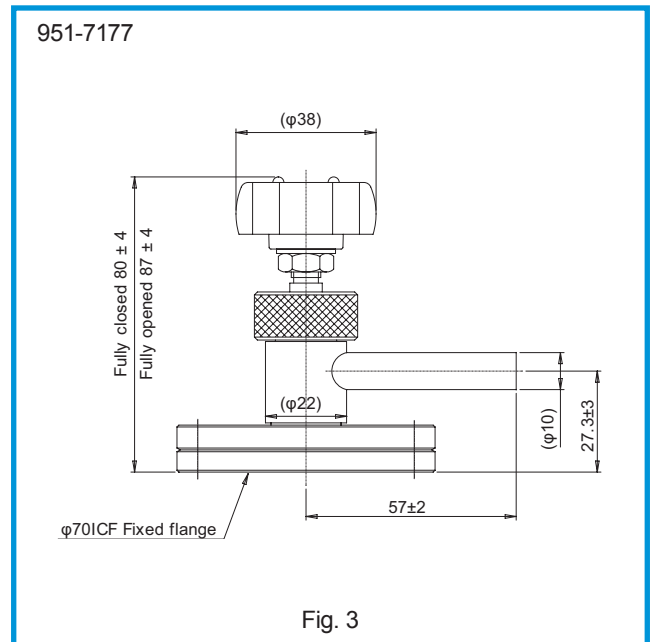
\*1. Gas permeation of the fluoro rubber (Viton) is not within specifications.

\*2. Remove the handles before baking.



951-7177

### ● Dimensions diagram



## ■ 951-7190 Leak Valve

## ■ 951-7192 Leak Valve

These grip-type leak valves are used for introducing atmospheric air into the vacuum equipment. A fluoro rubber (Viton) O-ring is used for the vacuum seal. These valves are ideal as an atmosphere feed through valve for leaking high vacuum or ultra-high vacuum equipment.

### ● Features

#### 1. Ultra-high vacuum range

An ultra-high vacuum range of up to approximately  $10^{-7}$ Pa is supported.

#### 2. High heat tolerance

The valve can be baked up to 125°C.

#### 3. Simple, easy maintenance

### ● Specifications

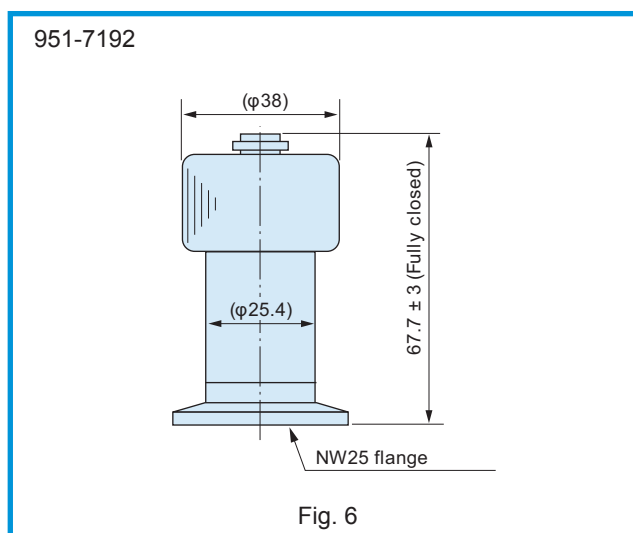
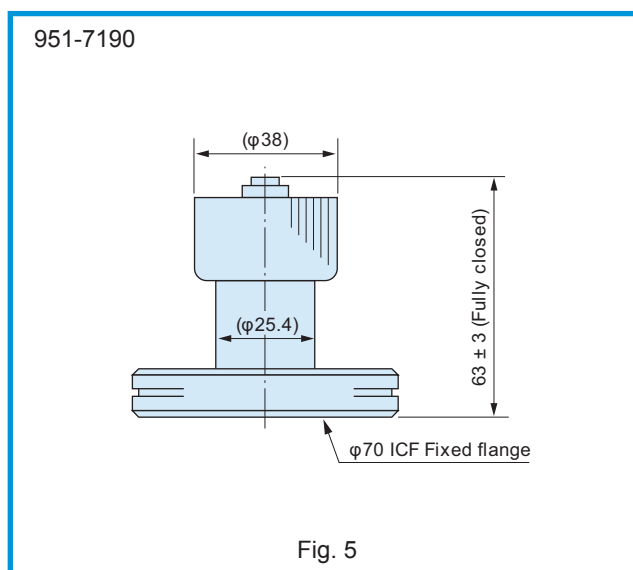
Item	Specifications
Type	951-7190, 951-7192
Operating vacuum range	Atmospheric to approx. $10^{-7}$ Pa
Leak when valve is closed	$6.7 \times 10^{-11}$ Pa·m <sup>3</sup> /sec or less
Orifice diameter	φ10mm
Allowable heating temperature	125°C
Main component material	Vacuum seal material: Fluoro rubber (Viton) O-ring Valve body: SUS304 Valve element: SS34 (Ni-plated)
Connection flange	φ70ICF, NW25 flange
Weight	0.5kg
Dimensions	See Fig. 5, 6

\* Gas permeation of the fluoro rubber (Viton) O-ring is not within specifications.



951-7190

### ● Dimensions diagram



### ■ Ordering information

Parts Number	Model	Description	Remarks	Code
0190-06097	951-7190	Air Leak Valve	φ70 ICF, O-ring seal grip type	31030
0190-09396	951-7177	Leak Valve	With φ70 ICF, O-ring shaft seal	31010
0190-09388	951-7179	Inlet Valve	With φ70 ICF, bellows shaft seal	31020

Note) Contact us for more information about CE (RoHS).

## ■ Ordering information

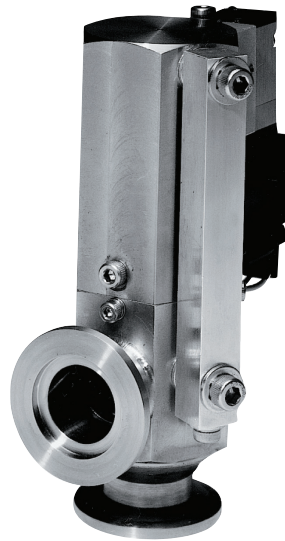
Parts Number	Model	Description	Remarks	Code
A26-05986	951-7192	Air Leak Valve	NW25 with flange, O-ring seal grip type	31031
0190-09362	951-7178	Leak Valve	NW25 with flange, O-ring shaft seal	31011
0190-09370	951-7180	Inlet Valve	NW25 with flange, bellows shaft seal	31021

Note) Contact us for more information about CE (RoHS).

Serves both as cut valve and vent valve!

# Isolate Valves

V -025SV



## ■ Summary

These valves are connected to the inlet of the oil-sealed rotary vacuum pump. The valves are automated valves that do not use compressed air to move the valve. The valves have two functions: vacuum locking the pumped system when the pump is stopped, and then venting the pump side.

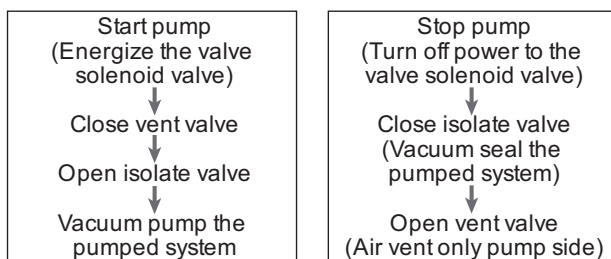
These valves prevent backflow of pump oil due to a power outage or improper operation of the automated or manual exhaust systems.

## ■ Features

1. When the oil-sealed rotary pump stops, the pumped system is automatically cut off (vacuum locked). The pump side is then vented to prevent the pump oil from flowing back into the pumped system.
2. Since the valve uses the vacuum created by the pump as the drive source, it does not require compressed air or pipes like conventional automated valves. (The valve does not open when the pump is not operating.)
3. This valve does not require any dedicated control circuit. It can be controlled by interlocking the power supply for the attached solenoid valve with the motor for the pump.

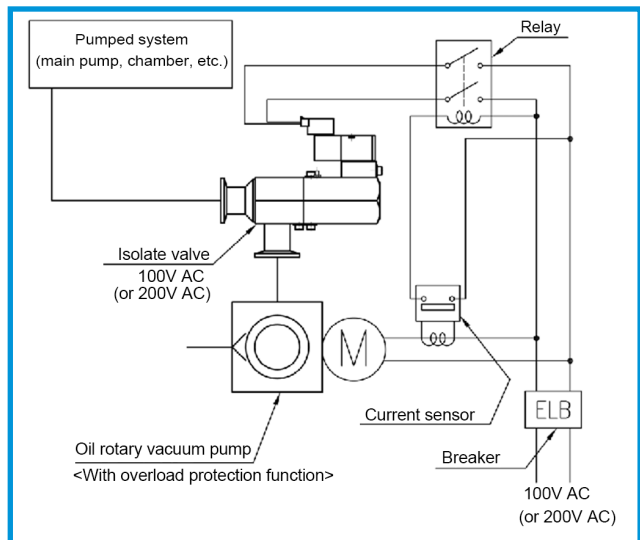
## ■ Flow of operation

(When linked to the oil-rotary vacuum pump in the pumping configuration example)



Note) Vent valve is built into an isolate valve.

## ■ Pumping system configuration example



- Note 1) Wire so that the solenoid valve to the valve is energized only when the pump is running.
- Note 2) The above diagram is an example of the connection containing a protection circuit.

## ■ Specifications

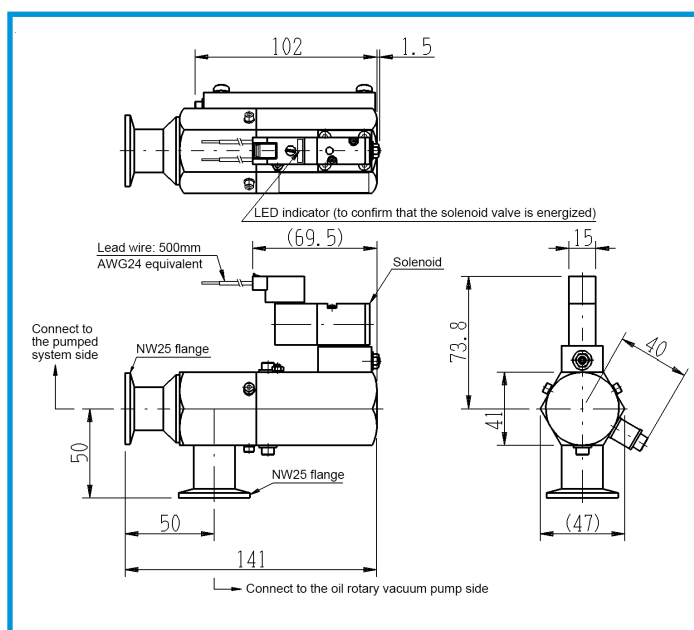
Type	V-025SV-100	V-025SV-200	
Pressure range	Atmospheric to approx. $10^{-2}$ Pa		
Leak	$<10^{-6}$ Pa·m <sup>3</sup> /sec		
Conductance	420 L/min* <sup>1</sup>		
Maintenance interval	10,000 cycles or 1 year		
Main component material	Vacuum seal material: Fluoro rubber O-ring* <sup>2</sup> Nitril rubber* <sup>3</sup> Body, valve, spring: SUS304 Shaft seal lubricant: Silicon grease		
Connection flange	NW25 flange		
Fluid used	Atmosphere or gas (excluding corrosive gas)		
Usage environment	Ambient temperature 10°C to 40°C		
Solenoid	Rated voltage (V)	100V AC (50/60Hz)	200V AC (50/60Hz)
	Starting current (A)	0.032/0.027	0.016/0.014
	Holding current (A)	0.028/0.022	0.014/0.011
Dimensions	See ■ Dimensions diagram.		
Weight	1kg		

\* 1. Values are for 20°C air in molecular flow range.

\* 2. Main seal, bonnet seal, and shaft seal

\* 3. Piston and screw seal

## ■ Dimensions diagram



Note) This may be mounted in any direction. However, the connection port to the pumped system and pump is fixed.  
(It cannot be used with the connection port reversed.)

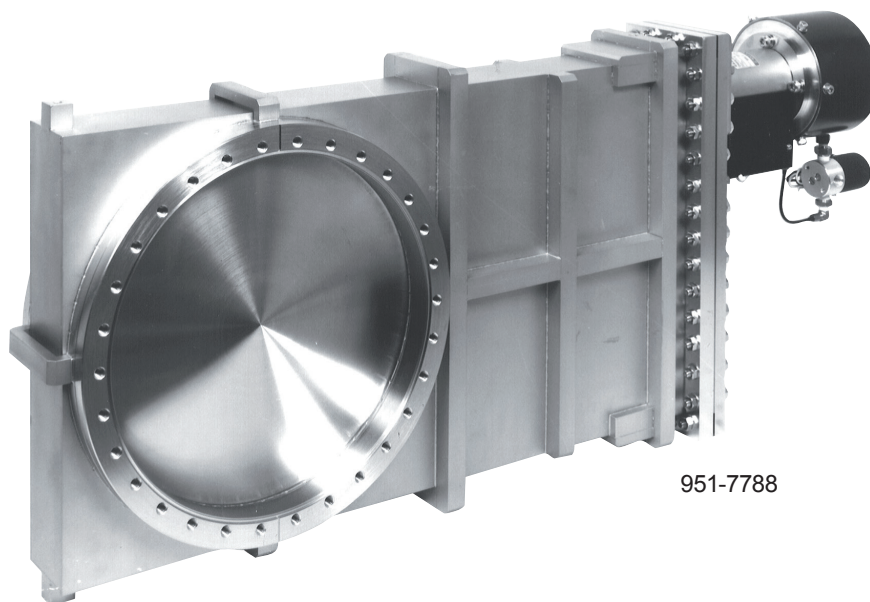
## ■ Ordering information

Parts Number	Model	Description	Remark	Code
0190-06160	V-025SV-100	Isolate Valve	With NW25 flange, 100V AC	31092
0190-06178	V-025SV-200	Isolate Valve	With NW25 flange, 200V AC	31093

Note) Contact us for more information about CE (RoHS).

# Ultra-High Vacuum Gate Valves

## MSB series



951-7788

### ■ Summary

These austenitic stainless steel gate valves can be baked up to 150°C (valve opened. Up to 200°C if within six hours). The shaft seal is also made of austenitic stainless steel welded bellows so that there is no leak even during use. Furthermore, the vacuum seal gasket uses a metal hollow O-ring at the bonnet seal and a fluorine rubber (Viton) O-ring at the main seal to prevent gas permeation from the atmosphere

and gas emission from the gasket. The valves can therefore be used in an ultra-high vacuum range of up to approximately  $10^{-8}$ Pa without disrupting the oil-free environment.

Manual and automated valves are available in sizes from 1.5" to 8". Automated valves are available in sizes 10" and 12".

Select the type that best meets your application.

### ■ Features

#### 1. Metal bonnet seal

Along with the bellows shaft seal, vacuum brazing is used for the body and internal mechanism. A metal hollow O-ring is used for the bonnet seal gasket, keeping the gas transmission low. The valve can be used in an ultra-high vacuum range of approximately  $10^{-8}$ Pa.

#### 2. Close-lock mechanism

The close-lock mechanism keeps the closed automated valve closed even if the air supply is cut off due to a power outage.

#### 3. Simple, easy maintenance

#### 4. Capable of counter pressure

Seal performance is maintained for both positive pressure and counter pressure.

#### 5. Position indicator

A position indicator is included as standard for automated valves.

### ■ Applications

- As the main valve for pumping systems.
- As an air lock valve for sample introduction.
- For ion beam introduction.
- For transfer lines that need to maintain the vacuum environment.

## ■ Specifications

		Manual type	Auto type
Drive system		Manual drive	Automatically driven by air pressure
Operating vacuum range		Atmospheric to approx. $10^{-8}$ Pa	
Leak		$6.7 \times 10^{-11}$ Pa·m <sup>3</sup> /sec or less* <sup>1</sup>	
Allowable heating temperature		150°C valve open, 125°C valve closed* <sup>2, 3</sup>	
Allowable maximum differential pressure		Valve at rest: $\pm 1$ atm., Valve operating: $\pm 133$ Pa	
Life		Bellows: 10,000 cycles, Maintenance time: 5,000 cycles or 1 year	
Material used		Seal material: Main seal ..... Fluoro rubber (Viton) O-ring Bonnet seal ..... SUS321 silver plated metal tube O ring Main body: SUS304 Bellows: SUS304 welded bellows	
Connection flange		ICF flange	
Operating air pressure range		–	1.5" to 4" 0.3 to 0.5MPa, 6" to 12" 0.4 to 0.5MPa
Solenoid	Type	–	4-way solenoid (200V AC 50/60Hz)* <sup>4</sup>
	Connection port	–	Rc1/4 (former PT1/4)
Position indicator* <sup>5</sup>		Option: For retrieving valve open/close signal	Standard: For retrieving valve open/close signal

(Note) \*1. Gas permeation of the fluoro rubber (Viton) O-ring is not within specifications.

\*2. The actuator and solenoid valve of the automated gate valves are not heat resistant. The allowable ambient temperature is 50°C.

\*3. Can be heated up to 200°C with the valve open, if the heating time is less than six hours.

\*4. If you need to use 100V AC 50/60Hz or 24V DC, please specify when ordering.

\*5. For the relay contact output and contact capacity, refer to the section on the Position indicator.

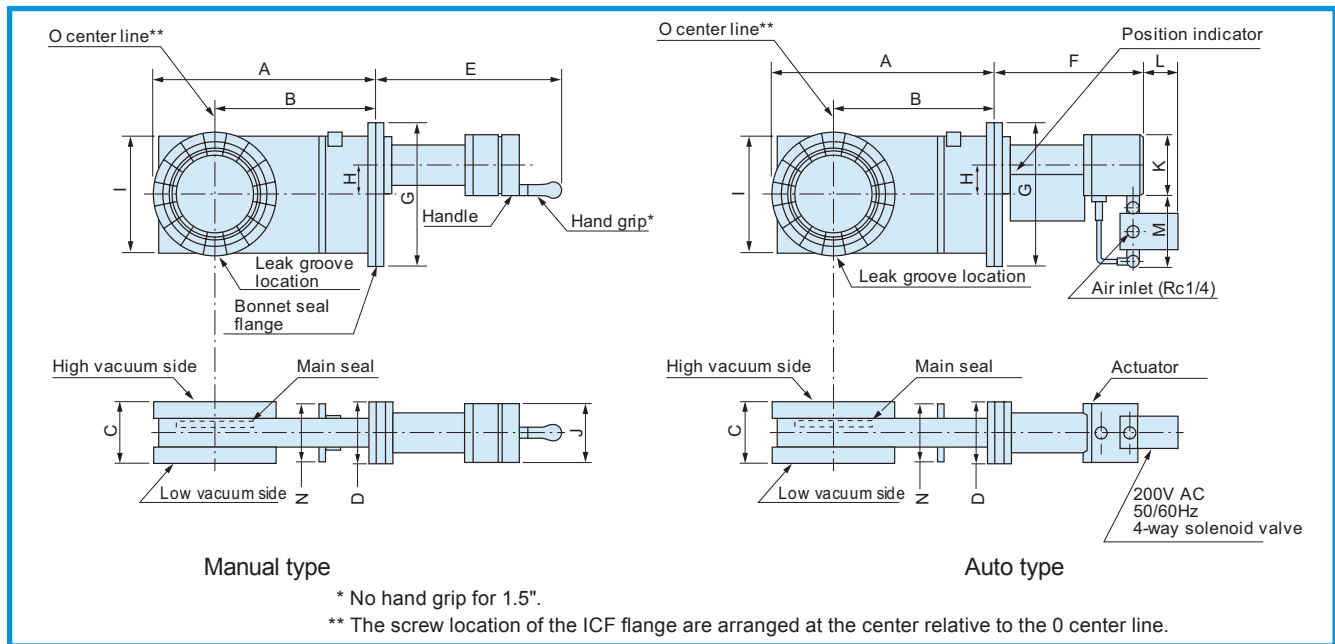
### ● Weight

Valve Nominal diameter	Manual type	Auto type
1.5"	3kg	3.5kg
2.5"	7.9kg	8.4kg
4"	12.6kg	13kg
6"	19.8kg	20.6kg
8"	30.8kg	31.8kg
10"	–	54kg
12"	–	74kg

### ● Fully opened conductance

Valve Nominal diameter	Conductance
1.5"	65L/sec
2.5"	203L/sec
4"	600L/sec
6"	1,450L/sec
8"	2,730L/sec
10"	4,350L/sec
12"	6,420L/sec

• Dimensions diagram



With ICF flange

Model	Nominal diameter	Flange dimensions				
		Outer diameter	Inner diameter	Thickness	Screw	
951-7723 951-7728	1.5"	φ70	φ38	12.7	6-M6	Depth 8
951-7733 951-7738	2.5"	φ114	φ64	17.5	8-M8	Depth 12
951-7743 951-7748	4"	φ152	φ102	20.0	16-M8	Depth 15
951-7753 951-7758	6"	φ203	φ152	22.0	20-M8	Depth 15
951-7763 951-7768	8"	φ253	φ203	25.0	24-M8	Depth 17
951-7778	10"	φ305	φ254	28.0	32-M8	Depth 19
951-7788	12"	φ356	φ305	28.5	30-M10	Depth 19

Model	Nominal diameter	Valve dimension													
		A	B	C	D	E	F	G	H	I	J	K	L	M	N
951-7723 951-7728	1.5"	138	103	51.4	62	105	105	108	18	70	φ51	φ53	48.5	103	-
951-7733 951-7738	2.5"	216	159	71	78	206	156	156	27	114	φ64	φ64	47.5	103	-
951-7743 951-7748	4"	284	208	78	80	225	180.5	190	39	148	φ74	φ74	46.5	103	70
951-7753 951-7758	6"	380	278	90	88	225	184	246	67	204	φ74	φ90	41.5	103	84
951-7763 951-7768	8"	485	358	100	92	258	224.5	296	83	254	φ86	φ100	44.5	103	100
951-7778	10"	601	443	116	102	-	227	358	113	316	-	φ110	44	103	100
951-7788	12"	700	518	127	114	-	241	414	138	370	-	φ137	40.5	103	110

Note) The number 3 at the end of the type name indicates a manual valve and 8 indicates an automated valve.

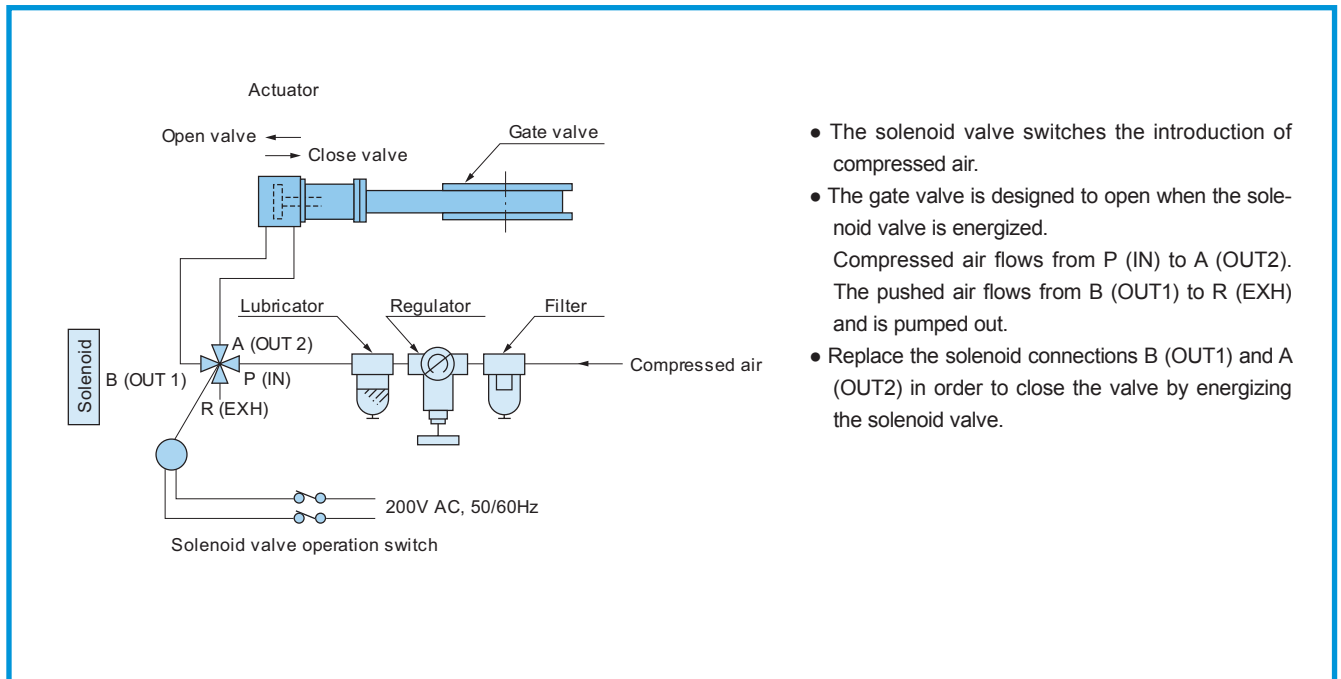


## ● Position indicator

AC rating	125V AC			
	Resistance load			
Current (A)	5			
DC rating	8V DC	14V DC	30V DC	115V DC
	Resistance load	Resistance load	Resistance load	Resistance load
Current (A)	5	5	5	0.3

(Note) Lead wire color (length 300mm): For open signal/red (COM), white For open signal/blue (COM), green

## ● Automated gate valve air piping example



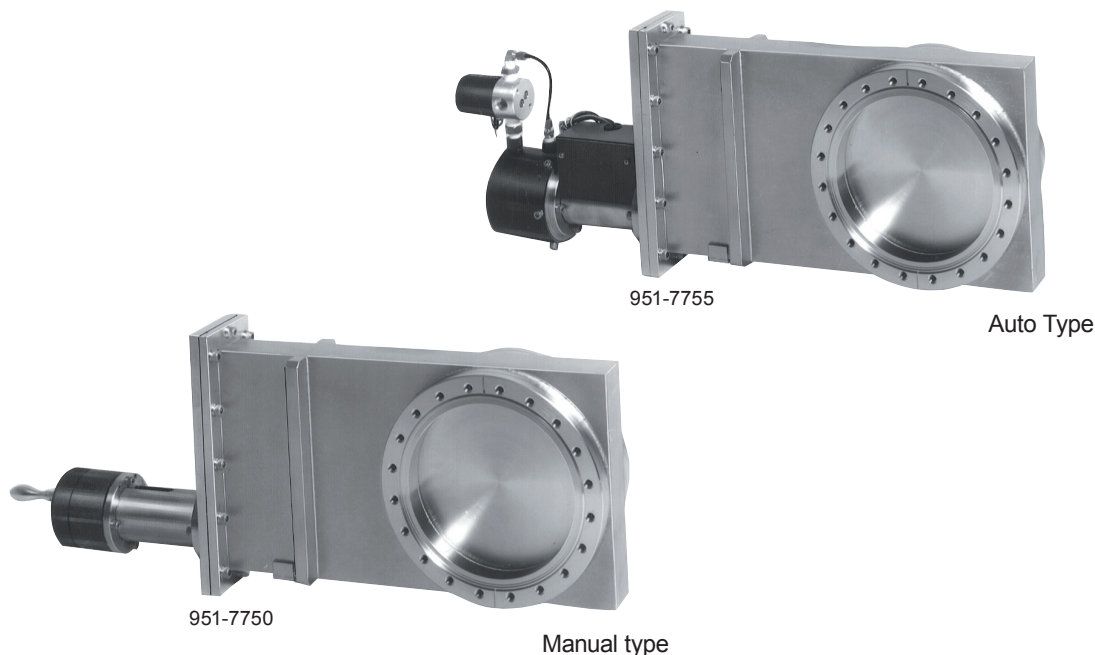
## ■ Ordering information

Parts Number	Model	Description	Remark	Code
P21-02210	951-7723	1.5" Manual Gate Valve (MSB)	With $\phi$ 70 ICF, bellows shaft seal	31212
P21-02212	951-7733	2.5" Manual Gate Valve (MSB)	With $\phi$ 114 ICF, bellows shaft seal	31222
P21-02355	951-7743	4" Manual Gate Valve (MSB)	With $\phi$ 152 ICF, bellows shaft seal	31232
P21-02362	951-7753	6" Manual Gate Valve (MSB)	With $\phi$ 203 ICF, bellows shaft seal	31242
P21-02369	951-7763	8" Manual Gate Valve (MSB)	With $\phi$ 253 ICF, bellows shaft seal	31252
P21-01899	951-7728	1.5" Automatic Gate Valve (MSB)	With $\phi$ 70 ICF, bellows shaft seal	31312
0190-08358	951-7738	2.5" Automatic Gate Valve (MSB)	With $\phi$ 114 ICF, bellows shaft seal	31322
P21-02360	951-7748	4" Automatic Gate Valve (MSB)	With $\phi$ 152 ICF, bellows shaft seal	31332
U11-15642	951-7758	6" Automatic Gate Valve (MSB)	With $\phi$ 203 ICF, bellows shaft seal	31342
P21-02374	951-7768	8" Automatic Gate Valve (MSB)	With $\phi$ 253 ICF, bellows shaft seal	31352
P21-02376	951-7778	10" Automatic Gate Valve (MSB)	With $\phi$ 305 ICF, bellows shaft seal	31362
P21-02563	951-7788	12" Automatic Gate Valve (MSB)	With $\phi$ 356 ICF, bellows shaft seal	31372

Note) Contact us for more information about CE (RoHS).

# Ultra-High Vacuum Gate Valves

## STD series



### ■ Summary

These austenitic stainless steel gate valves can be baked up to 150°C (valve opened). The shaft seal is also made of austenitic stainless steel welded bellows. The valves can therefore be used in an ultra-high vacuum range of up to approximately  $10^{-7}$ Pa

without disrupting the oil-free environment. Manual and automated valves are available in sizes from 1.5" to 8". Automated valves are available in sizes 10" and 12". Select the type that best meets your application.

### ■ Features

#### 1. Vacuum brazing

Along with the bellows shaft seal, vacuum brazing is used for the body and the internal mechanism, keeping the gas transmission low. The valve can be used in an ultra-high vacuum range of approximately  $10^{-7}$ Pa.

#### 2. Close-lock mechanism

The close-lock mechanism keeps the closed automated valve closed even if the air supply is cut off due to a power outage.

#### 3. Simple, easy maintenance

The simple structure enable the bellows to be easily replaced.

#### 4. Capable of counter pressure

Seal performance is maintained for both positive pressure and counter pressure.

#### 5. Position indicator

A position indicator is included as standard for automated valves.

### ■ Applications

- As the main valve for pumping systems.
- As an air lock valve for sample introduction.
- For ion beam introduction
- For transfer lines that need to maintain the vacuum environment.

## ■ Specifications

		Manual type	Auto type
Drive system		Manual drive	Automatically driven by air pressure
Operating vacuum range		Atmospheric to approx. $10^{-7}$ Pa	
Leak		$6.7 \times 10^{-11}$ Pa·m <sup>3</sup> /sec or less* <sup>1</sup>	
Allowable heating temperature		150°C valve open, 125°C valve closed* <sup>2</sup>	
Allowable maximum differential pressure		Valve at rest: $\pm 1$ atm., Valve operating: $\pm 133$ Pa	
Life		Bellows: 10,000 cycles, Maintenance time: 5,000 cycles or 1 year	
Material used		Seal material: Fluoro rubber (Viton) O ring (main seal, bonnet seal, bellows seal) Main body: SUS304 Bellows: SUS304 welded bellows	
Connection flange		ICF flange, JIS flange	
Operating air pressure range		-	1.5" to 4" 0.3 to 0.5MPa, 6" to 12" 0.4 to 0.5MPa
Solenoid	Type	-	4-way solenoid (200V AC 50/60Hz)* <sup>3</sup>
	Connection port	-	Rc1/4 (former PT1/4)
Position indicator* <sup>4</sup>		Option: For retrieving valve open/close signal	Standard: For retrieving valve open/close signal

(Note) \*1. Gas permeation of the fluoro rubber (Viton) O-ring is not within specifications.

\*2. The actuator and solenoid valve of the automated gate valves are not heat resistant. The allowable ambient temperature is 50°C.

\*3. If you need to use 100V AC 50/60Hz or 24V DC, please specify when ordering.

\*4. For the relay contact output and contact capacity, refer to the section on the Position indicator.

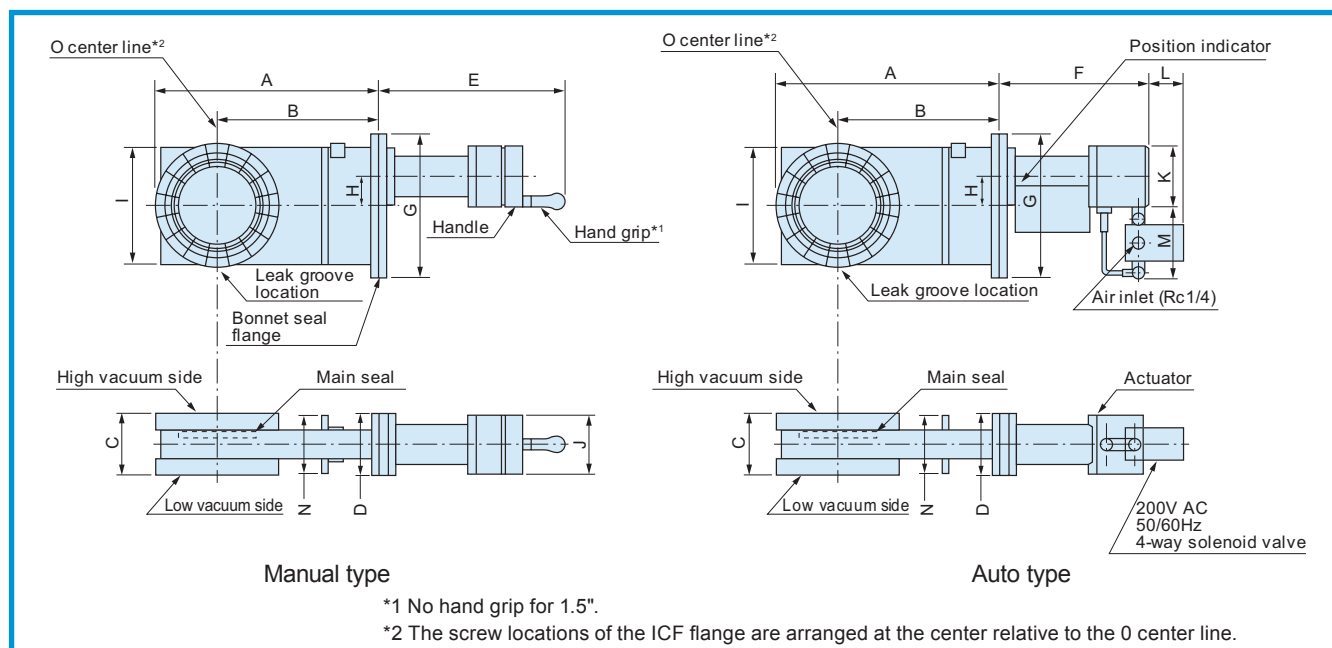
## ● Weight

Valve Nominal diameter	Manual type		Auto type	
	With ICF flange	With JIS flange	With ICF flange	With JIS flange
1.5"	2.3kg	3.0kg	2.8kg	3.5kg
2.5"	6.4kg	6.6kg	6.9kg	7.1kg
4"	10.3kg	10.8kg	10.7kg	11.2kg
6"	17.8kg	18.3kg	18.6kg	19.1kg
8"	28.6kg	31.8kg	29.6kg	32.8kg
10"	-	-	50.0kg	52.0kg
12"	-	-	70.0kg	72.0kg

## ● Fully opened conductance

Valve Nominal diameter	With ICF flange	With JIS flange
1.5"	65L/sec	69L/sec
2.5"	203L/sec	225L/sec
4"	600L/sec	649L/sec
6"	1,450L/sec	1,560L/sec
8"	2,730L/sec	2,870L/sec
10"	4,350L/sec	4,610L/sec
12"	6,420L/sec	6,740L/sec

• Dimensions diagram (The figure shows the ICF flange).



### With ICF flange

Model	Nominal diameter	Flange dimensions			
		Outer diameter	Inner diameter	Thickness	Screw
951-7720 951-7725	1.5"	φ70	φ38	12.7	6-M6 Depth 8
951-7730 951-7735	2.5"	φ114	φ64	17.5	8-M8 Depth 12
951-7740 951-7745	4"	φ152	φ102	20.0	16-M8 Depth 15
951-7750 951-7755	6"	φ203	φ152	22.0	20-M8 Depth 15
951-7760 951-7765	8"	φ253	φ203	25.0	24-M8 Depth 17
951-7775	10"	φ305	φ254	28.0	32-M8 Depth 19
951-7785	12"	φ356	φ305	28.5	30-M10 Depth 19

Model	Nominal diameter	Valve dimension													
		A	B	C	D	E	F	G	H	I	J	K	L	M	N
951-7720 951-7725	1.5"	138	103	51.4	51	105	105	96	18	70	φ51	φ53	48.5	103	-
951-7730 951-7735	2.5"	216	159	71	64	206	156	144	27	114	φ64	φ64	47.5	103	-
951-7740 951-7745	4"	284	208	78	74	225	180.5	182	39	148	φ74	φ74	46.5	103	70
951-7750 951-7755	6"	380	278	90	82	225	184	240	67	204	φ74	φ90	41.5	103	84
951-7760 951-7765	8"	485	358	100	86	258	224.5	295	83	254	φ86	φ100	44.5	103	100
951-7775	10"	601	443	116	97	-	227	354	113	316	-	φ110	44	103	100
951-7785	12"	700	518	127	107	-	241	407	138	370	-	φ137	40.5	103	110

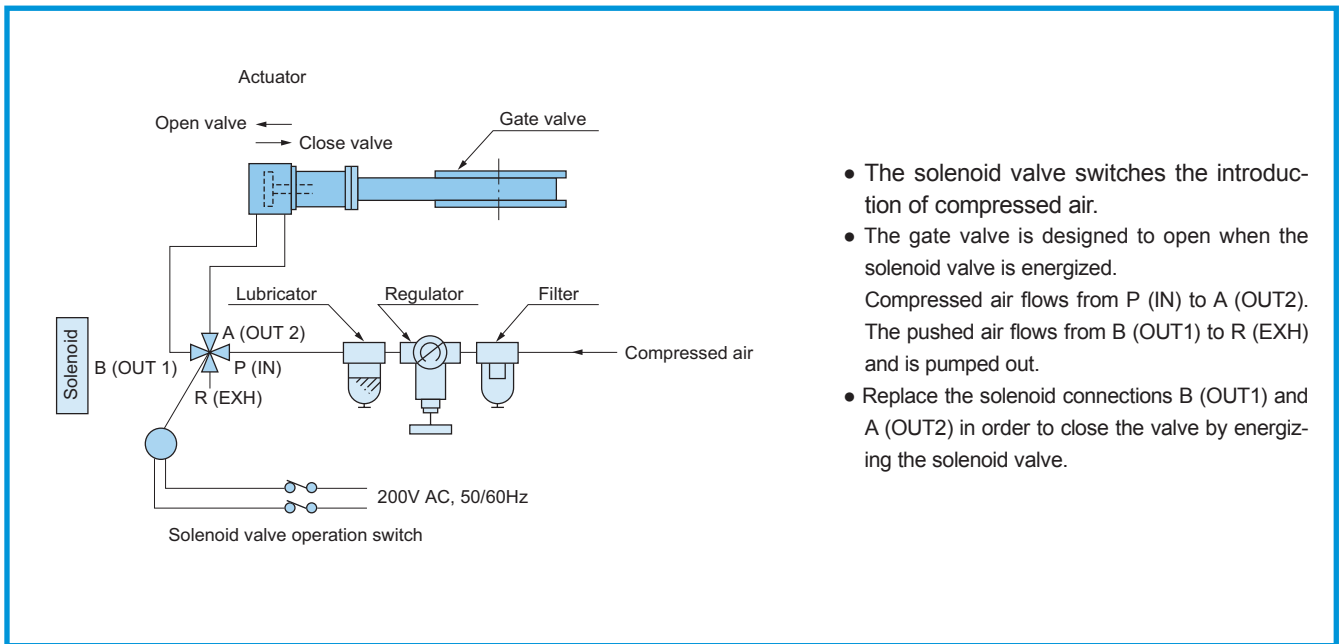
Note) The number 0 at the end of the type name indicates a manual valve and 5 indicates an automated valve.

● Position indicator

Rated voltage (V)	Non-inductive current (A)				Inductive load (A)			
	Resistance load		Lamp load		Inductive load		Motor load	
	Always closed	Always opened	Always closed	Always opened	Always closed	Always opened	Always closed	Always opened
AC125	5		1.5	0.7	4		2.5	1.3
250	5		1	0.5	4		1.5	0.8
DC 8	5		3		4		3	
14	5		3		4		3	
30	5		3		4		3	
125	0.4		0.05		0.4		0.05	
250	0.2		0.03		0.2		0.03	

(Note) Lead wire color (length 300mm): For open signal/red (COM), white; For closed signal/blue (COM), green.

● Automated gate valve air piping example



## ■ Ordering information

Parts Number	Model	Description	Remarks	Code
<b>Manual type with ICF flange</b>				
0190-04906	951-7720	1.5"Manual Gate Valve	With $\phi$ 70 ICF, bellows shaft seal	31210
0190-04922	951-7730	2.5"Manual Gate Valve	With $\phi$ 114 ICF, bellows shaft seal	31220
0190-04948	951-7740	4"Manual Gate Valve	With $\phi$ 152 ICF, bellows shaft seal	31230
P21-02317	951-7750	6"Manual Gate Valve	With $\phi$ 203 ICF, bellows shaft seal	31240
FMT-9118	951-7760	8"Manual Gate Valve	With $\phi$ 253 ICF, bellows shaft seal	31250
<b>Automated type with ICF flange</b>				
P21-02053	951-7725	1.5" Automatic Gate Valve	With $\phi$ 70 ICF, bellows shaft seal	31310
VMT-9652	951-7735	2.5"Automatic Gate Valve	With $\phi$ 114 ICF, bellows shaft seal	31320
0190-04956	951-7745	4" Automatic Gate Valve	With $\phi$ 152 ICF, bellows shaft seal	31330
P21-02319	951-7755	6" Automatic Gate Valve	With $\phi$ 203 ICF, bellows shaft seal	31340
FMT-9132	951-7765	8" Automatic Gate Valve	With $\phi$ 253 ICF, bellows shaft seal	31350
FMT-9166	951-7775	10" Automatic Gate Valve	With $\phi$ 305 ICF, bellows shaft seal	31360
P21-02952	951-7785	12" Automatic Gate Valve	With $\phi$ 356 ICF, bellows shaft seal	31370

Note) Contact us for more information about CE (RoHS).

*Memorandum*

# Rotary Feedthroughs

## Magnetic Coupling Type, Bellows Type



954-7620  
(Bellows)



954-7605  
(Magnetic coupling)

### ■ Summary

These rotary feedthroughs are used for introducing rotary motion into equipment installed in a vacuum. They can be used in an ultra-high vacuum range of

up to  $10^{-8}$ Pa. Two types of rotary feedthroughs are available: Magnetic coupling type rotary feedthrough and bellows type rotary feedthrough.

### ■ Features

#### 1. High transfer torque

A side variety of models are available to best meet your application, from  $3\text{kg}\cdot\text{cm}$  up to a high torque type of  $100\text{kg}\cdot\text{cm}$ .

#### 2. Long life

Dry lubricant ball bearings are used for the vacuum side bearings (excluding the 954-7640 rotary feedthrough). This ensures a long product life, making the rotary feedthrough ideal for semiconductor manufacturing equipment.

#### 3. Capable of bake-outs

Vacuum brazing joints that do not require elastomer seals are used, making the rotary feedthrough ideal for ultra-high vacuum systems.

#### 4. Outer rotor stopper

An outer rotor stopper (fixed screw) enables holding at any rotating position.

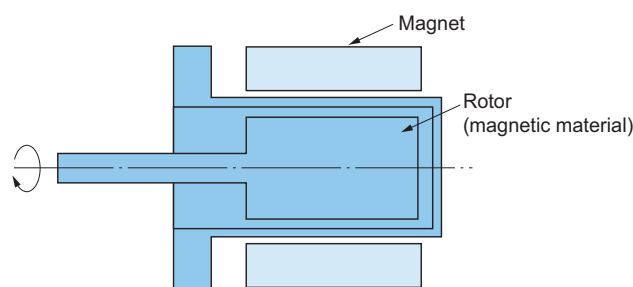
#### 5. Capable of motor drive

Two types of drive systems are available: Manual and motor.  
(The 954-7630 is manual drive only.)

#### ■ Magnetic coupling type rotary feedthroughs (954-7603, 7604, 7605, 7606, 7607)

The magnetic coupling type rotary feedthroughs use strong magnet. They have a simple structure and can withstand continuous rotation at high speed. The rotary feedthroughs can be used semi-permanently simply by replacing the bearings. There is no reduction in the transmission torque because there is almost no demagnetization of the magnet. Leakage flux is comparable to the geomagnetic field. (See the Leakage flux table.)

The motor driven rotary feedthroughs can be used at a higher rotation speed (500rpm) compared to the bellows type. In addition, if excessive load is applied to the rotor, the rotor will rotate freely to prevent damage to the motor.



Magnetic coupling drive system



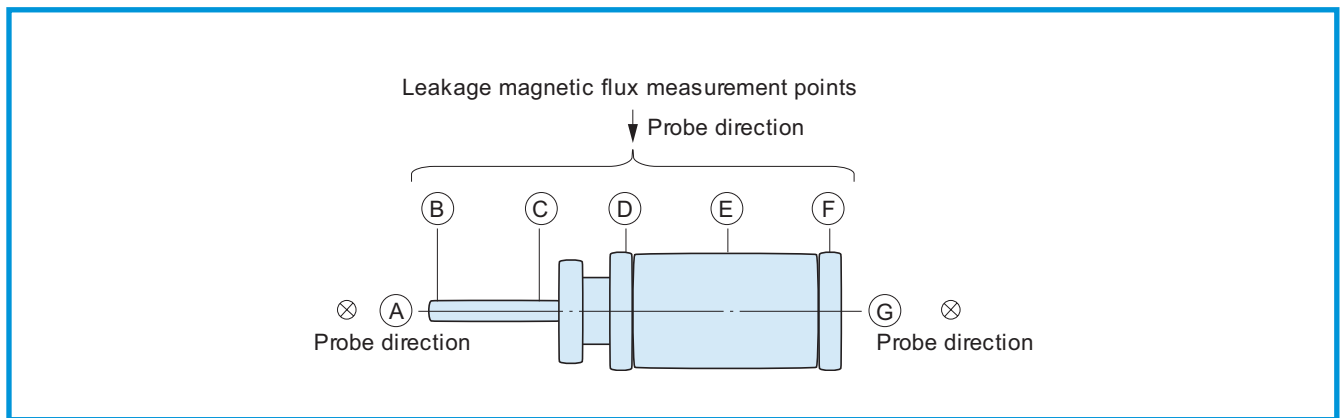
## Leakage flux

Unit:  $\mu\text{T}$  (Geomagnetism is  $40\mu\text{T}$ )

Type	954-7603	954-7604	954-7605	954-7606	954-7607						
Measurement Method	I* <sup>1</sup>	II* <sup>2</sup>	I	II	I						
Target points	A	80	40	80	40	60	10	40	40	40	40
	B	120	40	480	40	60	20	400	40	400	40
	C	160	40	500	40	60	20	400	40	400	40
	D	600	80	600	80	60	30	400	40	560	120
	E	600	80	600	80	60	30	400	40	560	120
	F	600	80	600	80	60	30	400	40	560	120
	G	200	40	200	40	60	10	200	40	300	20

\*1 For measurement method I, measurements are made by having the probe make contact.

\*2 For measurement method II, measurements are made by keeping the probe at a distance of approximately 5mm.



## Specifications

Type	954-7603	954-7604	954-7605	954-7606	954-7607	
Drive system	Magnetic coupling					
Connection flange	$\phi 34\text{ICF}$		$\phi 70\text{ICF}$			
Drive shaft diameter	$\phi 6$		$\phi 8$	$\phi 12$		
Drive system	Manual and motor drive					
Transfer torque	Manual	$0.5\text{N}\cdot\text{m}$	$1.6\text{N}\cdot\text{m}$	$1.6\text{N}\cdot\text{m}$	$5.9\text{N}\cdot\text{m}$	$9.8\text{N}\cdot\text{m}$
	Motor drive	$0.44\text{N}\cdot\text{m}$	$1.42\text{N}\cdot\text{m}$	$1.42\text{N}\cdot\text{m}$	$5.3\text{N}\cdot\text{m}$	$8.8\text{N}\cdot\text{m}$
Allowable rotation speed	500RPM					
Allowable heating temperature	$100^\circ\text{C}^{*1}$	$100^\circ\text{C}^{*2}$	$100^\circ\text{C}^{*3}$	$100^\circ\text{C}^{*2}$		
Leak	$1.3 \times 10^{-11} \text{Pa}\cdot\text{m}^3/\text{sec}$ or less					
Weight	0.72kg		2.6kg	2.5kg		

\*<sup>1</sup>300°C, \*<sup>2</sup>150°C, \*<sup>3</sup>400°C without outer rotor.

Do not operate while heated.

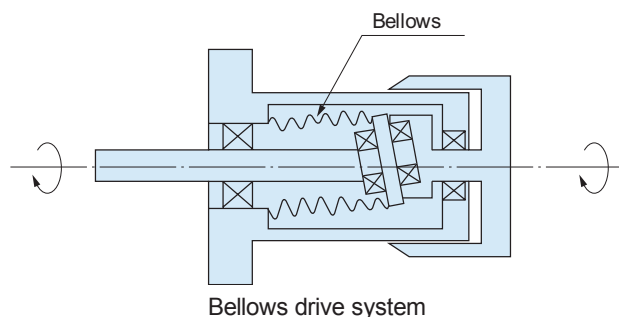
## Main component material

Type	954-7603	954-7604	954-7605	954-7606	954-7607
Support tube with ICF	SUS 304				
Inner rotor	Martensitic stainless steel				
Inner rotor magnet	None	Rare earth cobalt magnet	None	Rare earth cobalt magnet	
Outer rotor	Carbon steel				
Outer rotor magnet	Rare earth cobalt magnet				
Disk plate	SUS304				

## ■ Bellows type rotary feedthroughs

(954-7620, 954-7630, 954-7640)

These bellows type rotary feedthroughs use a welded bellows to completely separate the vacuum side and air side. Because no O-ring is used at the shaft seal, there is no fear of leakage from the rotating shaft seal during operation. In addition, a scale is provided on the handle so that the rotating angle of the drive shaft inside the vacuum system can be read directly.



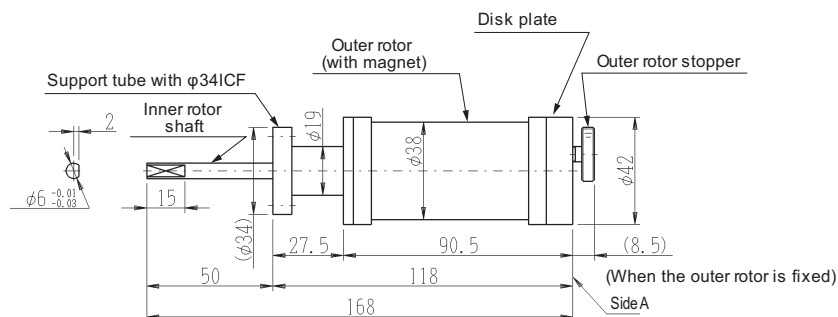
## ● Specifications

Type	954-7620		954-7630		954-7640	
Drive system	Bellows					
Connection flange	φ70ICF			φ34ICF		
Drive shaft diameter	φ8			φ6		
Drive method	Manual	Motor drive	Manual	Manual	Motor drive	
Transfer torque	2N·m	1.2N·m	0.3N·m	1N·m	0.6N·m	
Allowable heating temperature*	200°C					
Allowable rotation speed	-	100rpm	-	-	200rpm	
Leak	1.3x10 <sup>-11</sup> Pa·m <sup>3</sup> /sec or less			1.3x10 <sup>-11</sup> Pa·m <sup>3</sup> /sec or less		
Material used	Main body SUS-304 Bellows SUS-304					
Weight	1.15kg		0.33kg		0.74kg	
Applications	For simple rotating inlets such as shutters.		For simple rotating inlets such as shutters.		For motor drive or high-precision, high-torque rotating inlets using mini ICF ports.	

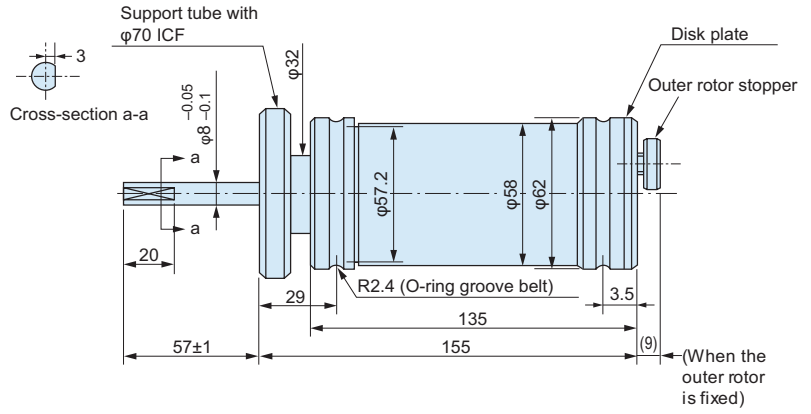
\*Do not operate while heated.

## ■ Dimensions diagram

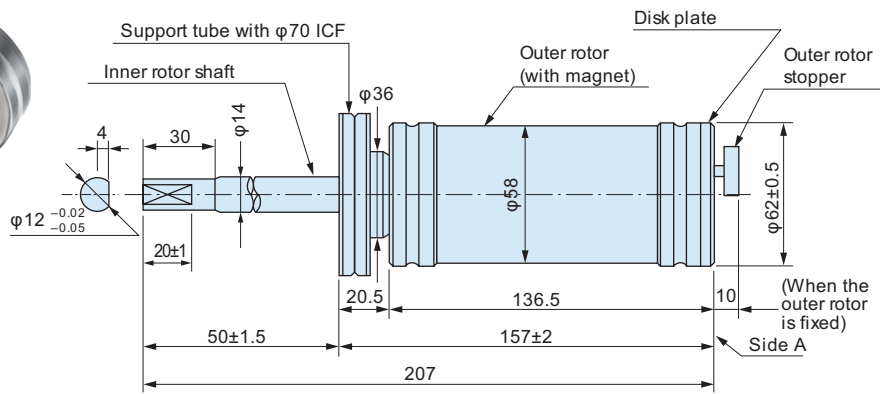
954-7603, 7604 rotary feedthrough (magnetic coupling)



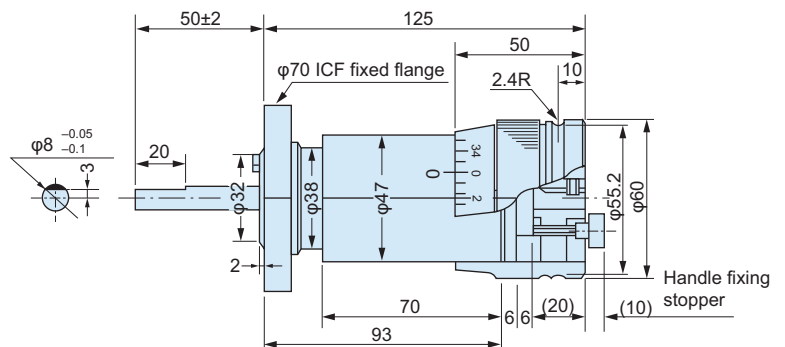
954-7605 rotary feedthrough (magnetic coupling)



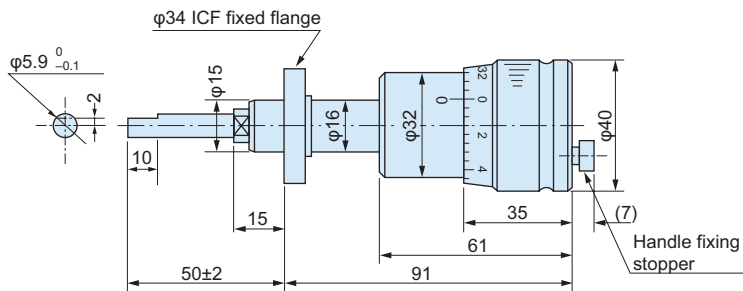
954-7606, 7607 rotary feedthrough (magnetic coupling type/high torque)



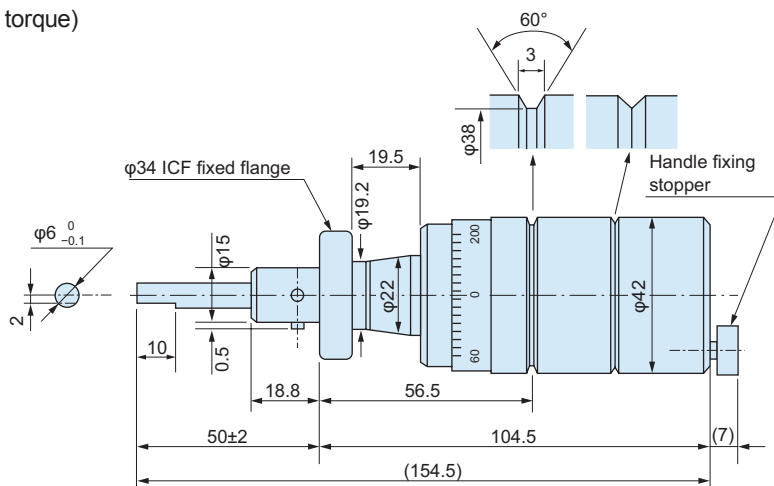
954-7620 rotary feedthrough (bellows)



954-7630 mini rotary feedthrough (bellows)



954-7640 mini rotary feedthrough (bellows/high torque)



■ Maintenance and consumable parts

The bearings are maintenance parts. They should be replaced when worn.

■ Applications

● Magnetic coupling rotary feedthroughs (954-7603 , 7604, 7605, 7606, 7607)

O-ring belt drive	Timing belt drive	Direct drive	Internal gear drive
<p>O-ring Pulley Standard part acceptable</p>	<p>Timing belt Pulley Attach boss (<math>\phi 6</math>) to disk plate</p>	<p>Ball joint (or flexible coupling)</p>	<p>Internal gear Attach the internal gear in place of the disk plate</p>

● Bellows type motor driven rotary feedthroughs (954-7620 , 954-7640)

When using a small motor to drive a bellows type rotary feedthrough, use an O-ring belt or chain. Please contact us if a drive motor that operates at 50rpm or more is to be used.

● Usage notes

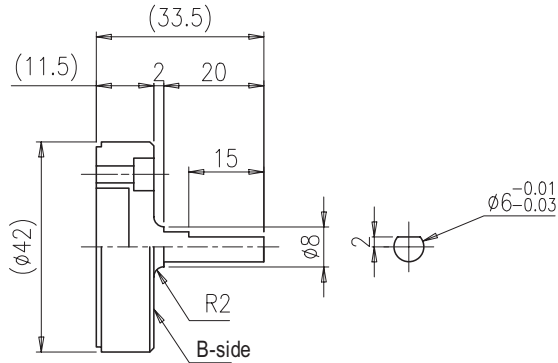
Refer to the assembly design to prevent direct radial load or thrust load on the rotary feedthrough shaft.

## Options

### 1. Head shaft (Material: SUS304)

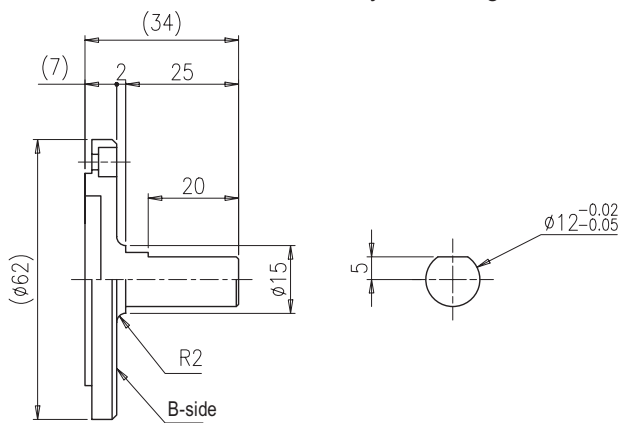
The head shaft is used to connect a magnetic coupling type rotary feedthrough with the drive source such as a motor. The following head shafts are available as standard. When ordering, append an H at the end of the type name and specify together with the rotary feedthrough. Ask us for the availability of shafts with shapes other than the following or about rotary feedthroughs with motors.

#### • Dimensions diagram



Head shaft (1)

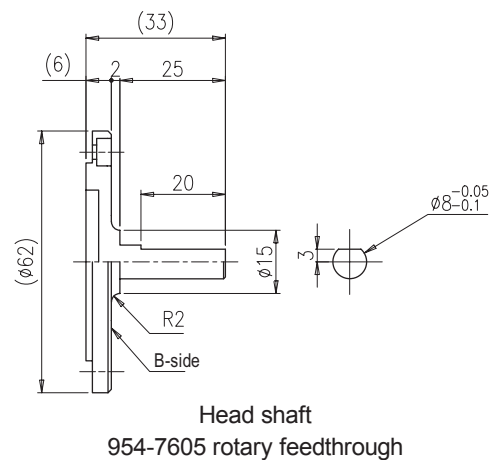
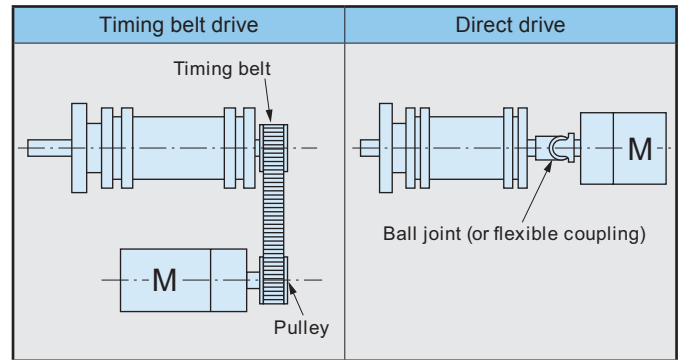
For 954-7603•7604 rotary feedthrough



Head shaft (2)

For 954-7606•7607 rotary feedthrough

### • Example of motor drive application



Head shaft

954-7605 rotary feedthrough

Note) When the head shaft is attached, side A shown in the rotary feedthrough dimensions diagram and side B shown in the head shaft dimensions diagram match.

### 2. Vacuum side bearings

Ball bearings coated with MoS<sub>2</sub> solid lubricant are provided as standard (excluding the 954-7640 rotary feedthrough).

## Ordering information

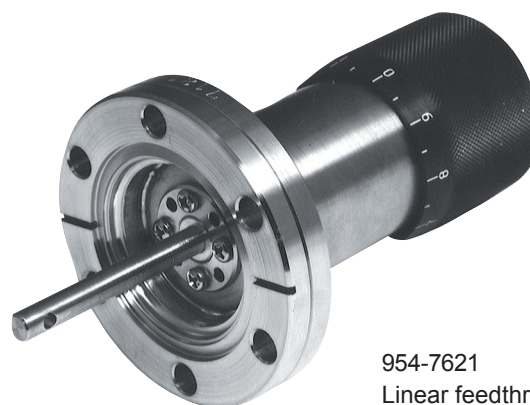
Parts Number	Model	Description	Remark	Code
763-1401	954-7630	Mni Rotary Motion Feedthrough	With $\phi 34$ ICF Bellows	36500
803-3549	954-7640	Mni Rotary Motion Feedthrough (High Torque)	With $\phi 34$ ICF Bellows	36501
0190-04215	954-7620	Rotary Motion Feedthrough	With $\phi 70$ ICF Bellows	36520
P21-03020	954-7603	Mni Rotary Motion Feedthrough	With $\phi 34$ ICF Magnetic coupling	36502
A23-01600	954-7604	Mni Rotary Motion Feedthrough	With $\phi 34$ ICF Magnetic coupling	36503
753-0001	954-7605	Rotary Motion Feedthrough	With $\phi 70$ ICF Magnetic coupling	36521
P21-03025	954-7606	Rotary Motion Feedthrough	With $\phi 70$ ICF Magnetic coupling	36522
P21-03028	954-7607	Rotary Motion Feedthrough	With $\phi 70$ ICF Magnetic coupling	36523

Note) Contact us for more information about CE (RoHS).

# Linear Feedthroughs

## ■ Summary

Linear feedthroughs are used to linearly move equipment installed in a vacuum. They can be used in an ultra-high vacuum range of up to  $10^{-8}$ Pa.



954-7621  
Linear feedthrough

## ■ Features

1. Made of all-metal and capable of hard baking, this linear feedthrough is ideal for ultra-high vacuum systems.
2. This is a bellows type linear feedthrough with the vacuum side and air side completely separated by the bellows.
3. The linear feedthrough introduces linear motion within a vacuum using the expansion and contraction of the bellows, preventing leakage during operation.
4. All components are non-magnetic, making this linear feedthrough ideal for vacuum equipment systems that must avoid magnetism (excluding the 954-7626, 7627).
5. All models move linearly by 1mm with a single turn of the handle. The scale on the handle is divided equally into 20.
6. The shaft and moving screw of the 954-7626 and 7627 mini linear motion drives are integrated so there is little backlash, making these linear feedthroughs ideal for high precision linear motion. In addition, they can be easily automated using a belt drive etc.

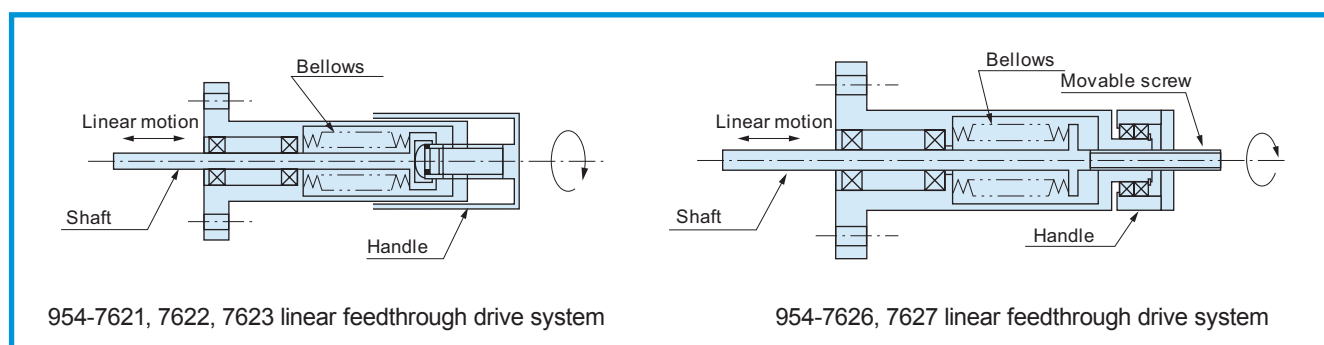
## ■ Specifications

Type	Description	Drive system	Connection flange	Linear motion	Allowable maximum thrust	Allowable heating temperature	Weight	Backlash
954-7621	Linear feedthrough	Bellows linear motion	φ70 ICF	20mm	196N	300°C	0.6kg	±0.5mm or less
954-7622	Linear feedthrough	↑	φ70 ICF	40mm	196N	300°C	0.7kg	
954-7623	Mini linear motion drive	↑	φ34 ICF	20mm	147N	300°C	0.48kg	
954-7626	Mini linear motion drive	↑	φ34 ICF	25mm	147N	200°C	0.9kg	±0.3mm or less
954-7627	Mini linear motion drive	↑	φ34 ICF	40mm	147N	200°C	1.1kg	

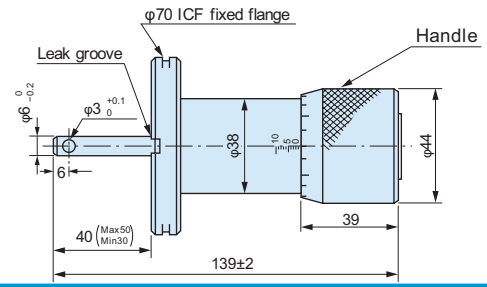
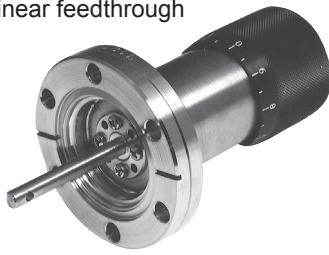
## Other common specifications

- Leakage:  $1.3 \times 10^{-11}$ Pa · m<sup>3</sup>/sec or less

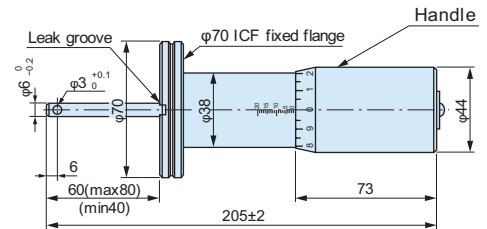
## ■ Dimensions diagram



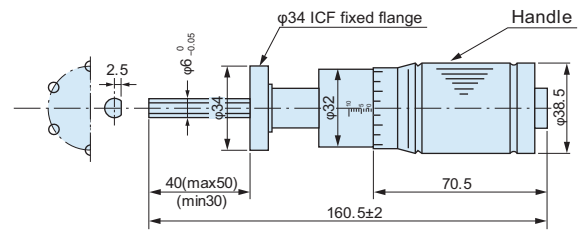
954-7621 linear feedthrough



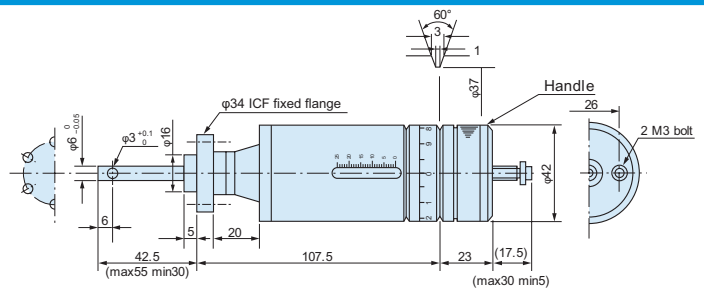
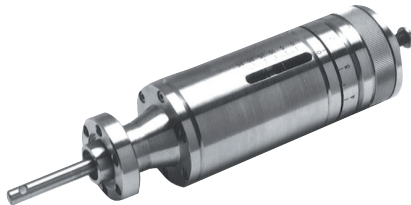
954-7622 linear feedthrough



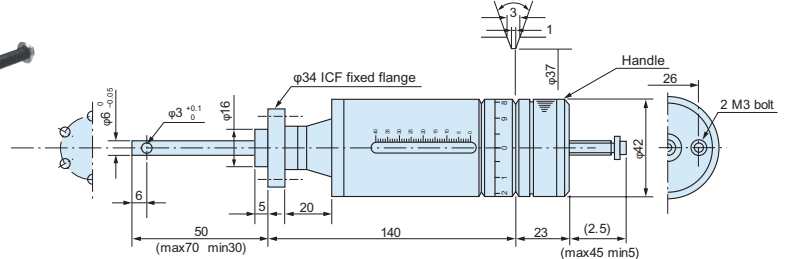
954-7623 mini linear feedthrough



954-7626 mini linear feedthrough



954-7627 mini linear feedthrough



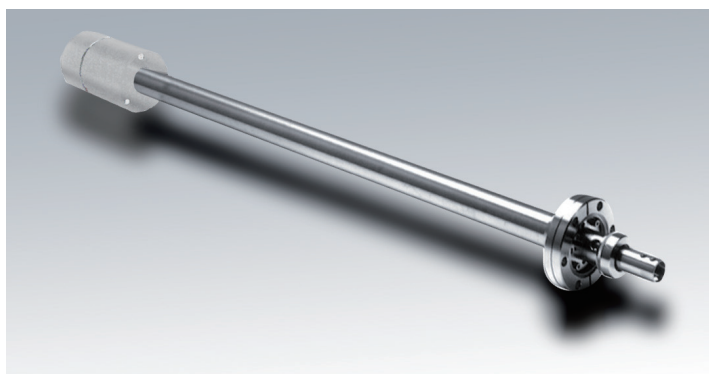
## Ordering information

Parts number	Model	Description	Remarks	Code
763-1960	954-7623	Mini Linear Motion Feedthrough	With $\phi 34$ ICF, bellows type, stroke 20mm	36600
0190-04257	954-7621	Linear Motion Feedthrough	With $\phi 70$ ICF, bellows type, stroke 20mm	36620
753-1438	954-7622	Linear Motion Feedthrough	With $\phi 70$ ICF, bellows type, stroke 40mm	36621
P25-01522	954-7626	Mini Linear Motion Feedthrough	With high precision $\phi 34$ ICF, bellows type, stroke 25mm	36622
P25-01478	954-7627	Mini Linear Motion Feedthrough	With high precision $\phi 34$ ICF, bellows type, stroke 40mm	36623

Note) Contact us for more information about CE (RoHS).



# R/L Feedthroughs



## ■ Summary

These magnetic coupled feedthroughs combine both rotary and linear feedthroughs, making them capable of both rotary and linear motion.

## ■ Features

### 1. Long stroke

Ideal for transporting samples with long travel distance.

### 2. Simple, easy maintenance

Semi-permanent. Because a magnetic coupling is used to convey the rotating and linear motion within a vacuum, only the bearings need replacing.

### 3. Simple structure

If samples must be transported, make sure the assembly design allows position adjustment of the tip of the rod.

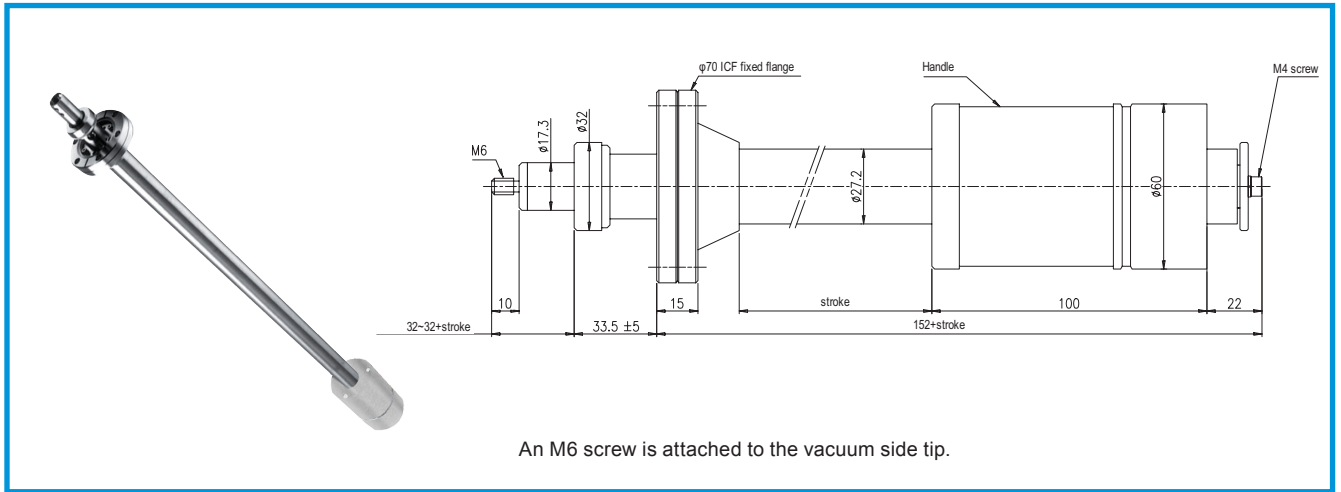
\* A metallic sound is emitted during operation because metal bearings are used.

## ■ Specifications

Type	954-7670	954-7671	954-7672	954-7673
Drive system	Magnetic coupling			
Connection flange	φ70 ICF flange			
Drive method	Manual			
Linear motion	250mm	500mm	750mm	1000mm
Transfer torque	0.4N•m			
Thrust	29.4N			
Allowable heating temperature	100°C			
Allowable tip load	200g			
Leakage	1.33x10 <sup>-11</sup> Pa•m <sup>3</sup> /sec (1x10 <sup>-10</sup> Torr•L/sec) or less			
Weight	2.3kg	2.6kg	2.9kg	3.2kg



## ■ Dimensions diagram



Supports any linear stroke.  
Also supports ones with a rotary/linear stopper.

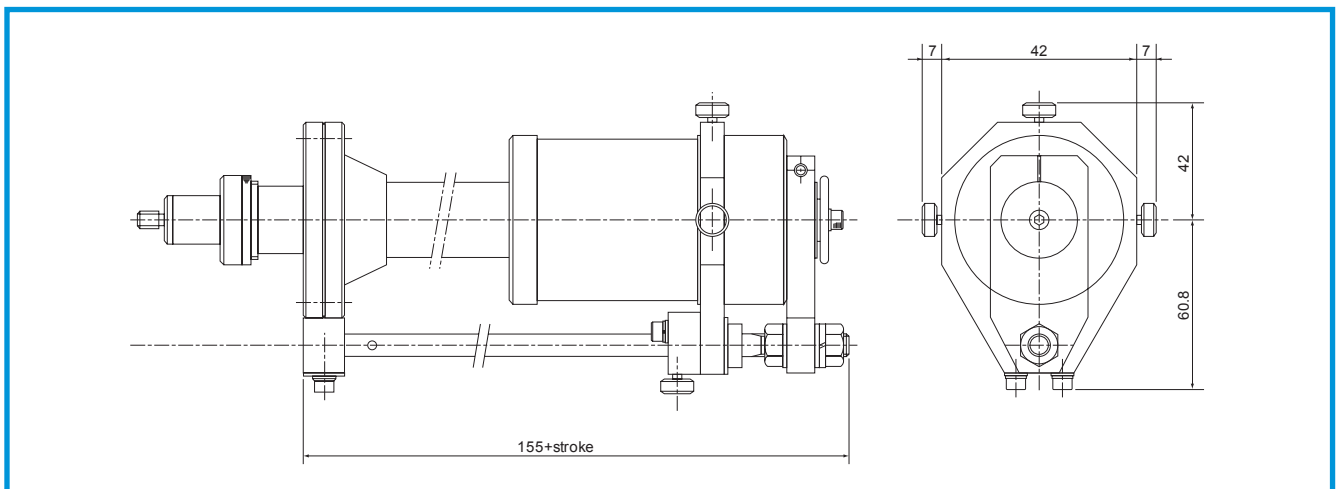
Type	Dimension A
954-7670	250
954-7671	500
954-7672	750
954-7673	1000

## ■ Ordering information

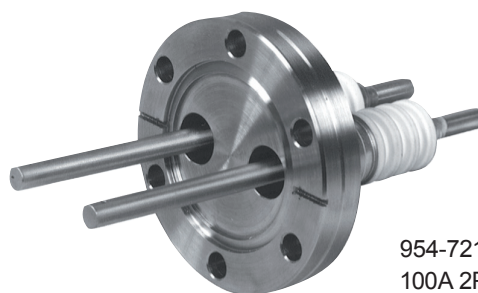
Parts number	Model	Description	Remarks	Code
0191-01075	954-7670	R/L Motion Feedthrough	Rotary linear motion feedthrough Stroke 250mm	36640
0191-01106	954-7671	R/L Motion Feedthrough	Rotary linear motion feedthrough Stroke 500mm	36641
0191-01130	954-7672	R/L Motion Feedthrough	Rotary linear motion feedthrough Stroke 750mm	36642
0191-01164	954-7673	R/L Motion Feedthrough	Rotary linear motion feedthrough Stroke 1000mm	36643

Note) Contact us for more information about CE (RoHS).

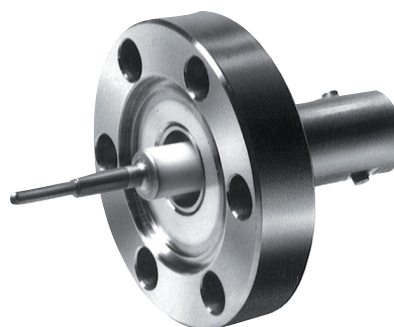
## ■ External drawings with rotating•linear stopper



# Current Terminals



954-7210  
100A 2P current terminal



954-7276  
Mini MHV current terminal

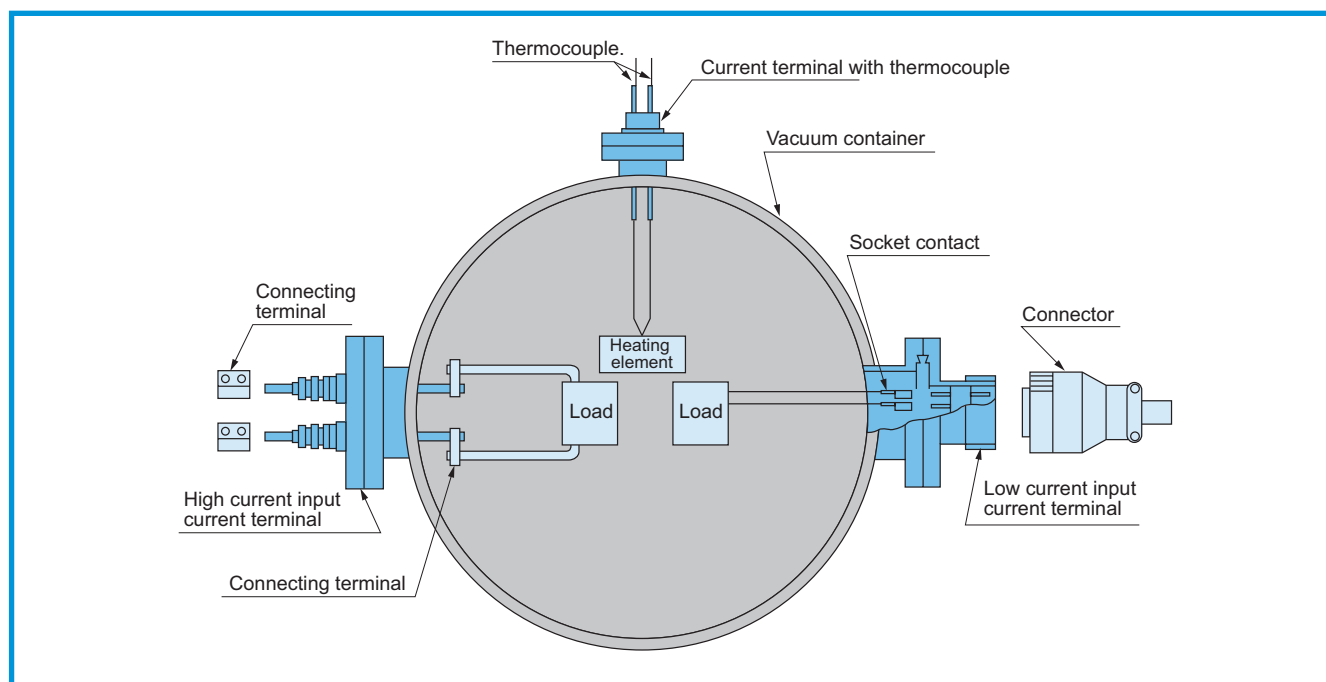
## ■ Summary

We offer a wide variety of current input terminals with ceramic sealed terminals welded to the ICF flange. These terminals have good insulation characteristics, are mechanically and thermally strong, and there is no fear of leakage. They are highly reliable and are used in ultra-high vacuum equipment and equipment with large thermal loads.

## ■ Features

1. Can withstand high baking temperatures with proven blazing technology and ICF flange.
2. Uses ceramic seals to provide excellent thermal properties, mechanical characteristic, and electrical characteristics.
3. Supports up to ultra-high vacuum.
4. Wide variety of types are available equipped with large current/small current/high voltage input multi-terminals.

## ■ Example of attaching to a vacuum container



# Current Terminal Series

## Specifications

Description	Electrodes					Weight	Applicable flange	Compatible connector	
	External diameter x Internal diameter x Length	Material	Quantity	Current capacity	Withstand voltage			Atmosphere side	Vacuum side
954-7209 Mini 100A current terminal	φ6x130 (Atmosphere side φ6.2)	Oxygen-free copper (Ni-plated)	1	100A	7kV DC	93g	φ34ICF	953-9910 100A connecting terminal	953-9900•953-9901 100A connecting terminal 100AL connector
954-7245 Mini 5A current terminal	φ1.5x91	Kovar	1	5A	1kV DC	50g		954-7326 #16 socket contact	
954-7238 Mini HF current terminal	φ3x7	Nonmagnetic Monel	1	5A	1.5kV AC (r.m.s)	60g		N-P-3-AS HF connector	
954-7276 Mini MHV current terminal	φ1.57 φ2.4xφ5.5x19.5	Kovar	1	3A	5kV DC	50g		UG-932/U MHV connector	954-7326 #16 Socket contact
954-7227 Mini 2W2T current terminal	φ1.2x115x2 φ1.2xφ0.9x115x2	Nickel	Wire 2 tubes 2	5A/line (wire only)	1kV DC	50g			
954-7203 100A current terminal	φ6x130 (Atmosphere side φ6.2)	Oxygen-free copper (Ni-plated)	1	100A	7kV DC	330g	φ70ICF	953-9910 100A connecting terminal	953-9900•953-9901•100A connecting terminal 953-9916 100AL connector
954-7210 100A2P current terminal	φ6x130 (Atmosphere side φ6.2)	Oxygen-free copper (Ni-plated)	2	100A/line	7kV DC	380g		953-9910 100A connecting terminal	953-9900•953-9901•100A connecting terminal 953-9916 100AL connector
954-7260 4P current terminal	φ6.1x125	Nickel	4	50A/line	1kV DC	510g		954-7261 4P plug (MS connector)	
954-7207 400A current terminal	φ15.8x140	Oxygen-free copper (Ni-plated)	1	400A	3kV DC	540g		953-9907 400A F connecting Terminal 953-9917 400A L connector	
954-7290 6P current terminal	φ1.6x64.5x4 φ1.6x68x2	Kovar	6	5A/line	1kV DC	235g		954-7291 6P plug (MS connector)	954-7326 #16 Socket contact
954-7221 8W current terminal	φ1.2x250	Nickel	Wire 8	5A/line	1kV DC	270g			
954-7225 8T current terminal	φ1.2xφ0.9x250	Nickel	Tube 8	–	1kV DC	270g			
954-7223 4W4T current terminal	φ1.2x250x4 φ1.2xφ0.9x250x4	Nickel	Wire 4 tubes 4	5A/line (wire only)	1kV DC	270g			
954-7252 13P current terminal	φ1x24	Kovar	12	5A/line	1.5kV DC	300g		954-9254 13P connector (MS connector)	954-7256 #20 Socket contact

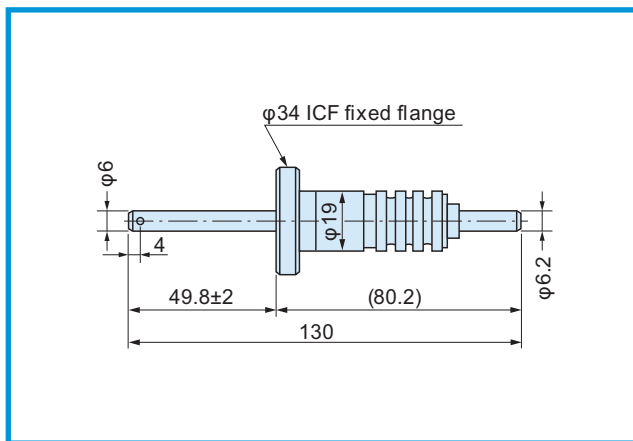
- See the separate page for MS type multi-pin current terminals.
- Kovar is an alloy with iron, nickel and cobalt as the main ingredients.
- The withstand voltage may drop and discharge may occur at  $1 \times 10^{-2}$  Pa or more pressure.

## Other common specifications

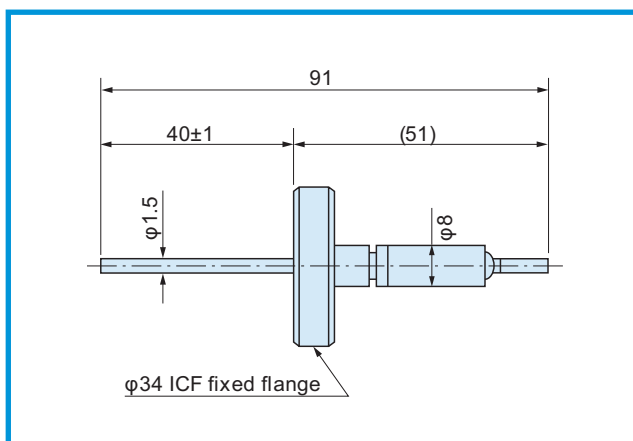
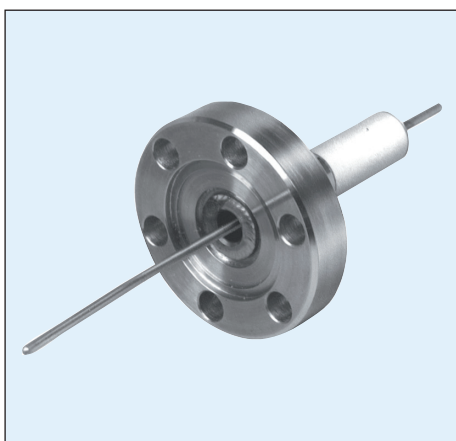
Allowable heating temperature	300°C
Allowable temperature change	25°C/min or less for all models
Insulating resistance	1000MΩ or more for 954-7276MHV current terminal and 954-7238 mini HF current terminal, 5000MΩ or more for others
Leakage	$1.3 \times 10^{-11}$ Pa•m <sup>3</sup> /sec or less

• Dimensions diagrams

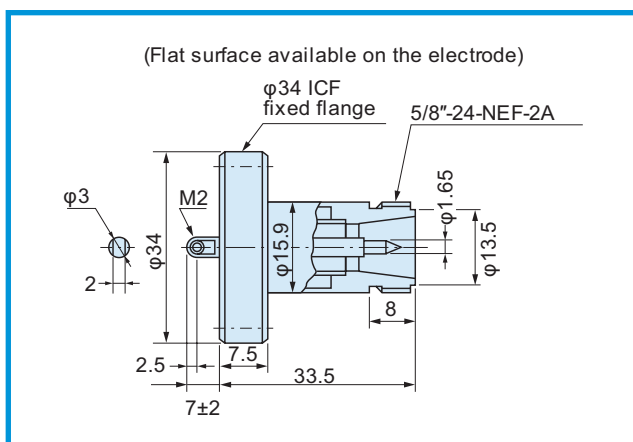
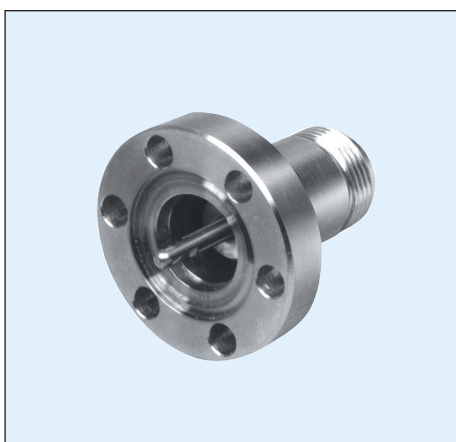
954-7209  
Mini 100A  
current terminal



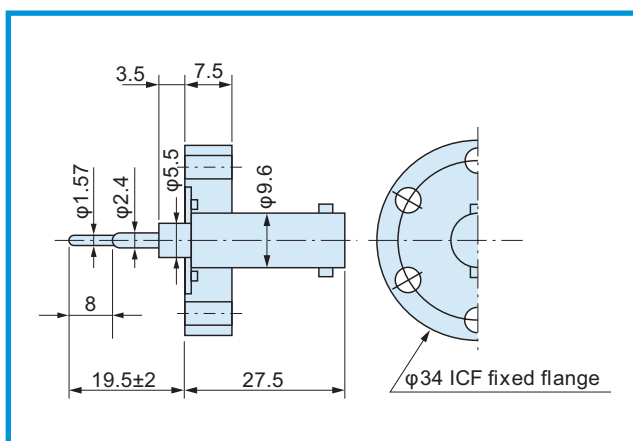
954-7245  
Mini 5A current  
terminal



954-7238  
Mini HF current  
terminal

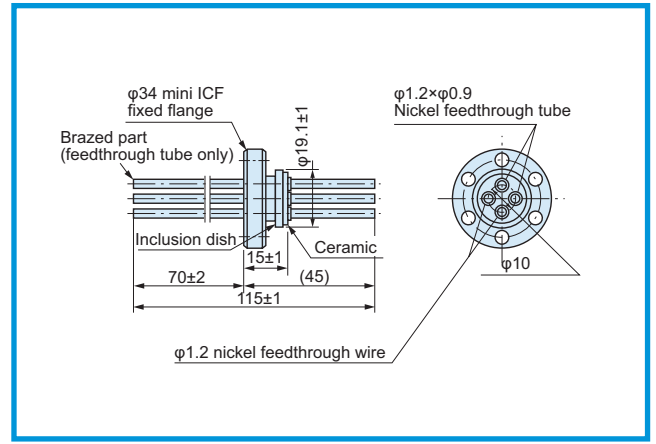
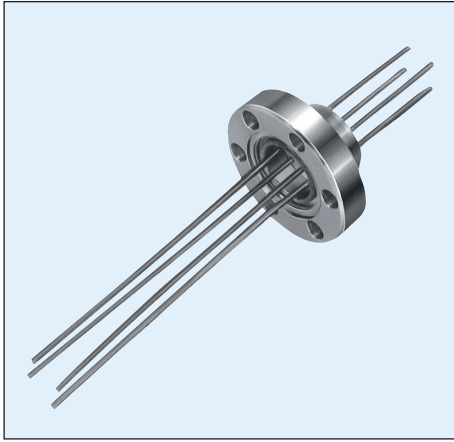


954-7276  
Mini MHV  
current terminal

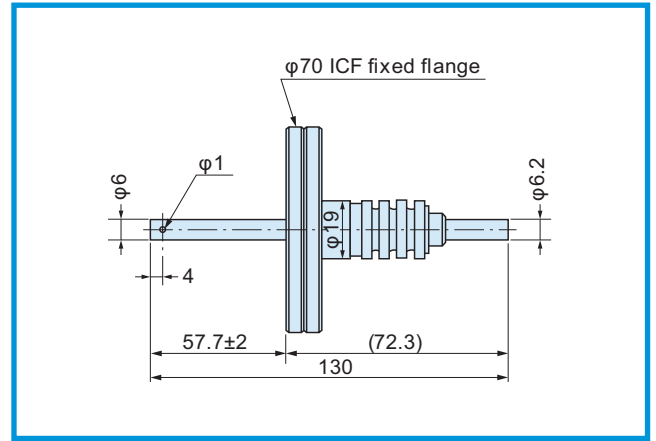
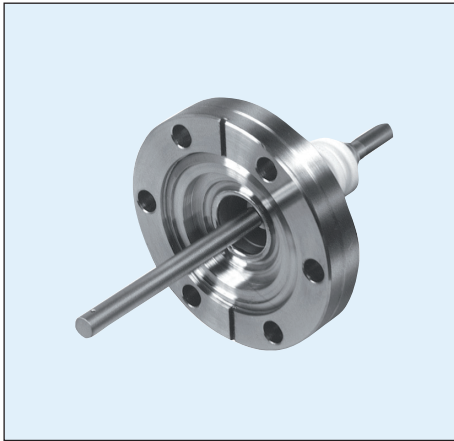


In the figure, the vacuum side is on the left.

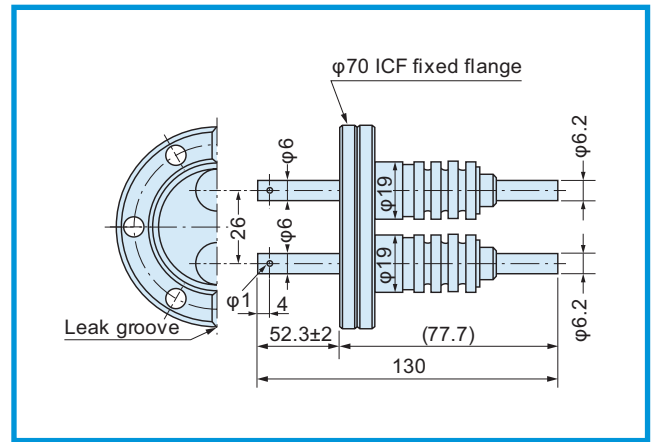
954-7227  
2W2T current  
terminal



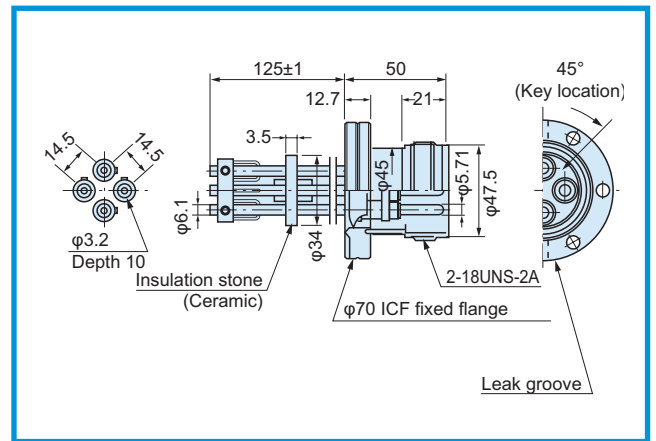
954-7203  
100A current  
terminal



954-7210  
100A2P current  
terminal

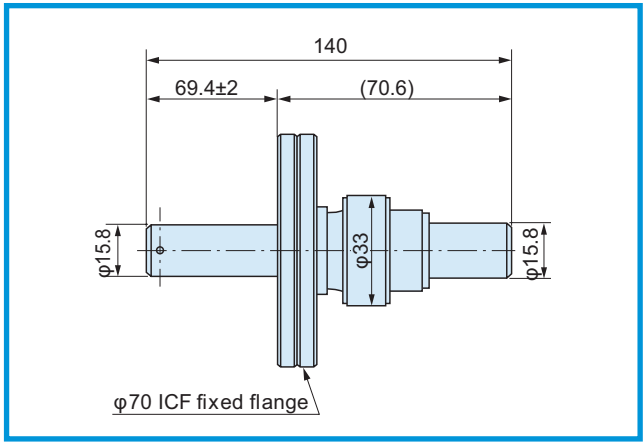


954-7260  
4P current  
terminal

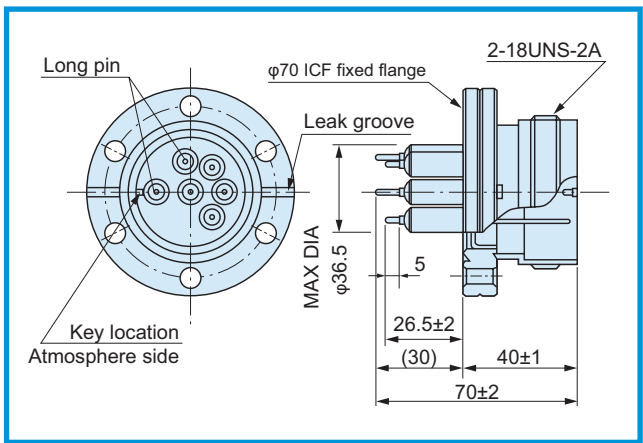


In the figure, the vacuum side is on the left.

954-7207  
400A current  
terminal

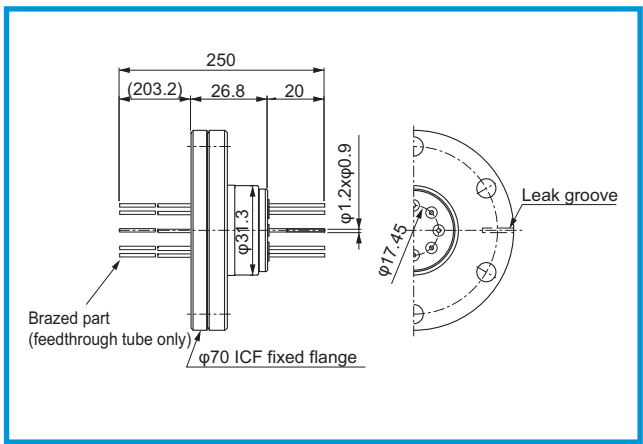


954-7290  
6P current  
terminal



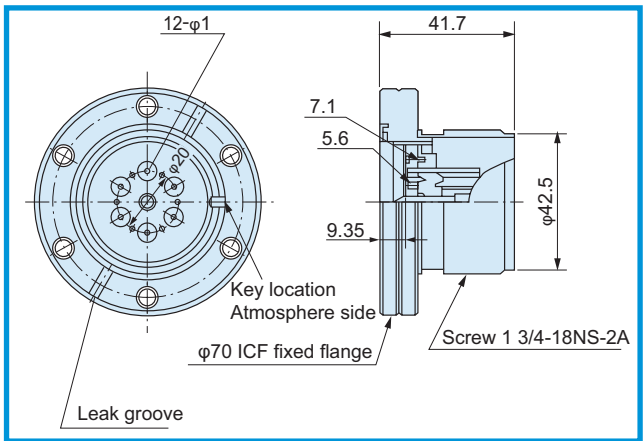
(Note) The inner diameter of the mounting φ70ICF port is φ38 or more.

954-7221  
8W current  
terminal



In the figure, the vacuum side is on the left.

954-7252  
13P current  
terminal



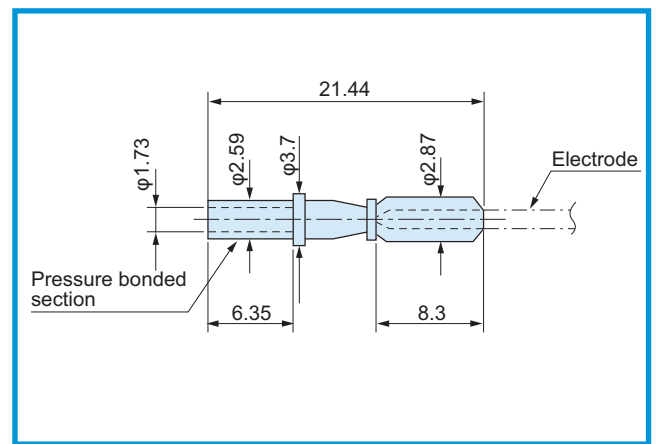
In the figure, the vacuum side is on the left.

■ Options

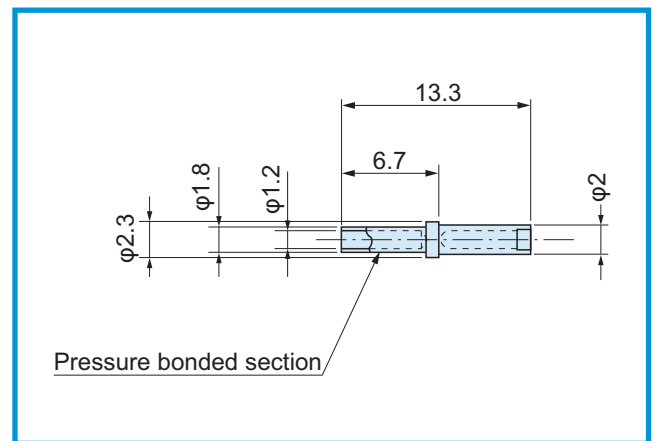
● Vacuum side connector

Type	Description	Applicable model	Compatible wire size	Allowable current	Material	Allowable heating temperature	Tool	Weight
954-7326	#16 socket Contact	954-7276 Mini MHV current terminal 954-7245 Mini 5A current terminal 954-7290 6P current terminal MS connector Multi-pin current terminal	AWG16-18	5A	Be-Cu (gold plated) Stainless steel	250°C	Main unit: M22520/1-01 Turret: M22520/1-02 (Made by Daniel)	0.8g
954-7256	#20 socket Contact	954-7252 13P current terminal	AWG20-24	5A	Copper alloy (gold plated) stainless steel	250°C	Main unit: M22520/1-01 Turret: M22520/1-04 (Made by Daniel)	0.15g

954-7326  
#16 socket contact



954-7256  
#20 socket contact



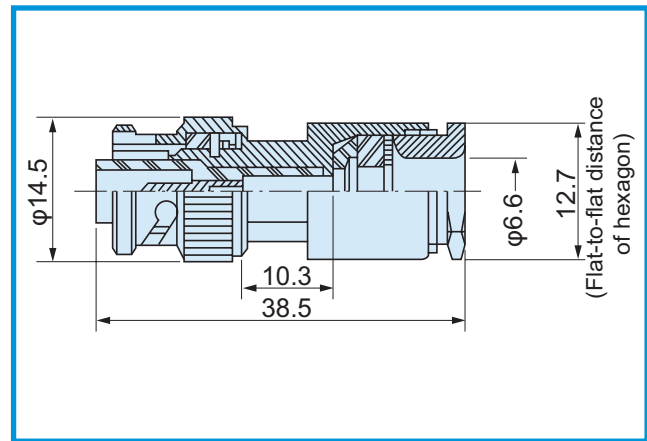
In the figure, the terminal connection side is on the right.



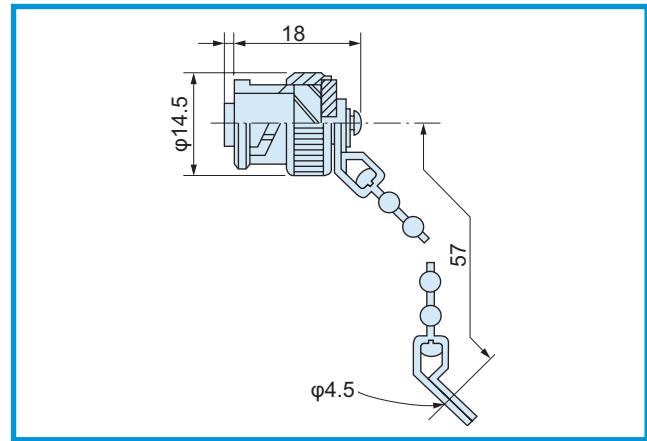
● Atmosphere side connector

Type	Description	Applicable model	Rated voltage	Rated current	Allowable temperature range	Remarks
UG-932/U	MHV connector	954-7276 mini MHV current terminal			-20°C to 160°C	Applied code: RG-59, 62/U Test voltage: 5000V AC/for 1 minute Weight 25g (soldered)
BNCH-CS	Short cap	954-7276 mini MHV current terminal			-	Ground connector
N-P-3-AS	HF connector	954-7238 mini HF current terminal			-20°C to 160°C	Compatible wire material: 3C2V, 3D2V (soldered)
951-7261	4P Plug	954-7260 4P current terminal	900V AC 1250V DC	80A	-50°C to 125°C	MS connector, contact size #4 solder
951-7291	6P Plug	954-7290 6P current terminal	500V AC 700V DC	13A	-50°C to 125°C	MS connector, contact size #16-18 solder
951-9254	13P connector	954-7252 13P current terminal	500V AC 700V DC	13A	-50°C to 125°C	MS connector, contact size #16-18 solder

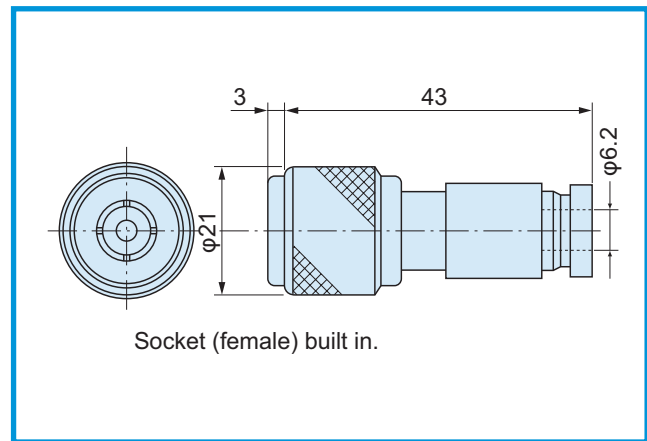
UG-932/U  
MHV connector



BNCH-CS  
short cap



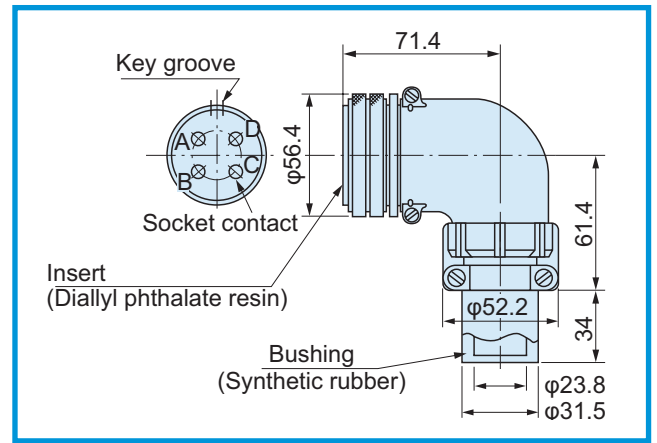
N-P-3-AS  
HF connector



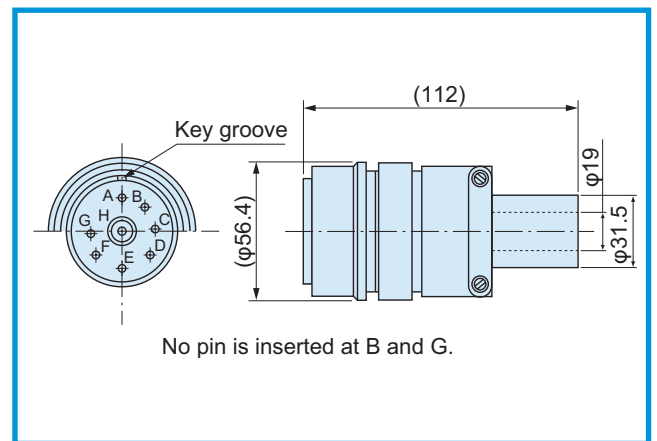
components



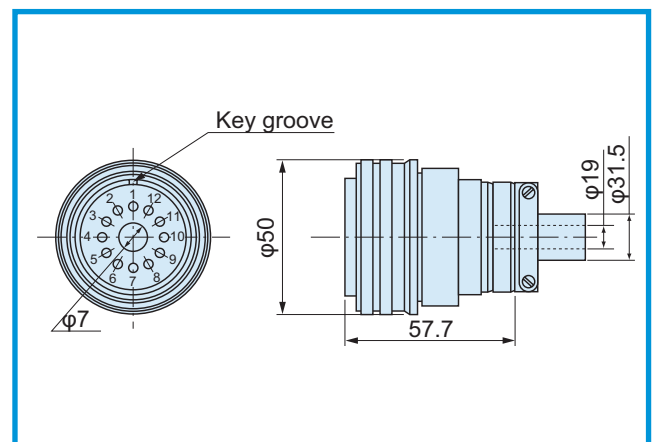
954-7261  
4P plug



954-7291  
6P plug



954-9254  
13P connector

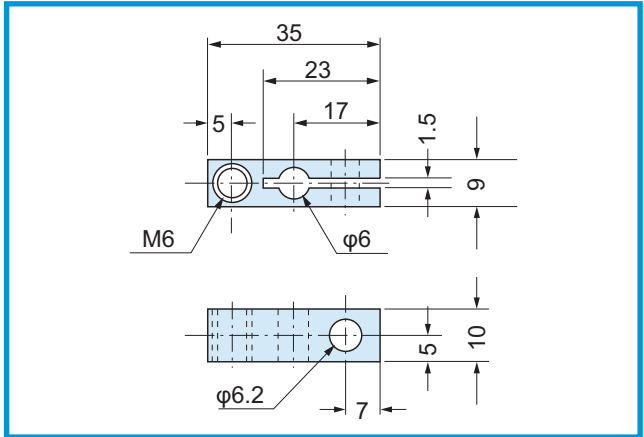
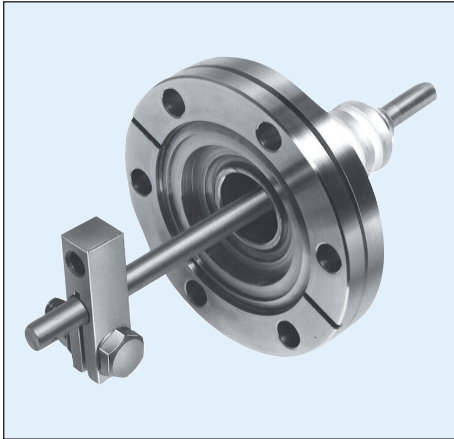


• Connecting terminal

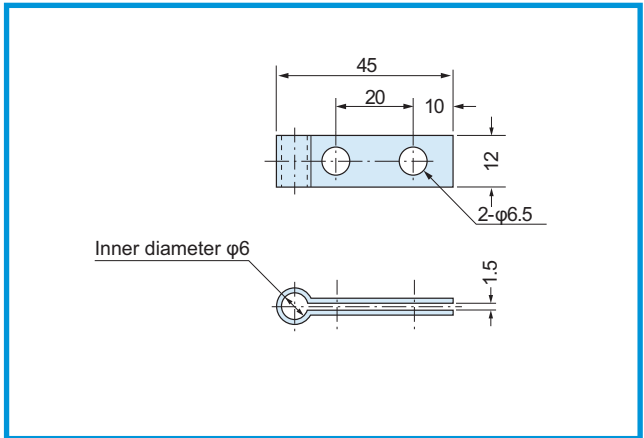
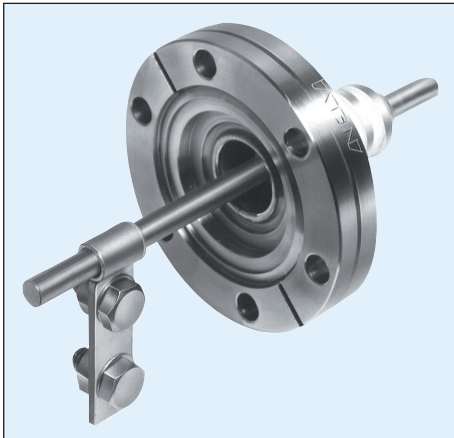
Type	Description	Material	Applicable model	Remarks
953-9900	100A connecting terminal	Copper (nickel plated)	954-7209 Mini 100A current terminal 954-7203 100A current terminal 954-7210 100A2P current terminal	Vacuum side
953-9901	100A connecting terminal	Copper (nickel plated)		Vacuum side
953-9910	100A connecting terminal	Copper (nickel plated)		Atmosphere side
953-9916	100AL connecting terminal	Copper (nickel plated)		Vacuum side
953-9903	400A connecting terminal	Copper (nickel plated)	954-7207 400A current terminal	Vacuum side
953-9917	400AL connecting terminal	Copper (nickel plated)	954-7241 400A water-cooled current terminal	Vacuum side

Connecting terminals other than the above are also available upon request. Contact us for details.

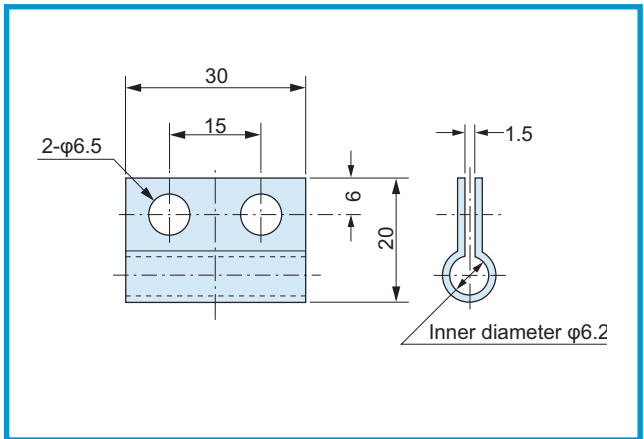
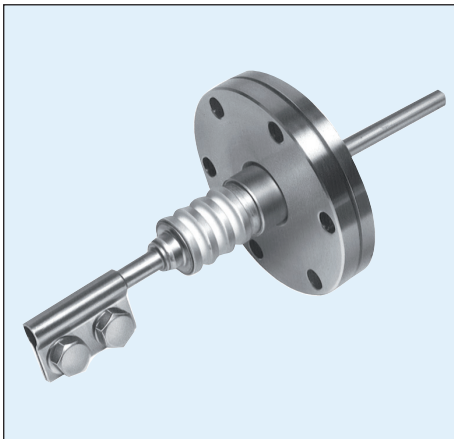
953-9900  
100A connecting terminal



953-9901  
100A connecting terminal

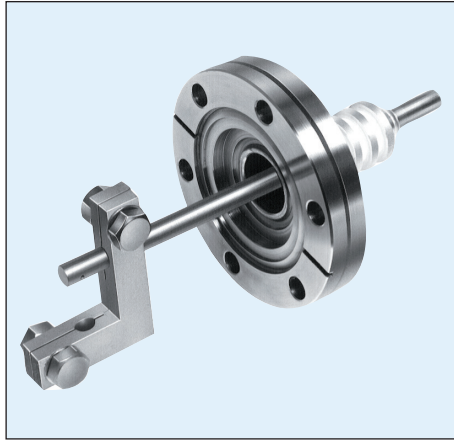


953-9910  
100A connecting terminal

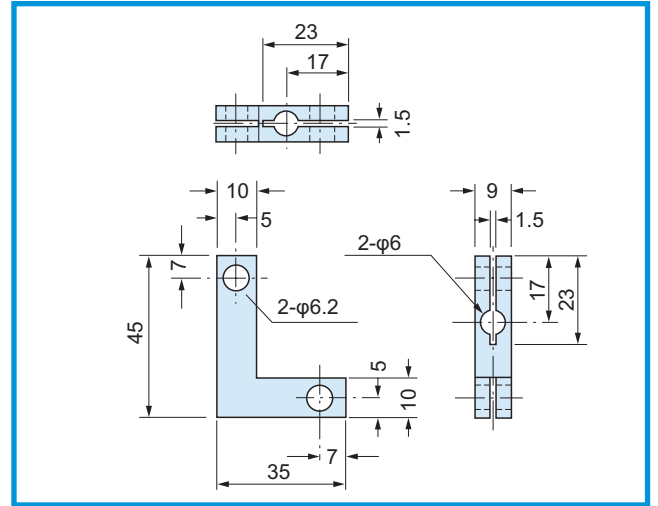


The photo shows an example of attaching to a current terminal.  
The mounting bolts in the figure are not included.

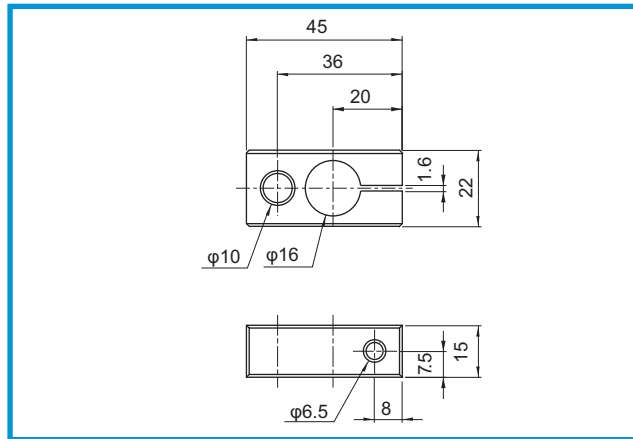
953-9916  
100AL connect-  
ing terminal



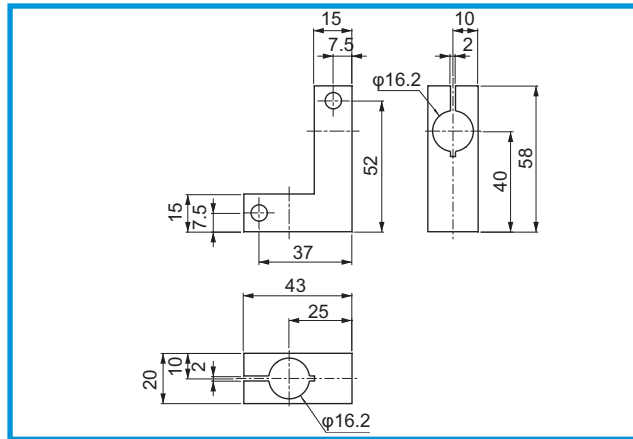
The photo shows an example of attaching to a current terminal.  
The mounting bolts in the figure are not included.



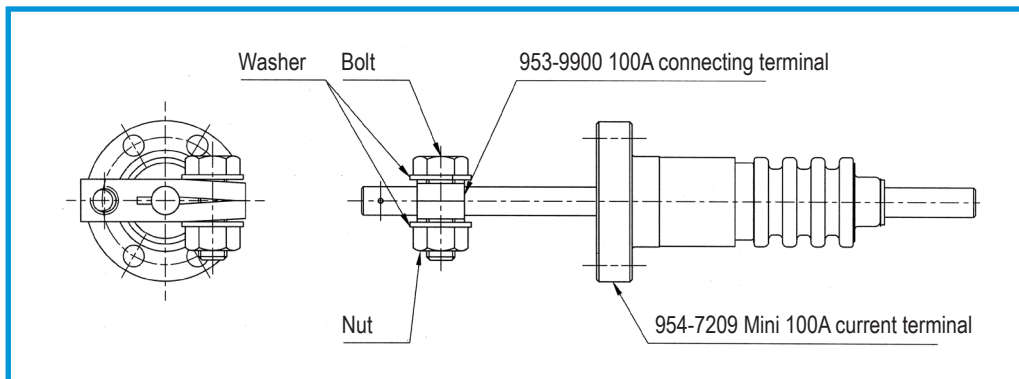
953-9903  
400A connecting  
terminal



953-9917  
400A L connecting  
terminal



• Connector usage example



## MS Connector Type Multi-pin Current Terminals



### ■ Specifications

Type	Description	Number of electrodes	Weight	Compatible flange	Compatible connectors (atmosphere side)
954-7911	3P current terminal	3	70g	φ34ICF	954-7915 3P connector
954-7912			340g	φ70ICF	
954-7921	4P current terminal	4	70g	φ34ICF	954-7925 4P connector
954-7922			340g	φ70ICF	
954-7931	6P current terminal	6	70g	φ34ICF	954-7935 6P connector
954-7932			340g	φ70ICF	
954-7942	10P current terminal	10	340g	φ70ICF	954-7945 10P connector
954-7952	14P current terminal	14	340g	φ70ICF	954-7955 14P connector
954-7962	19P current terminal	19	340g	φ70ICF	954-7965 19P connector
954-7972	24P current terminal	24	320g	φ70ICF	954-7975 24P connector
954-7982	37P current terminal	37	330g	φ70ICF	954-7985 37P connector
954-7993	48P current terminal	48	1140g	φ114ICF	954-7995 48P connector

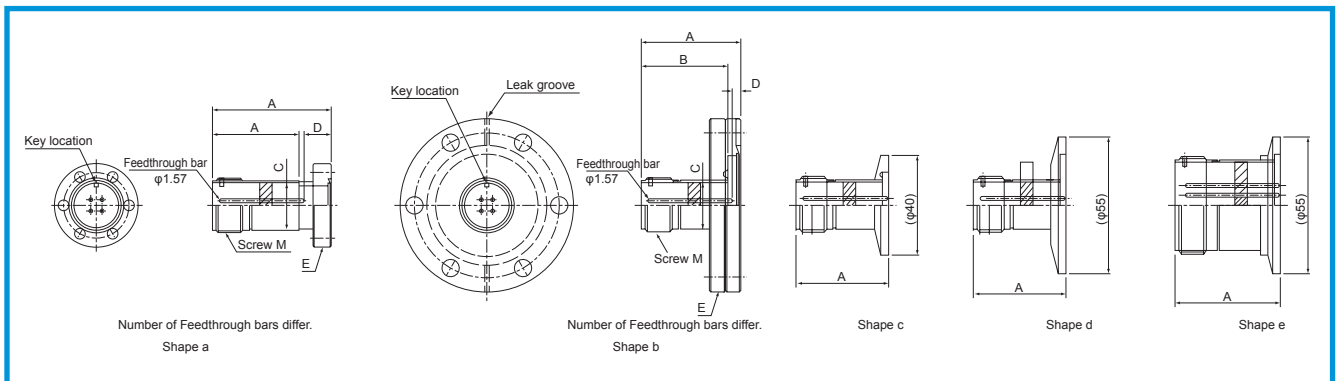
### ● Other common specifications

Current capacity	3A/line
Withstand voltage*	350V AC [r.m.s], 500V DC
Insulating resistance	1000MΩ or more
Allowable heating temperature	350°C
Temperature change	15°C/min or less
Leakage	$1.3 \times 10^{-11} \text{Pa} \cdot \text{m}^3/\text{sec}$ or less
Vacuum side connector	954-7326, 954-7327 #16 socket connector
Electrode material	Kovar
Electrode diameter	φ1.57

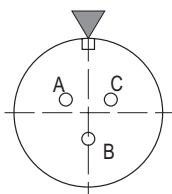
\* Note that the rated voltage is different from the optional atmosphere side connector.

Type	Description	Shape	A	B	φC	D	E	Screw M
954-7911	3P current terminal	a	48.2	35	φ20.1	11.2	φ34ICF fixed flange	7/8-20UNEF
954-7912		b	40.3			3.3	φ70ICF fixed flange	
		c	37.5				NW25 flange	
		d	37.5				NW40 flange	
954-7921	4P current terminal	a	48.2	35	φ20.1	11.2	φ34ICF fixed flange	7/8-20UNEF
954-7922		b	40.3			3.3	φ70ICF fixed flange	
		c	37.5				NW25 flange	
		d	37.5				NW40 flange	
954-7931	6P current terminal	a	48.2	35	φ20.1	11.2	φ34ICF fixed flange	7/8-20UNEF
954-7932		b	40.3			3.3	φ70ICF fixed flange	
		c	37.5				NW25 flange	
		d	37.5				NW40 flange	
954-7942	10P current terminal	b	45.3	40	φ26.1	3.3	φ70ICF fixed flange	1 <sup>1</sup> / <sub>8</sub> -18UNEF
		d	42.5				NW40 flange	
954-7952	14P current terminal	b	45.3	40	φ29.6	3.3	φ70ICF fixed flange	1 <sup>1</sup> / <sub>4</sub> -18UNEF
		d	42.5				NW40 flange	
954-7962	19P current terminal	b	45.3	40	φ32.6	3.3	φ70ICF fixed flange	1 <sup>3</sup> / <sub>8</sub> -18UNEF
		d	42.5				NW40 flange	
954-7972	24P current terminal	b	45.3	40	φ36.6	3.3	φ70ICF fixed flange	1 <sup>1</sup> / <sub>2</sub> -18UNEF
		e	44.0				NW40 flange	
954-7982	37P current terminal	b	45.3	40	φ41.1	3.3	φ70ICF fixed flange	1 <sup>3</sup> / <sub>4</sub> -18UNEF
954-7993	48P current terminal	b	49.5	40	φ53.1	7.5	φ114ICF fixed flange	2 <sup>1</sup> / <sub>4</sub> -16UN

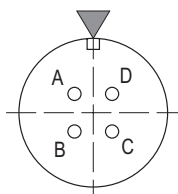
### • Dimensions diagram



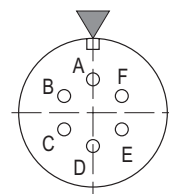
• Pin layout (▼: key location, viewed from the vacuum side)



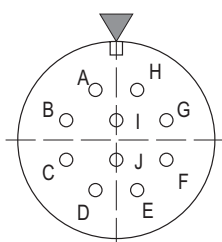
3P current terminal  
( • 954-7911 )  
( • 954-7912 )



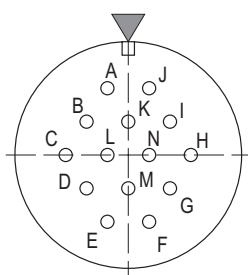
4P current terminal  
( • 954-7921 )  
( • 954-7922 )



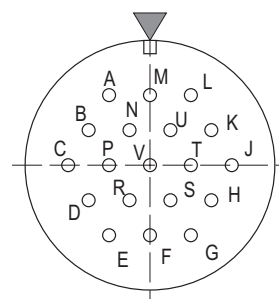
6P current terminal  
( • 954-7931 )  
( • 954-7932 )



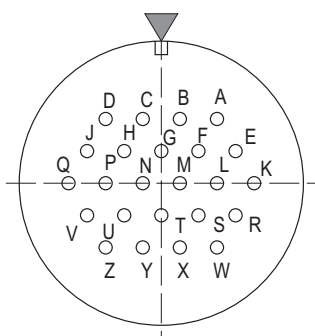
10P current terminal  
( • 954-7942 )



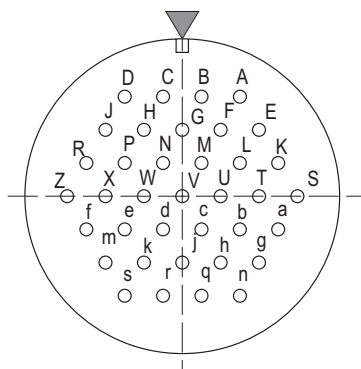
14P current terminal  
( • 954-7952 )



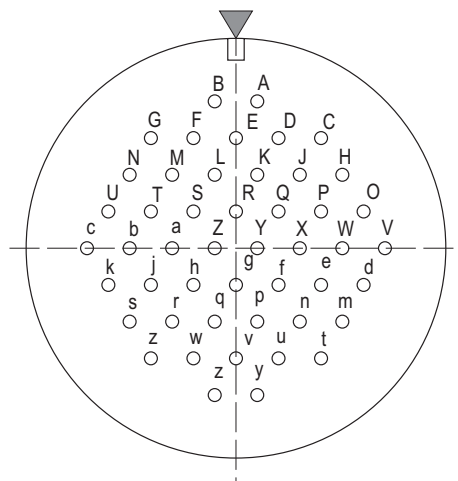
19P current terminal  
( • 954-7962 )



24P current terminal  
( • 954-7972 )



37P current terminal  
( • 954-7982 )



48P current terminal  
( • 954-7993 )

\* There are no pin numbers on the current terminals. (The above pin numbers are matched with the connectors.)

## Options

### • Vacuum side connector

Type	Description	Applicable model	Compatible wire size	Allowable current	Material	Allowable heating temperature	Tool	Weight
954-7326	#16 socket contact	Common to all series	AWG16-18	5A However, current terminals are all 3A or less.	Be-Cu (Rhodium plating) Stainless steel	250°C	Main unit: M22520/1-01 Turret: M22520/1-02 (Made by Daniel)	0.8g

Refer to the current terminal series options page for the appearance and dimensions.

### • Atmosphere side connector

Type	Description	Applicable model	Allowable current	Rated voltage		A	B	φC	D	φE
				AC [r.m.s]	DC					
954-7915	3P connector	3P current terminal	13A/line However, current terminals are all 3A or less.	500V	700V	108	54.8	7.9	27	24.6
954-7925	4P connector	4P current terminal		200V	250V	108	54.8	7.9	27	24.6
954-7935	6P connector	6P current terminal		200V	250V	108	54.8	7.9	27	24.6
954-7945	10P connector	10P current terminal		200V	250V	108	63	14.3	31.8	30.2
954-7955	14P connector	14P current terminal		500V	700V	111	69.1	15.9	36.7	34.9
954-7965	19P connector	19P current terminal		500V	700V	111	69.1	15.9	36.7	34.9
954-7975	24P connector	24P current terminal		200V	250V	113	75.5	15.9	42.4	42.1
954-7985	37P connector	37P current terminal		200V	250V	113	75.5	15.9	42.4	42.1
954-7995	48P connector	48P current terminal		500V	700V	111	79.8	23.8	57.9	56.4

\* Note that this is different from the withstand voltage of the current terminal.

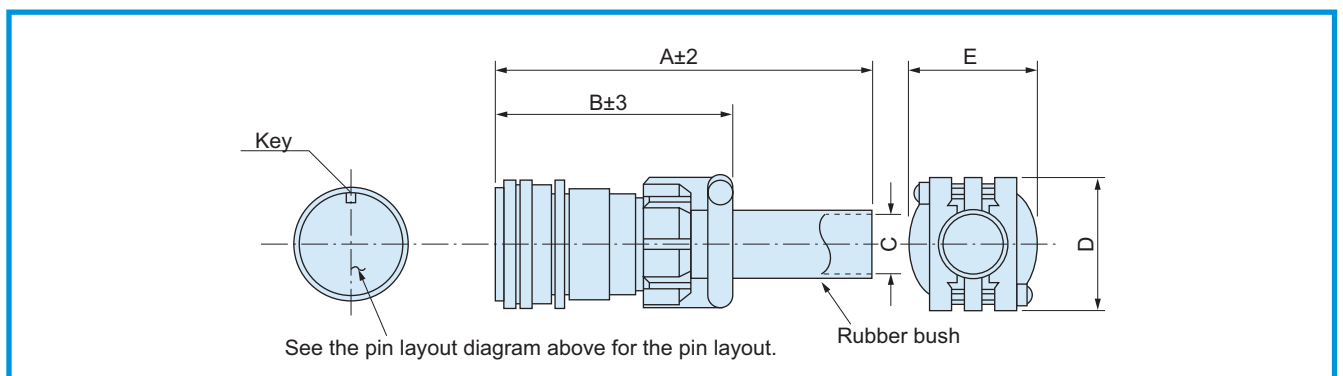
### • Atmosphere side connector common specifications

Allowable heating temperature	-55°C to 125°C
Insulating resistance	5,000MΩ or more
Contact	Solder coupling inner diameter φ1.76 Compatible wire A.W.G#16 to #22



Atmosphere side connector

### • Atmosphere side connector shape diagram

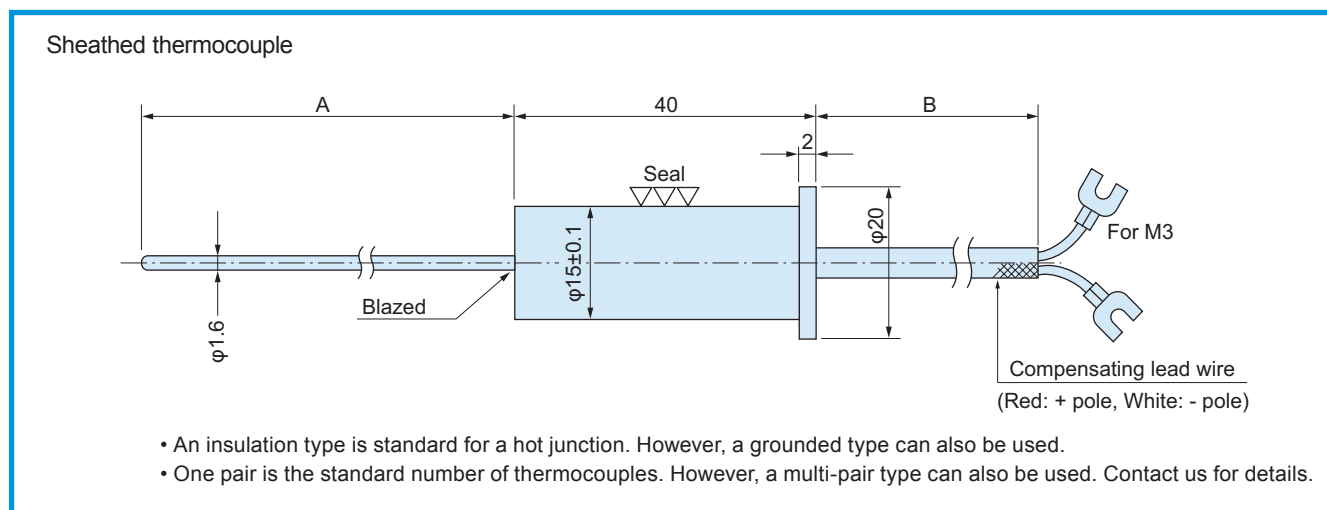


### • Sheathed thermocouple

An insulated thermocouple (insulated type) is contained in a metal protective tube with a  $\phi 1.6$  sheath diameter.

Use a  $\phi 15$  adapter similar to the vacuum measurement gauge when mounting.

Description	Mounting adapter	Remarks	Allowable heating temperature
Sheathed thermocouple	952-7806, $\phi 15$ adapter 954-7832, gauge adapter 954-7833, gauge adapter 954-7834, gauge adapter	Select the thermocouple type and A and B dimensions from the following when ordering: A: 100, 200, 300, 400, 500 B: 1000, 2000 Other dimensions are available upon request.	60°C





● **MS connector type temperature measurement terminals**

These temperature measurement terminals with thermocouples can be easily attached/removed from the vacuum side or atmosphere side.

The K thermocouple is the standard. The same material as the chromel/alumel thermocouples is used for

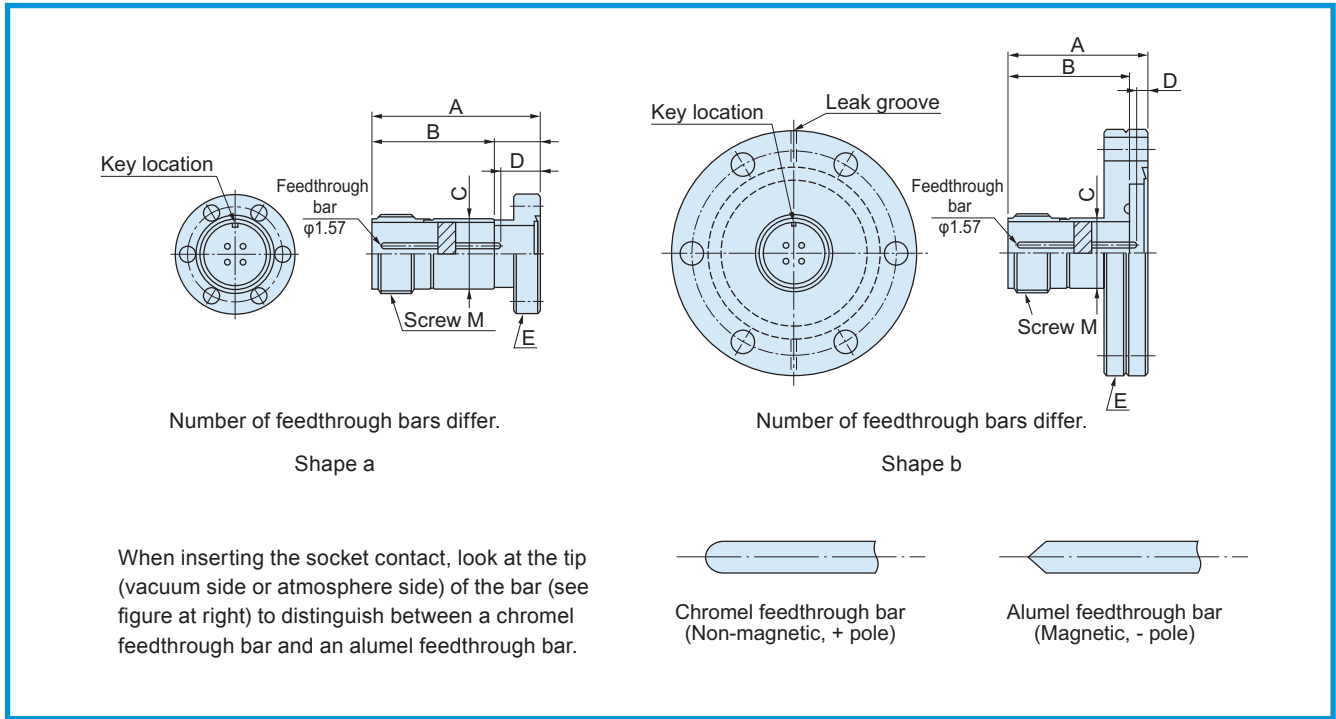
the temperature measurement terminal's feedthrough bar/vacuum side socket contact and atmosphere side connection socket contact.

Type	Description	Electrodes		Weight	Compatible Flange	Compatible connector	
		Quantity	Pair			Vacuum side	Atmosphere side
954-7917	2 pair temperature measurement terminal	4	2	70g	φ34ICF	954-7328 Alumel socket contact 954-7329 Chromel socket contact	954-7914, 2 pair connector
954-7918				340g	φ70ICF		
954-7928	5 pair temperature measurement terminal	10	5	340g	φ70ICF		954-7924, 5 pair connector
954-7938	7 pair temperature measurement terminal	14	7	340g	φ70ICF		954-7934, 7 pair connector
954-7948	12 pair temperature measurement terminal	24	12	320g	φ70ICF		954-7944, 12 pair connector

● **Other common specifications**

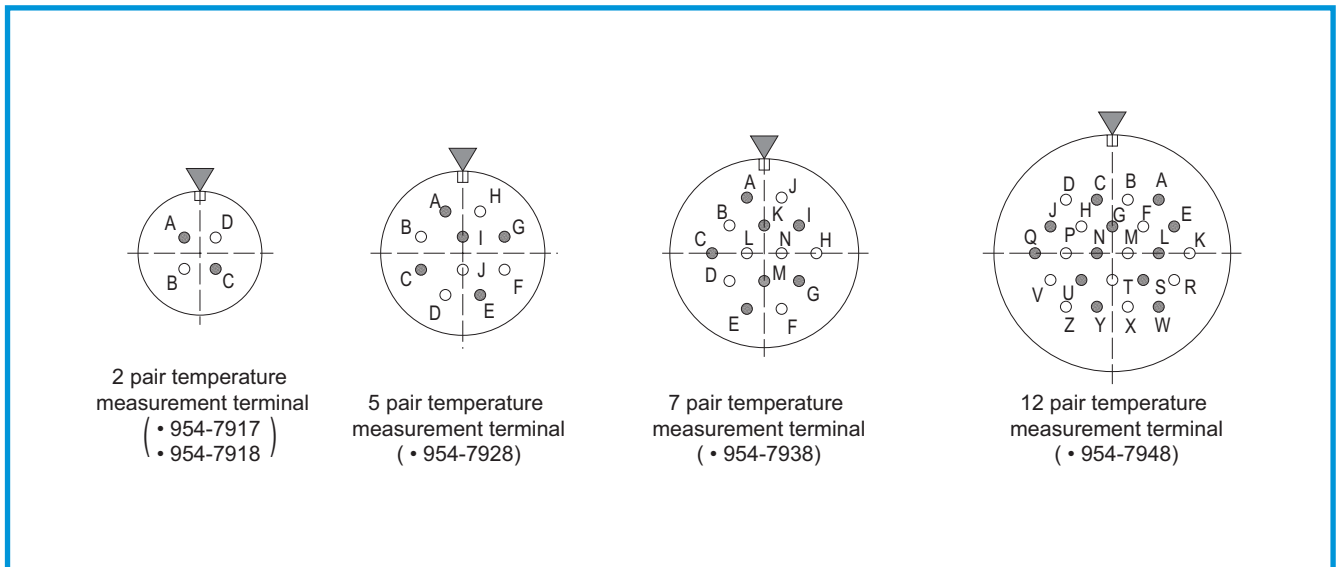
Withstand voltage	350V AC [r.m.s], 500V DC
Insulating resistance	1000MΩ or more
Allowable heating temperature	350°C
Temperature change	15°C/min or less
Leakage	1.3x10 <sup>-11</sup> Pa·m <sup>3</sup> /sec or less
Vacuum side connector	954-7328 # 16 alumel socket contact 954-7329 # 16 chromel socket contact
Feedthrough bar material	Chromel, alumel
Feedthrough bar thickness	φ1.57

• Dimensions diagram



Type	Description	Shape	A	B	φC	D	E	Screw M
954-7917	2 pair temperature measurement terminal	a	48.2	35	φ20.1	11.2	φ34ICF fixed flange	7/8-20UNEF
954-7918		b	40.3			3.3	φ70ICF fixed flange	
954-7928	5 pair temperature measurement terminal	b	45.3	40	φ26.1	3.3	φ70ICF fixed flange	1 <sup>1</sup> / <sub>8</sub> -18UNEF
954-7938	7 pair temperature measurement terminal	b	45.3	40	φ29.6	3.3	φ70ICF fixed flange	1 <sup>1</sup> / <sub>4</sub> -18UNEF
954-7948	12 pair temperature measurement terminal	b	45.3	40	φ36.6	3.3	φ70ICF fixed flange	1 <sup>1</sup> / <sub>2</sub> -18UNEF

• Pin layout (▼: Key location, viewed from the vacuum side)



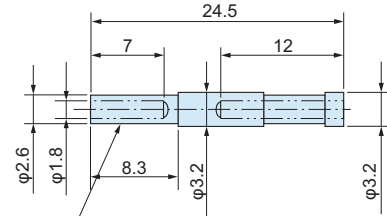
\*1. The above pin numbers are not on the temperature measurement terminals. (The above pin numbers are matched with the connectors.)  
 2. In the figure, ● indicates a chromel terminal (+) and ○ indicates an aludel terminal (-).

## Options

### • Vacuum side connector

Type	Description	Applicable models	Applicable thermocouple wire diameter	Material	Allowable heating temperature	Tool	Weight
954-7328	#16 alumel Socket contact	Common to all series	AWG16-18	Alumel Beryllium copper (gold plated)	125°C	Main unit: M22520/1-01 Turret: M22520/1-02 (Made by Daniel)	0.86g
954-7329	#16 chromel Socket contact			Chromel Beryllium copper (gold plated)			0.87g

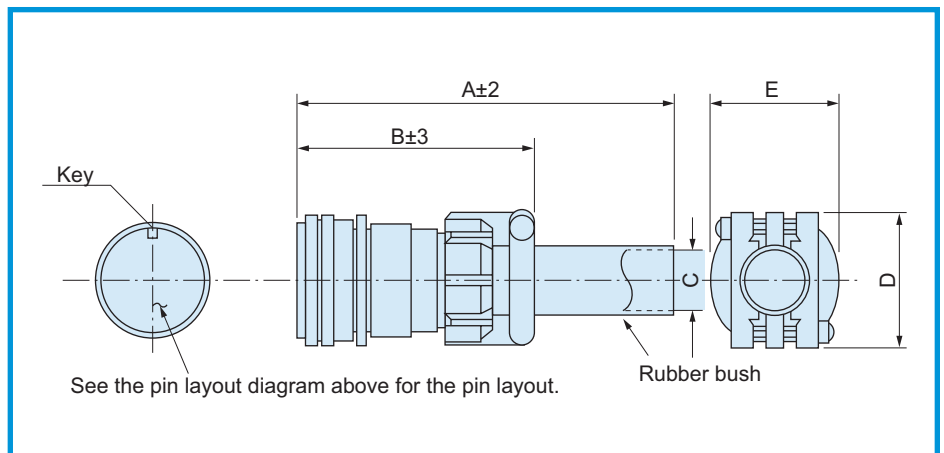
954-7328 #16 alumel socket contact (magnetic)  
954-7329 #16 chromel socket contact (non-magnetic)



Pressure bonded section

### • Atmosphere side connector

Type	Description	Applicable model	A	B	φC	D	φE
954-7914	2 pair connector	2 pair temperature measurement terminal	103	49	φ8	27	φ25
954-7924	5 pair connector	5 pair temperature measurement terminal	108	64	φ14	32	φ30
954-7934	7 pair connector	7 pair temperature measurement terminal	108	66	φ16	37	φ35
954-7944	12 pair connector	12 pair temperature measurement terminal	113	φ16	43	φ42	

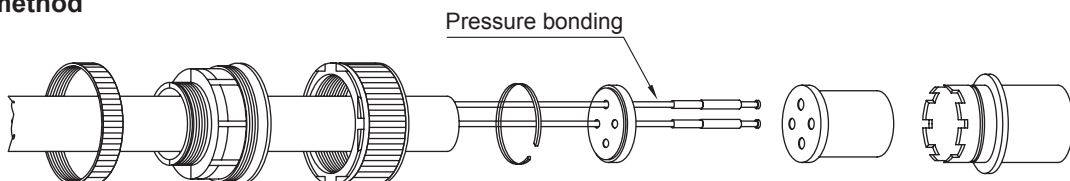


In the figure, the terminal connection side is on the left.

### • Other common specifications

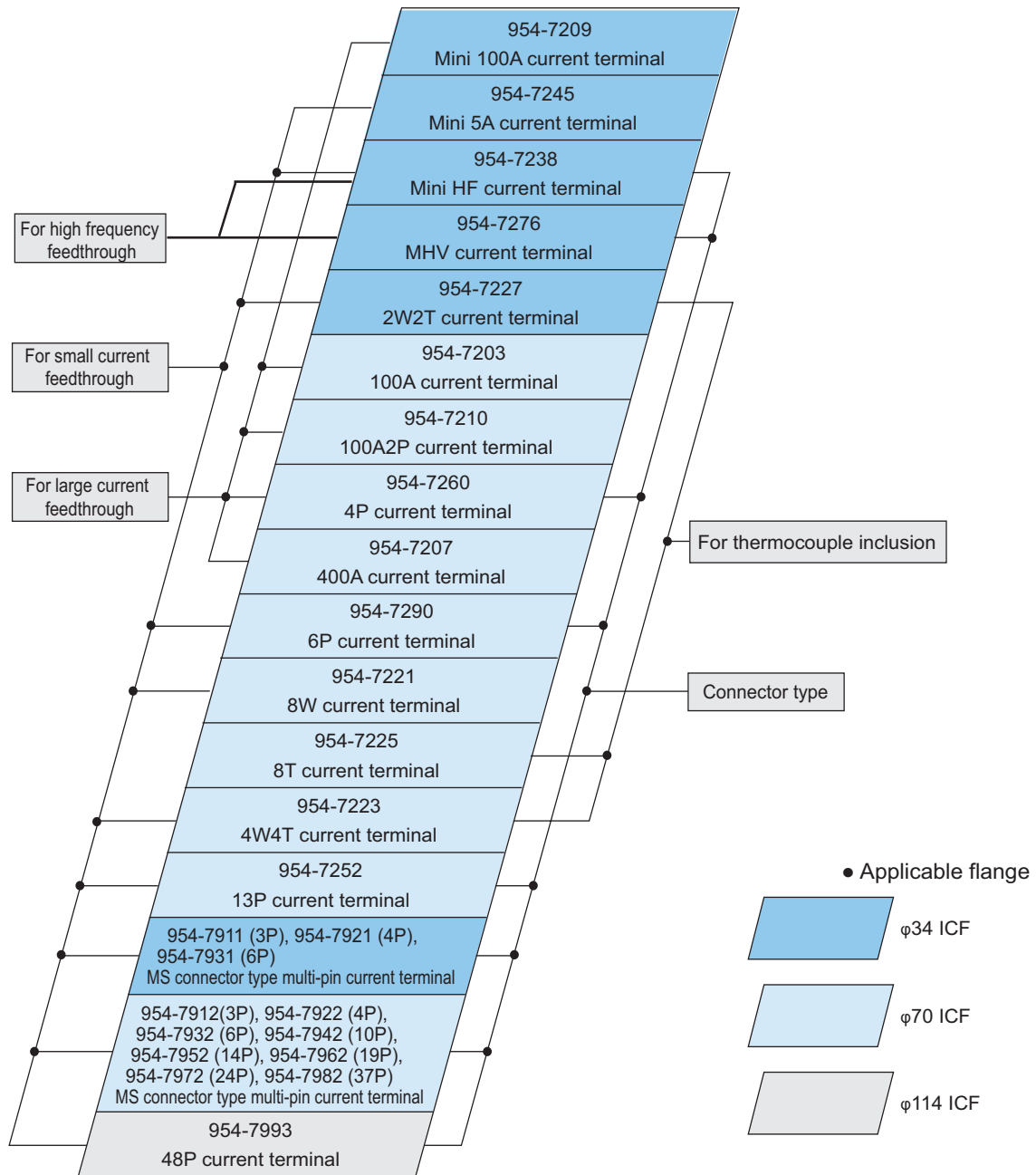
Allowable temperature range	-55°C to 125°C
#16 socket contact	Material: Alumel (magnetic) Chromel (non-magnetic) Applicable compensating lead wire diameter: AWG16-18 Crimp type

### • Wiring method



## ■ Selection guide

- Select the current terminal that matches the intended application.



## ■ Ordering information

Parts number	Model	Description	Remarks	Code
A26-13706	954-7917	2 Pair Feedthrough for Thermocouples	φ34ICF, K (CA) thermocouple	36400
P25-02875	954-7918	2 Pair Feedthrough for Thermocouples	φ70ICF, K (CA) thermocouple	36405
A26-13707	954-7928	5 Pair Feedthrough for Thermocouples	φ70ICF, K (CA) thermocouple	36410
P25-02877	954-7938	7 Pair Feedthrough for Thermocouples	φ70ICF, K (CA) thermocouple	36415
P25-02878	954-7948	12 Pair Feedthrough for Thermocouples	φ70ICF, K (CA) thermocouple	36420
0194-12777	954-7914	2 Pair Contacts Plug	For 2 pair temperature measurement terminal, K (CA) thermocouple	36235
0194-13210	954-7924	5 Pair Contacts Plug	For 5 pair temperature measurement terminal, K (CA) thermocouple	36237

Note) Contact us for more information about CE (RoHS).

Parts number	Model	Description	Remarks	Code
P25-02881	954-7934	7 Pair Contact Plug	For 7 pair temperature measurement terminal, K (CA) thermocouple	36239
P25-02882	954-7944	12 Pair Contact Plug	For 12 pair temperature measurement terminal, K (CA) thermocouple	36242
A26-11597	954-7328	#16 Alumel Socket Contact	Each temperature measurement terminal vacuum side contact	36260
A26-11598	954-7329	#16 Chromel Socket Contact	Each temperature measurement terminal vacuum side contact	36265
753-0500	954-7227	Mini 2W2T Current Feedthrough	With $\phi$ 34ICF, 1kV DC, only W is 5A, for enclosing small current/thermocouple	36100
0190-04312	954-7223	4W4T Current Feedthrough	With $\phi$ 70ICF, 1kV DC, only W is 5A, for enclosing small current/thermocouple	36101
0190-04320	954-7221	8W Current Feedthrough	With $\phi$ 70ICF, 1kV DC, 5A, for small current	36102
0190-04338	954-7225	8T Current Feedthrough	With $\phi$ 70ICF, 1kV DC, for enclosing thermocouple	36103
VMT-9152	954-7245	5A Current Feedthrough	With $\phi$ 34ICF, 1kV DC, 5A, for small current	36110
794-5947	954-7290	6P Current Feedthrough	With $\phi$ 70ICF, 1kV DC, 5A, plug connectable	36111
0191-15951	954-7291	6P Plug	Atmosphere side connector for 954-7290	36200
0190-04354	954-7252	13P Current Feedthrough	With $\phi$ 70ICF, 1.5kV DC, 5A, plug connectable	36112
0191-15943	954-9254	13P Contact Plug	Atmosphere side connector for 954-7252	36201
824-3199	954-7256	#20 Socket Contact	Vacuum side for 954-7252	36250
795-2002	954-7276	MHV Current Feedthrough	With $\phi$ 34ICF, 5kV DC, 3A, coaxial connector connectable	36120
N14051188	UG-932/U	MHV Connector	Atmosphere side connector for 954-7276	36203
0190-04370	954-7238	Mini HF Current Feedthrough	With $\phi$ 34ICF, 3kV DC, 5A, coaxial connector connectable	36121
9007-71040	BNCH-CS	Short Cap	For 954-7276	36206
N14051097	NP-3A-S	HF Contact Plug	Atmosphere side connector for 954-7238	36204
0111-86518	954-7260	4P Current Feedthrough	With $\phi$ 70ICF, 1kV DC, 50A, plug connectable	36130
0191-15977	954-7261	4P Plug	Atmosphere side connector for 954-7260	36205
0190-04396	954-7209	Mini 100A Current Feedthrough	With $\phi$ 34ICF, 7kV DC	36140
0190-04401	954-7203	100A Current Feedthrough	With $\phi$ 70ICF, 7kV DC	36141
4-340069	954-7210	100A2P Current Feedthrough	With $\phi$ 70ICF, 7kV DC	36142
MOD-243304	953-9900	100A Current Feedthrough	954-7209, 7203, 7210 vacuum side	36270
MOD-243305	953-9901	100A Current Feedthrough	954-7209, 7203, 7210 vacuum side	36271
P25-12394	953-9916	100AL Current Feedthrough	954-7209, 7203, 7210 vacuum side	36275
MOD-243654	953-9910	100A Current Feedthrough	954-7209, 7203, 7210 atmosphere side	36276
0190-04427	954-7207	400A Current Feedthrough	With $\phi$ 70ICF, 3kV DC, 400A	36150
FMT-9088	954-7911	3P Current Feedthrough	With $\phi$ 34ICF	36160
FMT-9089	954-7912	3P Current Feedthrough	With $\phi$ 70ICF	36163
FMT-9090	954-7921	4P Current Feedthrough	With $\phi$ 34ICF	36166
FMT-9091	954-7922	4P Current Feedthrough	With $\phi$ 70ICF	36169
FMT-9092	954-7931	6P Current Feedthrough	With $\phi$ 34ICF	36172
FMT-9093	954-7932	6P Current Feedthrough	With $\phi$ 70ICF	36175
FMT-9094	954-7942	10P Current Feedthrough	With $\phi$ 70ICF	36178
FMT-9095	954-7952	14P Current Feedthrough	With $\phi$ 70ICF	36181
FMT-9096	954-7962	19P Current Feedthrough	With $\phi$ 70ICF	36184
594-3505	954-7972	24P Current Feedthrough	With $\phi$ 70ICF	36187
FMT-9098	954-7982	37P Current Feedthrough	With $\phi$ 70ICF	36190
FMT-9099	954-7993	48P Current Feedthrough	With $\phi$ 114ICF	36193
0191-14989	954-7915	3P Contact Plug	Atmosphere side connector for 954-7911, 954-7912	36210
0191-14997	954-7925	4P Contact Plug	Atmosphere side connector for 954-7921, 954-7922	36213
0191-15008	954-7935	6P Contact Plug	Atmosphere side connector for 954-7931, 954-7932	36216
0191-15016	954-7945	10P Contact Plug	Atmosphere side connector for 954-7942	36219
0191-15024	954-7955	14P Contact Plug	Atmosphere side connector for 954-7952	36222
0191-15032	954-7965	19P Contact Plug	Atmosphere side connector for 954-7962	36225
0191-15040	954-7975	24P Contact Plug	Atmosphere side connector for 954-7972	36228
0191-15058	954-7985	37P Contact Plug	Atmosphere side connector for 954-7982	36231
0191-15066	954-7995	48P Contact Plug	Atmosphere side connector for 954-7993	36232
0191-21708	954-7326	#16 Socket Contact	954-7245,7290,7276, multi-pin current terminal for vacuum side	36251

Note) Contact us for more information about CE (RoHS).

# Ultra-high Vacuum Viewing Ports

## ■ Summary

A viewing port is a window for looking inside a vacuum container. These viewing ports use Kovar glass or synthesized sapphire sealed with Kovar welded onto an ICF flange, enabling them to be used under ultra-high pressure of up to  $10^{-8}$ Pa. In particular, the sapphire viewing ports have stable transmission characteristics with respect to irradiation of electromagnetic waves and particle beams in the UV range (short wavelength).



## ■ Features

### 1. Wide, clear effective field of view

The thin viewing port provides a wide effective field of view. The strain-free glass and sapphire allow for a clear view.

### 2. Ultra-high vacuum

The use of ICF flanges enable the viewing port to be used under ultra-high vacuum.

### 3. High heat tolerance

Capable of withstanding 350°C heat cycle.

### 4. Stable transmission of wide wavelength range

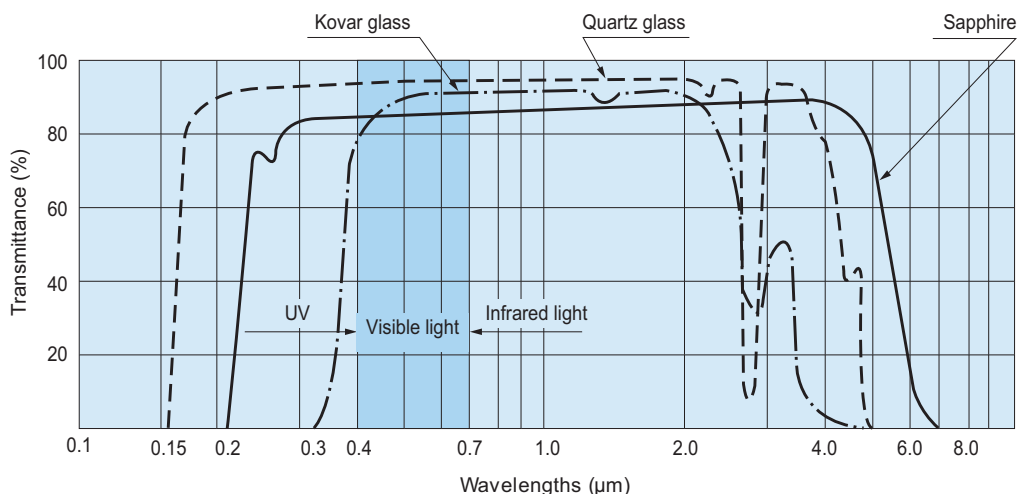
The sapphire viewing ports offer more stable transmission characteristics over a wider range of wavelengths in the UV to IR range when compared to Kovar glass viewing ports and longer wavelengths in the IR range compared to quartz viewing ports. (952-7042, 7043, sapphire viewing ports)

### 5. Excellent radiation resistance

The synthetic sapphire is a single crystal of  $Al_2O_3$ . It has excellent radiation resistance against irradiation of high energy electromagnetic waves and particle beams with little discoloration or change in transmittance. (954-7042, 7043, sapphire viewing ports)

## ■ Specifications

Withstand pressure	0.1MPa (inside vacuum, outside atmosphere)
Allowable heating temperature	350°C
Temperature change	25°C/min or less
Leakage	$1.3 \times 10^{-11}$ Pa·m <sup>3</sup> /sec or less



Relationship between the wavelength and transmittance of glass material (reference value)

## ■ Kovar glass viewing port dimensions

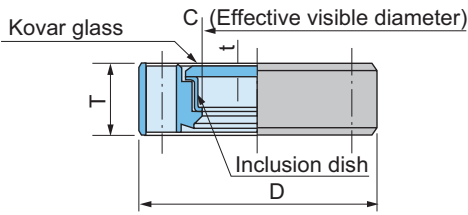


Fig. 1 Thin type viewing port (shape q)

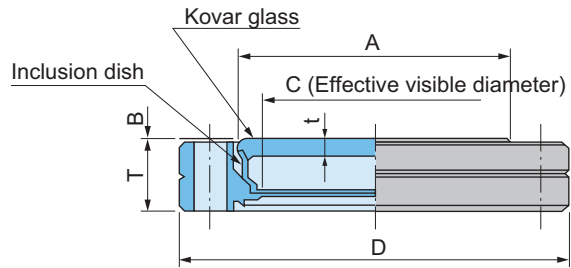


Fig. 2 Thin type viewing port (shape w)

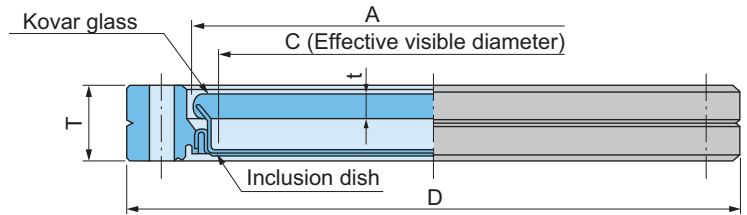
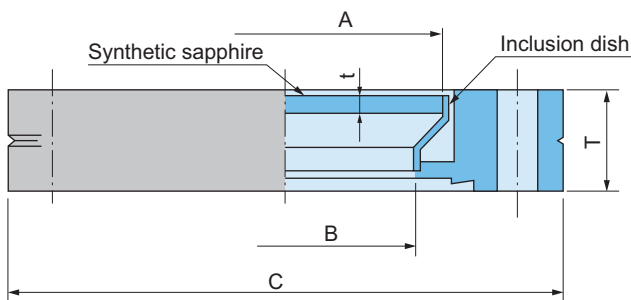


Fig. 3 Thin type viewing port (shape e)

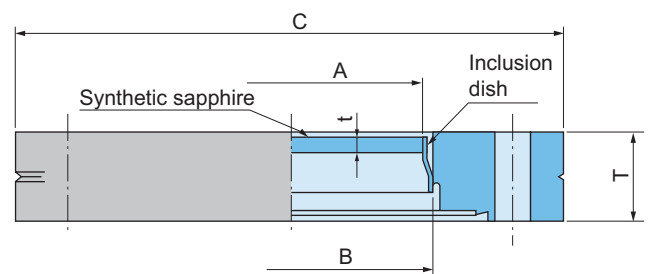
Material (Flange: SUS-304, Glass: Synthetic Kovar glass, Enclosing dish: Kovar)

Type	Description	Connection flange	Shape	A	B	C	D	T	t	Weight
954-7001	Thin type viewing port with $\phi 34$ ICF	$\phi 34$ ICF	(1)	$\phi 20$	$< 0$	$\phi 15$	$\phi 34$	10	1.8	0.05kg
954-7002	Thin type viewing port with $\phi 70$ ICF	$\phi 70$ ICF	(2)	$\phi 43$	$< 2.9$	$\phi 32.6$	$\phi 70$	14	3.5	0.25kg
954-7003	Thin type viewing port with $\phi 114$ ICF	$\phi 114$ ICF	(2)	$\phi 72.5$	$< 3$	$\phi 60$	$\phi 114$	19	4.5	0.85kg
954-7004	Thin type viewing port with $\phi 152$ ICF	$\phi 152$ ICF	(2)	$\phi 113$	$< 5$	$\phi 98$	$\phi 152$	22	6.1	1.4kg
954-7005	Thin type viewing port with $\phi 203$ ICF	$\phi 203$ ICF	(3)	$\phi 163$	$< 0$	$\phi 143$	$\phi 203$	24	8.6	2.5kg

## ■ Sapphire viewing port dimensions



954-7042, sapphire viewing port with  $\phi 70$ ICF



954-7043, sapphire viewing port with  $\phi 114$ ICF

Material (Flange: SUS-304, Glass: Synthetic sapphire, Enclosing dish: Kovar)

Type	Description	Connection flange	A	B	C	T	t	Weight
954-7042	Sapphire viewing port with $\phi 70$ ICF	$\phi 70$ ICF	$\phi 40$	$\phi 33$	$\phi 70$	12.7	2.5	0.25kg
954-7043	Sapphire viewing port with $\phi 114$ ICF	$\phi 114$ ICF	$\phi 56$	$\phi 59$	$\phi 114$	17.5	3.0	0.97kg



## Options

The following options are available to protect the viewing port.

### Protective covers

#### Features

1. Protects the bolted glass surface of the viewing port from damage due to external force.
2. Can be easily installed on the viewing port. Fig. 4 shows the protective cover.

Protective covers (Material: SUS-304)

Type	Applicable viewing port	A	B	t
954-7012	954-7002, 7042 Thin type with $\phi 70$ ICF Viewing port	$\phi 72.7$	20	0.4
954-7013	954-7003, 7043 Thin type with $\phi 114$ ICF Viewing port	$\phi 116.7$	25	0.4
954-7014	954-7004, Thin type with $\phi 152$ ICF Viewing port	$\phi 154.7$	29	0.6
954-7015	954-7005, Thin type with $\phi 203$ ICF Viewing port	$\phi 205.7$	32	0.6

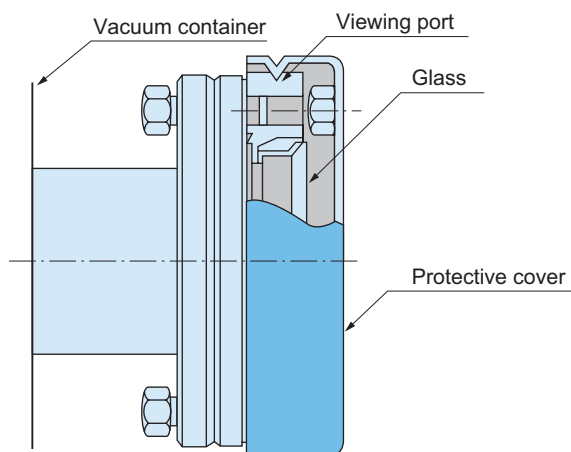


Fig. 4

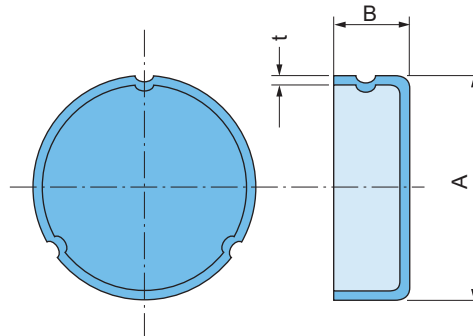


Fig. 5

## Shields

#### Features

1. The vaporized material generated inside the vacuum chamber adheres to the shield glass to ensure a clear view through the viewing port.
2. The shield glass is easy to replace. The shield assembly holds the glass shield and can be fixed to the inner diameter of the vacuum chamber side port with a single action.

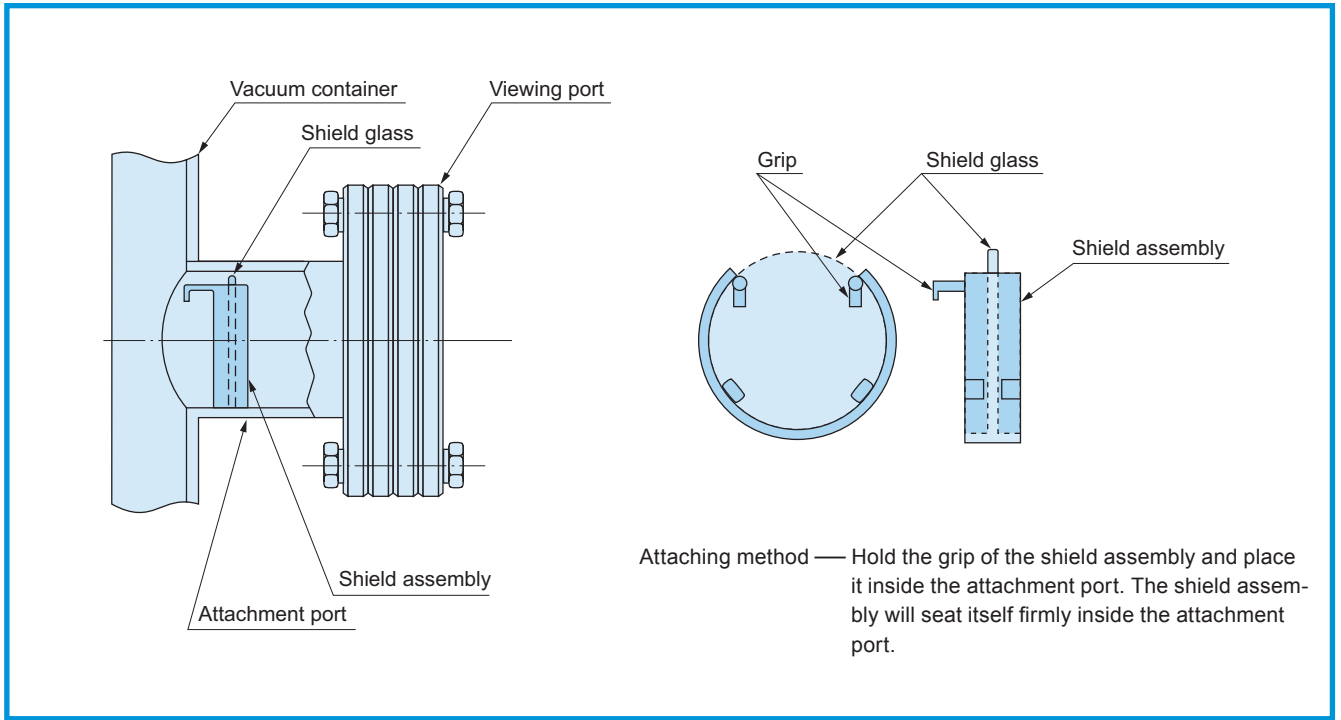
Shield assembly (Material: SUS-304)

Type	Applicable attachment port inner diameter
954-7022	$\phi 38$
954-7023	$\phi 54.9$
954-7026	$\phi 60.2$
954-7025	$\phi 147$

Shield glass (Material: Soda glass)

Type	Applicable shield assembly	Glass diameter	Thickness
954-7032	954-7022	$\phi 35$	2
954-7033	954-7023	$\phi 51$	2
954-7036	954-7026	$\phi 56$	2
954-7035	954-7025	$\phi 142$	2
954-7034	954-7024	$\phi 91$	2





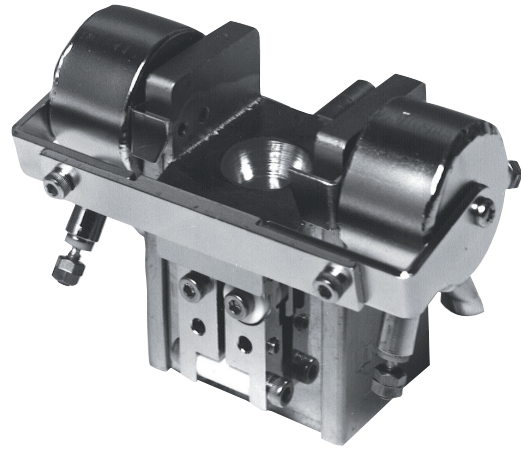
## ■ Ordering information

Parts number	Model	Description	Remarks	Code
A26-11089	954-7001	φ34 Mini Viewing Port	With φ34ICF (Kovar glass)	36305
0190-04566	954-7002	φ70 Thin Type Viewing Port	With φ70ICF (Kovar glass)	36301
795-1609	954-7003	φ114 Thin Type Viewing Port	With φ114ICF (Kovar glass)	36302
0190-04582	954-7004	φ152 Thin Type Viewing Port	With φ152ICF (Kovar glass)	36303
A26-01963	954-7005	φ203 Thin Type Viewing Port	With φ203ICF (Kovar glass)	36304
A26-03738	954-7042	φ70 Sapphire Viewing Port	With φ70ICF	36311
A26-03991	954-7043	φ114 Sapphire Viewing Port	With φ114ICF	36312
825-5725	954-7012	φ70 Protect Cover for Viewing Port	Thin type viewing port with φ70ICF/for sapphire viewing port with φ70ICF	36340
856-1409	954-7013	φ114 Protect Cover for Viewing Port	Thin type viewing port with φ114ICF/for sapphire viewing port with φ114ICF	36341
825-5895	954-7014	φ152 Protect Cover for Viewing Port	For thin type viewing port with φ152ICF	36342
A26-03634	954-7015	φ203 Protect Cover for Viewing Port	For thin type viewing port with φ203ICF	36343
734-2111	954-7032	φ35 Shield Glass	For thin type viewing port with φ70ICF	36350
P25-02781	954-7036	φ56 Shield Glass	For thin type viewing port with φ114ICF	36354
734-2107	954-7022	φ38 Shield Assembly	For thin type viewing port with φ70ICF	36370
P25-02780	954-7026	φ60.2 Shield Assembly	For thin type viewing port with φ114ICF	36374
734-2117	954-7024	φ95.6 Shield Assembly	For thin type viewing port with φ152ICF	36372

Note) Contact us for more information about CE (RoHS).

For electron beam deposition

# E-type Electron Guns



## ■ Summary

Our E-type Electron Guns have a proven sales record since their introduction in 1964 as electron guns used for vapor deposition experiments. Through constant, continuous product development and improvement from that time, today they have evolved into a more operable, reliable, and safer electron beam deposition source used in the electronics industry and optics industry laboratories. We are confident that our E-type electron guns can satisfy the performance requirements of any field.

## ■ Features of electron beam deposition

In electron beam deposition, electrons emitted from a hot filament are accelerated in a vacuum, and deflected by a magnetic or electric field to bombard an evaporated substance to cause thermal evaporation and form a thin film on a substrate. This method has the following advantages over the resistance heating method.

1. Deposition of most metal and oxide from AL to refractory metals such as W, Ta, and Mo is possible with its high power density.
2. The water-cooled copper crucible maintains the purity of the deposition specimen, providing deposited films with few impurities.
3. Parts wear out slower compared to resistance heating type evaporation sources.

## ■ Features of the ANELVA E-type electron gun and power supply

### 1. Excellent deposition

Because the primary electron beam is deflected by a magnetic field, the secondary electrons and reflected electrons generated from the surface of the evaporated sample are also deflected and are less likely to adversely affect the deposited film.

### 2. Excellent control

A raster scan method and circle sweep method are used as the electron beam sweep methods. The amplitude, scanning frequency, and waveform pattern in the X and Y directions are compensated to enable fine control of the power density over the crucible.

### 3. Beam sweep capable

Electron guns capable of beam sweep, able to withstand baking up to 200°C, and usable in an ultra-high vacuum of up to approximately  $10^{-8}$ Pa are available (980-7100 and 980-7300)

Ultra-high vacuum electron guns without beam sweep, and capable of withstanding baking up to 250°C are also available (980-7102, 980-7104, and 980-7302).

### 4. Sustained discharge prevention

The electron gun power has a circuit to prevent sustained discharge.

## E-type electron gun series line-up

We offer a full line-up of E-type electron guns so that you can select the best gun for your application, based on the input power, crucible capacity, number of crucibles (single-shot or multi-barrel), and beam sweep capability.

For conventional vacuum equipment, a high-pressure

input terminal and shutter mechanism had to be attached from a separate port. As a result, it was difficult to install an EB gun because of the small work space. To solve this problem, flange mount type products with these components integrated into the electron gun itself are also included.

Applications			Name		Features		Specifications						
Production line equipment	R&D	Ultra-high vacuum equipment support	Name	Features	Number of crucibles	Crucible capacity (mL)	Crucible capacity (MAX)	Baking temperature	Baking angle	Beam deflection	Beam sweep power	Maximum input	Flange mount type
x	⊙	⊙	980-7100 (980-7102) 2kW single-shot	Sweepable ultra-high vacuum deposition use	1	1	200°C (250°C)	220°	⊙ (x)	2kW	⊙	⊙	
x	⊙	⊙	980-7104 2kW triple-shot	For multi-layer ultra-high vacuum deposition	3	1	250°C	220°	x	2kW	⊙	⊙	
x	⊙	⊙	980-7300 (980-7302) 3kW single-shot	Equipped with a sweep coil and increased power for ultra-high vacuum deposition. Ideal for superconducting film creation and experimenting.	1	2.5	200°C (250°C)	220°	⊙ (x)	3kW	⊙	⊙	
x	⊙	⊙	980-7401 3kW 4 source	Capable of 4 source simultaneous deposition. Ideal for superconducting film creation and experimenting.	4	3.8	200°C	220°	⊙	3kW x4	⊙	⊙	

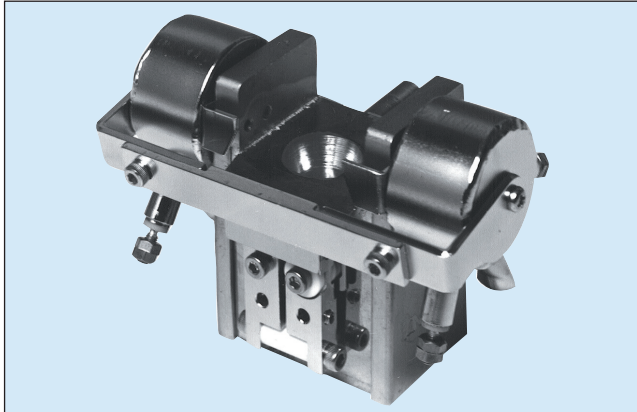
- ⊙ Optimum
- Compatible
- △ Acceptable
- × Not acceptable or compatible

Note: 980-7102, 7302, 7311 in parentheses do not have a sweep coil (sweep function).

## E-type Electron Guns

### ■ 980-7100/980-7102 2kW single-shot E-type electron gun

(Experimental)



(Note) 980-7100 shown (with sweep coil)

#### ● Features

1. Capable of beam sweep. (980-7100 only)
2. Compact and lightweight.
3. Can be easily attached to the equipment.
4. Can withstand baking and can be used in ultra-high vacuum of  $10^{-8}$ Pa range.
5. Flange mount type available.

#### ● Applications

Deposition of high temperature superconductive material  
 Deposition of various metals including refractory metals  
 Deposition of insulator or semiconductor  
 Melting of refractory metals  
 Ideal for creating Josephson devices

#### ● Specifications

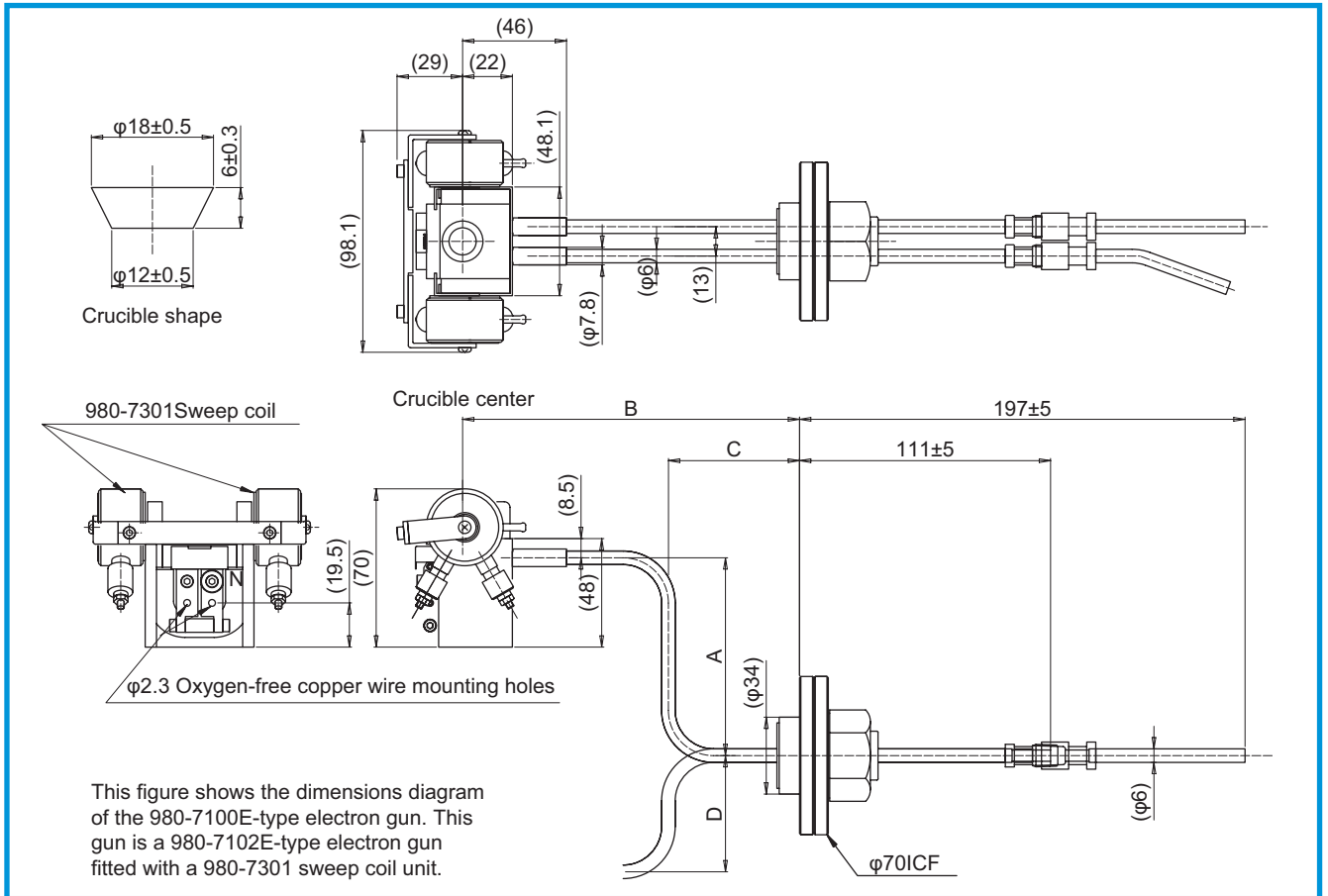
Type	980-7100	980-7102
Beam accelerator voltage	4kV	4kV
Emission current	0 to 500mA	0 to 500mA
Filament power	10Vx25A (max)	10Vx25A (max)
Coil current	±1A (max)	-
Electron beam scanning	Available	-
Electron beam scanning range	±8mm	-
Crucibles	Quantity	x1
	Size	φ18xφ12xDepth 6 (mm)
	Capacity	1mL
Beam deflection angle	220°	220°
Cooling water flow	2L/min*	2L/min*
Operating pressure	$6.7 \times 10^{-3}$ Pa or less	$6.7 \times 10^{-3}$ Pa or less
Baking temperature	200°C (max)	250°C (max)
Weight	1.3kg	1kg
Attachments	Filament (x10) tool attachment fixture	Same as left
Applicable controller	922-9203 2kW E-type electron gun controller or EGP-230 electron controller, EGP-212S-C sweep controller	922-9203 2kW E-type electron gun controller or EGP-230 electron gun controller
Typical evaporation rate example	See item in technical memorandum	Same as left

\* If necessary, the customer must install a boost pump to ensure a sufficient flow of cooling water.

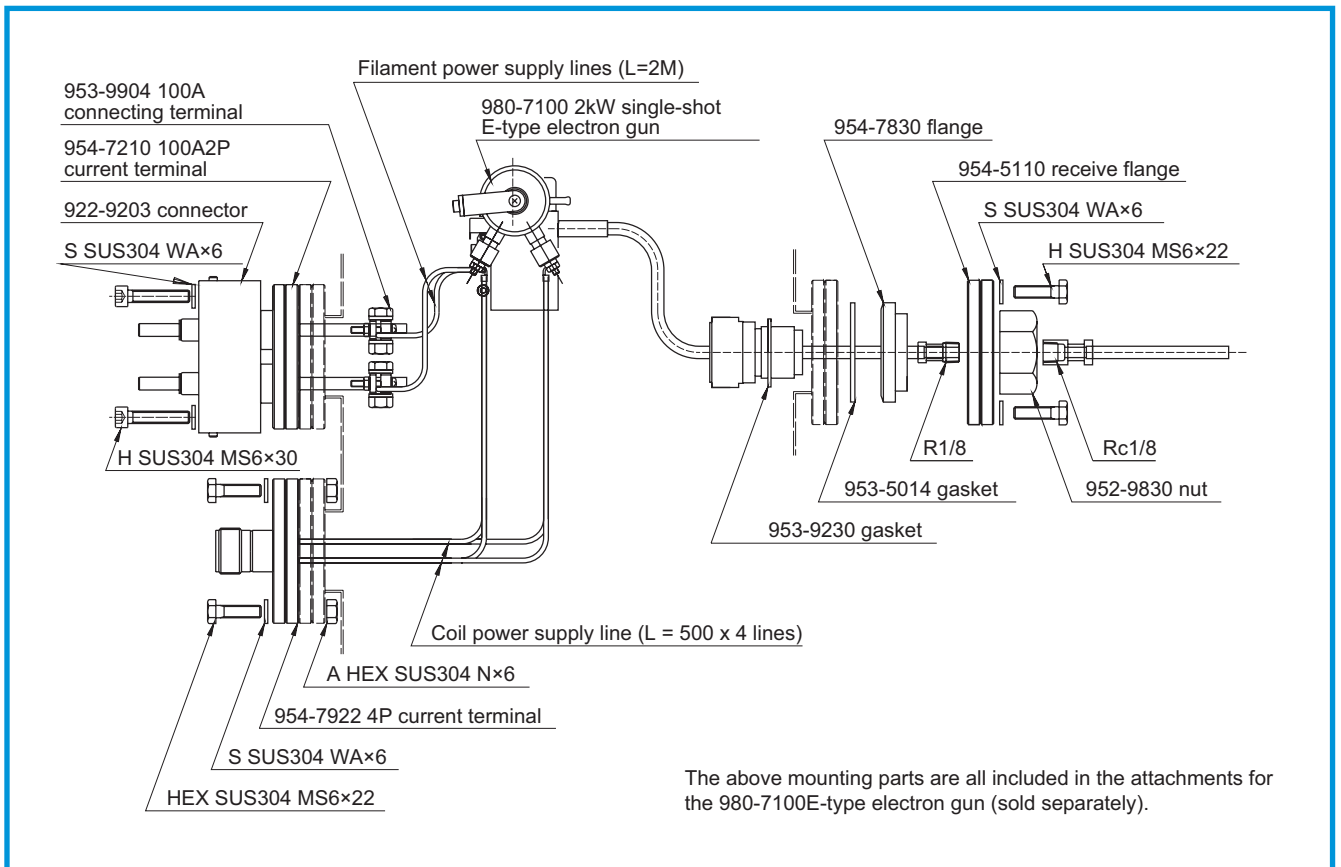
#### ● Water-cooled pipe dimensions

A (D)+B≤320, B-C≥76	Dimensions
A	0 or 50 to 180 (upward)
D	0 or 50 to 180 (downward)
B	119 to 329/69 to 329 (when A = D = 0)
C	43 to 260

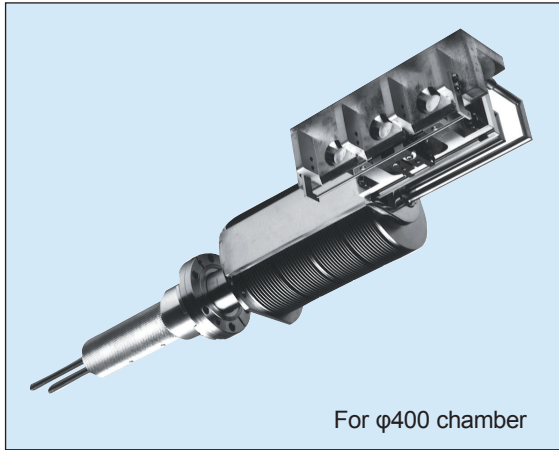
• Dimensions diagram



• Attachment method



■ 980-7104 2kW triple barrel E-type electron gun  
(for laboratory use)



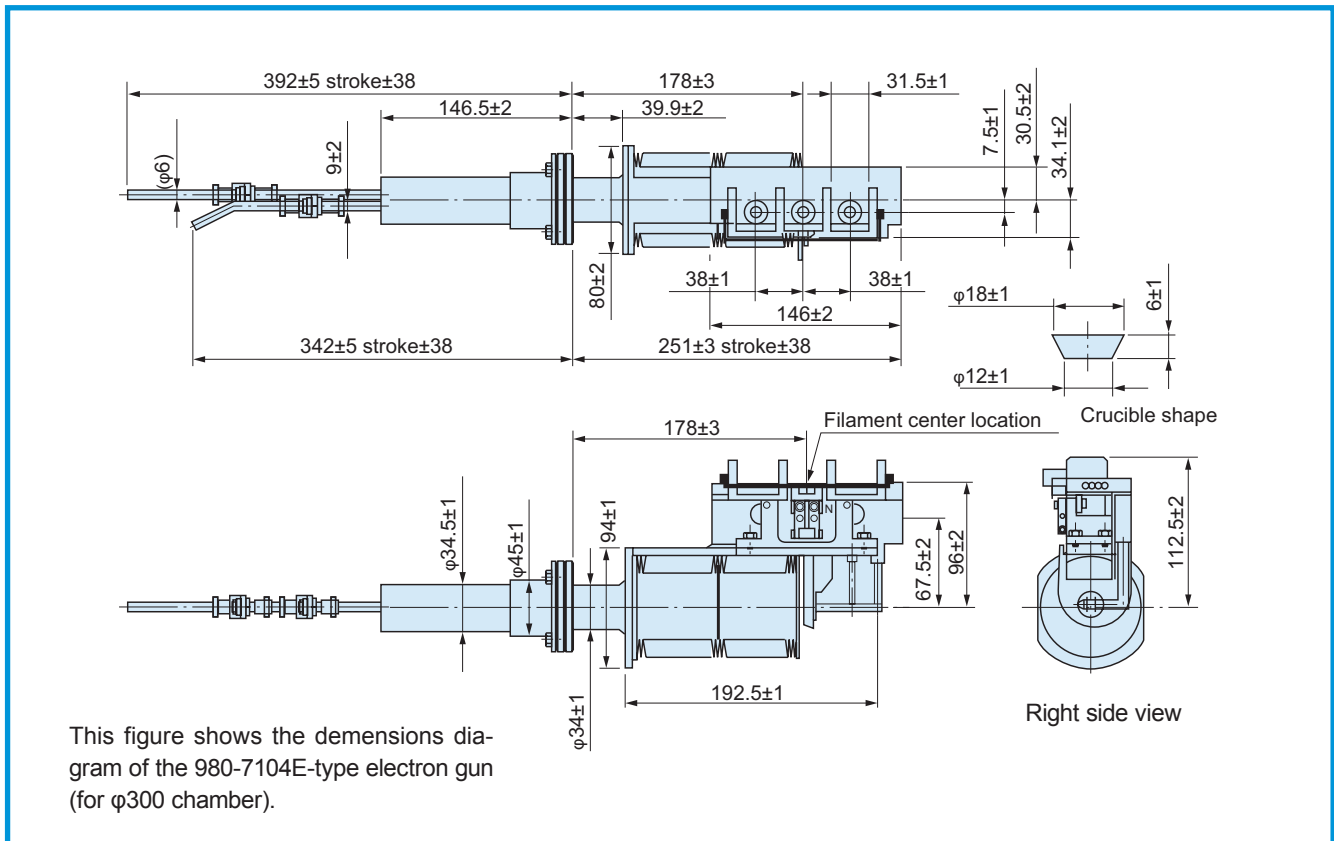
● Features

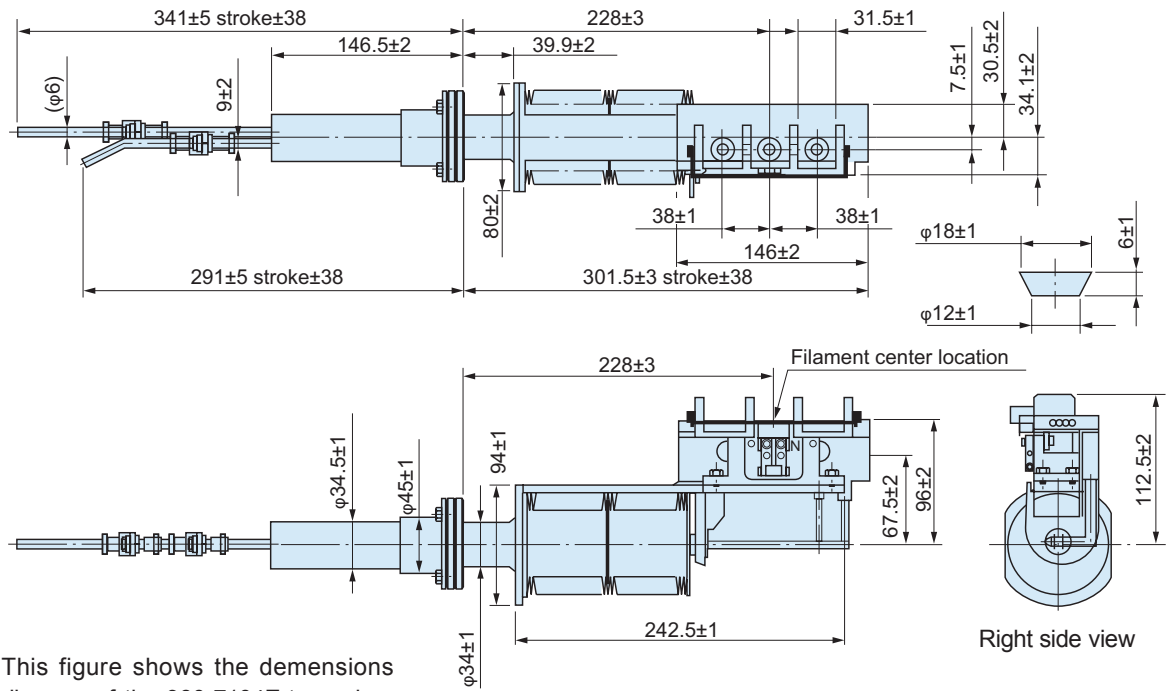
1. Multi-barrel electron gun that can withstand baking and can be used in ultra-high vacuum of  $10^{-8}$ Pa range.
2. Can accommodate up to three samples.
3. Can be easily attached to the equipment.

● Applications

- Deposition of high temperature superconductive material.
- Deposition of various metals including refractory metals.
- Deposition of insulator or semiconductor.
- Melting of refractory metals.
- Ideal for creating Josephson devices.

● Dimensions diagram





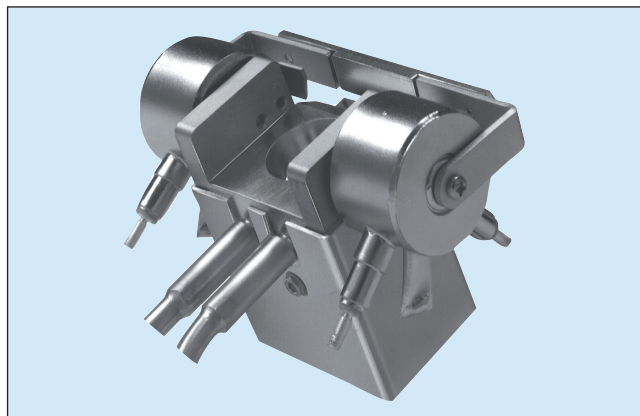
This figure shows the dimensions diagram of the 980-7104E-type electron gun (for φ400 chamber).

#### ● Mounting method (for φ400 chamber)

Move the crucible horizontally. Since attachment is performed from inside the vacuum chamber, the inner diameter of the vacuum chamber must be at least 350mm. However, note that the required inner diameter depends on the depth of the attachment port. If the attachment port is within 67mm from the top of the vacuum chamber, φ300 diameter is sufficient. The attachment method for supplying power is the same as that for the 980-7100 2kW single-shot E-type electron gun. A separate conversion flange is necessary for ports other than the φ70ICF port.



■ 980-7300/7302 3kW single shot E-type electron gun (for laboratory use)



(Note) 980-7300 shown (with sweep coil)

● Features

1. Capable of beam sweep (980-7300).
2. Compact, lightweight, and bigger capacity crucible than the 2kW electron gun. (2.5mL)
3. Can be easily attached to the equipment.
4. Can withstand baking and can be used in ultra-high vacuum of  $10^{-8}$ Pa range.
5. Flange mount type available.  
Flange mount type product: 980-7001 deposition unit (mounts a 980-7300E gun)

● Applications

Deposition of high temperature superconductive material.  
 Deposition of various metals including refractory metals.  
 Deposition of insulator or semiconductor.  
 Melting of refractory metals.  
 Ideal for creating Josephson devices.

● Specifications

Type	980-7300	980-7302
Beam accelerator voltage	5kV or 4kV*1	5kV or 4kV*1
Emission current	0 to 500mA (4kV), 0 to 600mA (5kV)	0 to 500mA, 0 to 600mA (5kV)
Filament power	10Vx25A (max)	10Vx25A (max)
Coil current	±1A (max)	-
Electron beam scanning	Available	-
Electron beam scanning range	±8mm	-
Crucibles	Quantity	x1
	Size	φ22xφ18xDepth 8 (mm)
	Capacity	2.5mL
Beam deflection angle	220°	220°
Cooling water flow	3L/min*2	3L/min*2
Operating pressure	$6.7 \times 10^{-3}$ Pa or less	Same as left
Baking temperature	200°C (max)	250°C (max)
Weight	1.3kg	1kg
Attachments	Filament (x10) tool attachment fixture	Same as left
Applicable controller	EGP-230 electron gun controller EGP-212S-C sweep controller	EGP-230 electron gun controller
Typical evaporation rate example	See item in technical memorandum	Same as left

\*1 Normally shipped with 5kV specification.

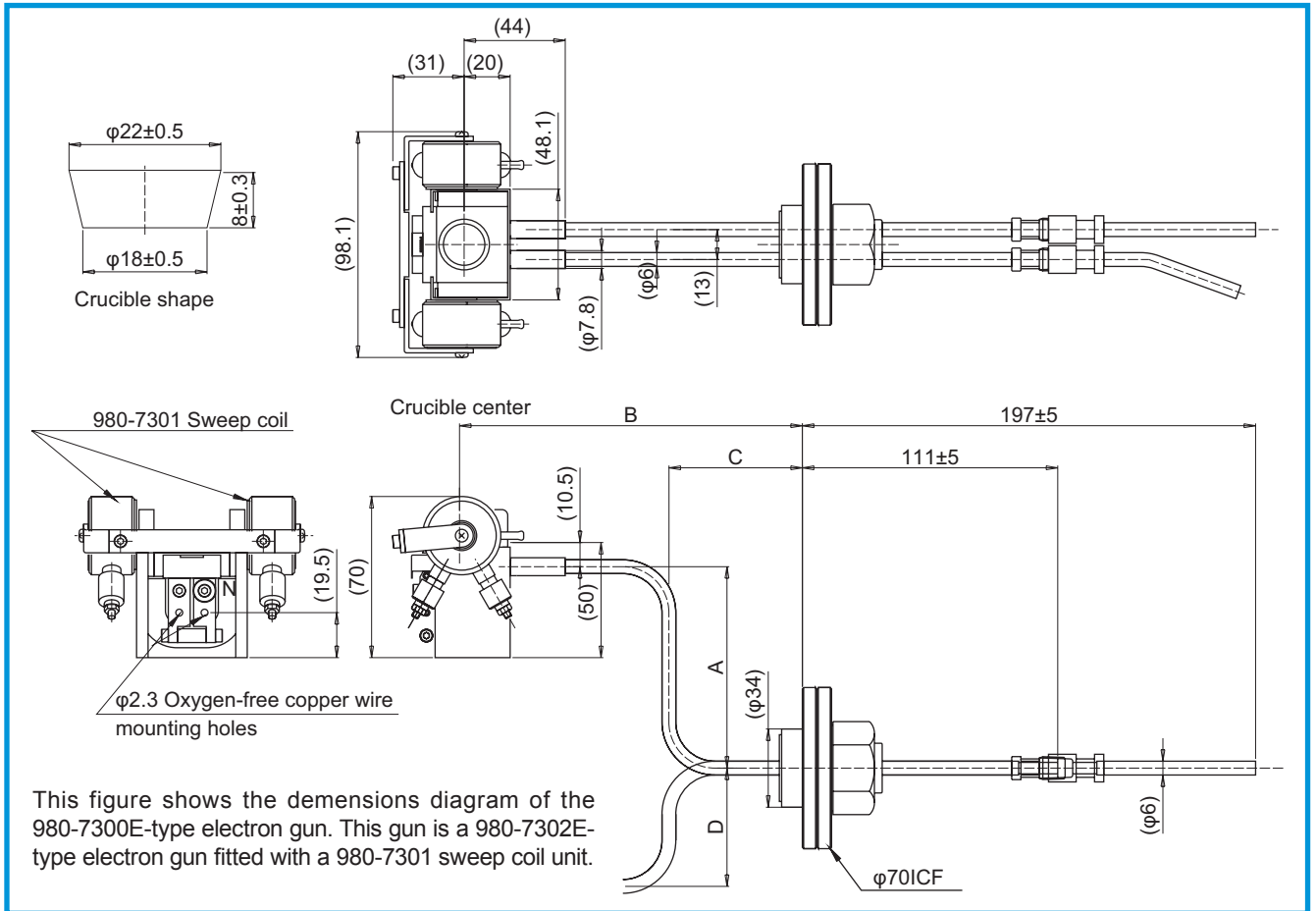
\*2 If necessary, the customer must install a boost pump to ensure a sufficient flow of cooling water.

● Water-cooled pipe dimensions

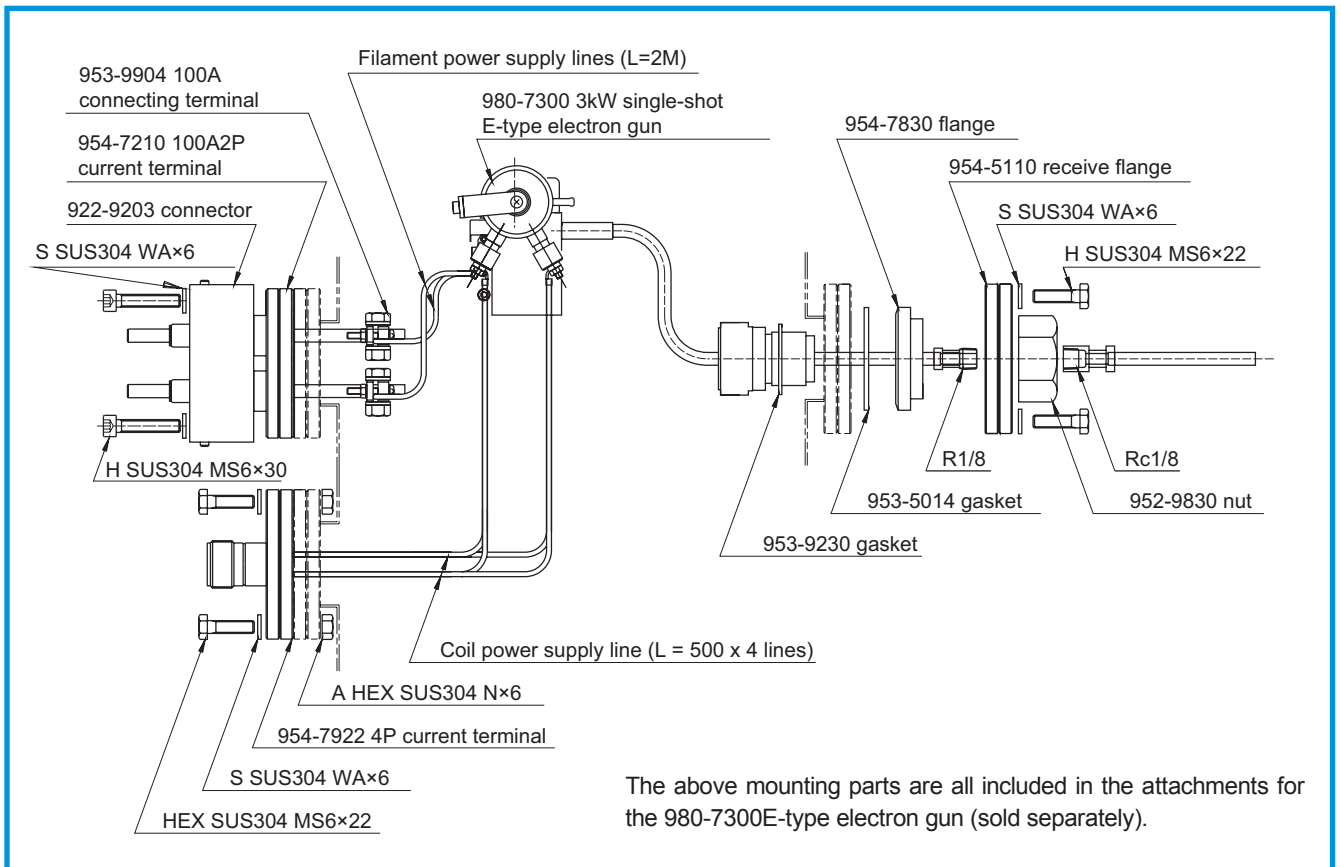
A (D)+B≤320, B-C≥76	Dimensions
A	0 or 50 to 180 (upward)
D	0 or 50 to 180 (downward)
B	119 to 329/69 to 329 (when A = D = 0)
C	43 to 260



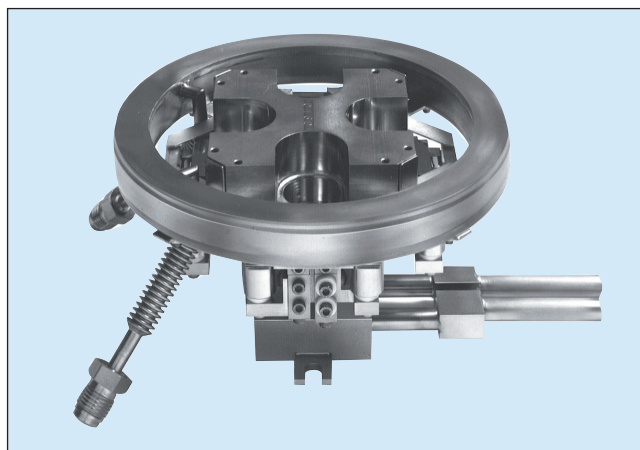
• Dimensions diagram



• Attachment method



■ 980-7401 3kW four source E-type electron gun  
(for laboratory use)



● Specifications

Type	980-7401	
Beam accelerator voltage	5kV	
Emission current	0 to 600mA	
Filament power	10Vx30A (max)	
Coil current	DC ±2A	
	AC 5A <sub>p-p</sub> 400/40Hz	
Electron beam scanning	Available	
Crucibles	Quantity	x4
	Size	φ24xφ20xDepth 10 (mm)
	Capacity	3.8mL
Beam deflection angle	225°	
Cooling water flow	14L/min (main unit)/0.5L/min (coil)*	
Operating pressure	10 <sup>-2</sup> Pa to 10 <sup>-8</sup> Pa	
Baking temperature	200°C (max, with cooling water flowing)	
Weight	5kg	
Attachments	Filament (x10) tool attachment fixture	
Applicable controller	EGP-230 electron gun controller x4 EGP-212S-D sweep controller, x1	
Simultaneous deposition rate	See item in technical memorandum	
Control example		

\* If necessary, the customer must install a boost pump to ensure a sufficient flow of cooling water.

● Features

1. Capable of stable, separate control of four sources with largely different saturated vapor pressures, such as Y, Ba, and Cu, in spite of its remarkably compact size of φ171×100mm.
2. The distance between the crucibles is 60mm (42mm minimum). This provides for excellent on-board mixing ratio distribution and deposition distribution of different elements. Each crucible is also surrounded by a copper hearth to prevent cross contamination.
3. The special circuit (patent pending)<sup>\*1</sup> minimizes the harmful effect of secondary and reflecting electrons.
4. Designed for simple, easy maintenance, such as easy replacement of the filament, taking into consideration useage for the gun under extreme conditions such as in an oxygen environment.
5. High speed electron beam sweep, enabling smooth deposition of insulators. (Patent pending)<sup>\*2</sup>
6. Flange mount type available.  
Flange mount type product: 980-7006 deposition unit

● Applications

Multi-source deposition equipment mainly for high-temperature superconductive thin-film creation experiments

Other general experimental multi-source deposition equipment

Experimental multi-layer film deposition equipment

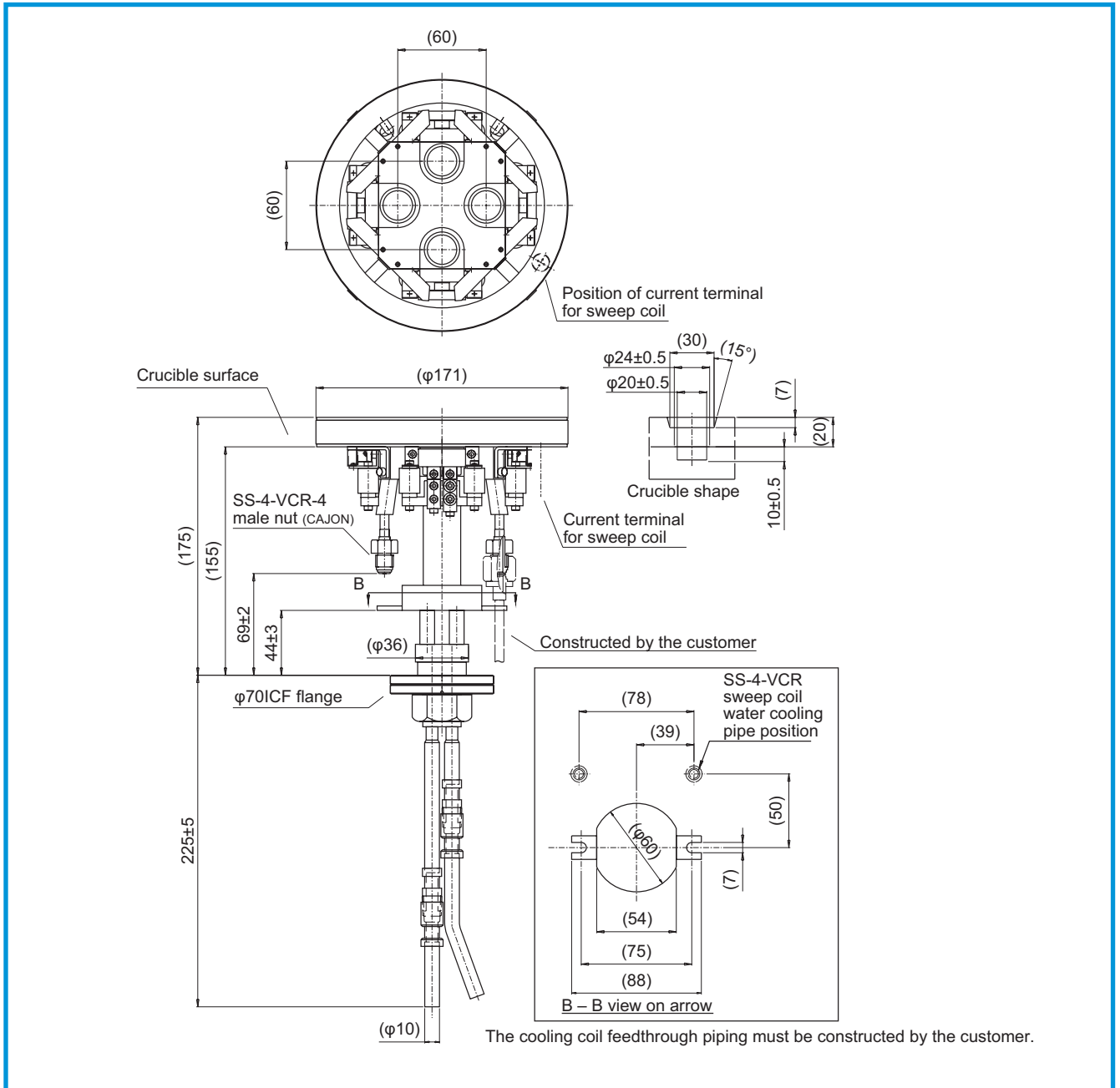
\*1, \*2

Patented in the United States and Taiwan

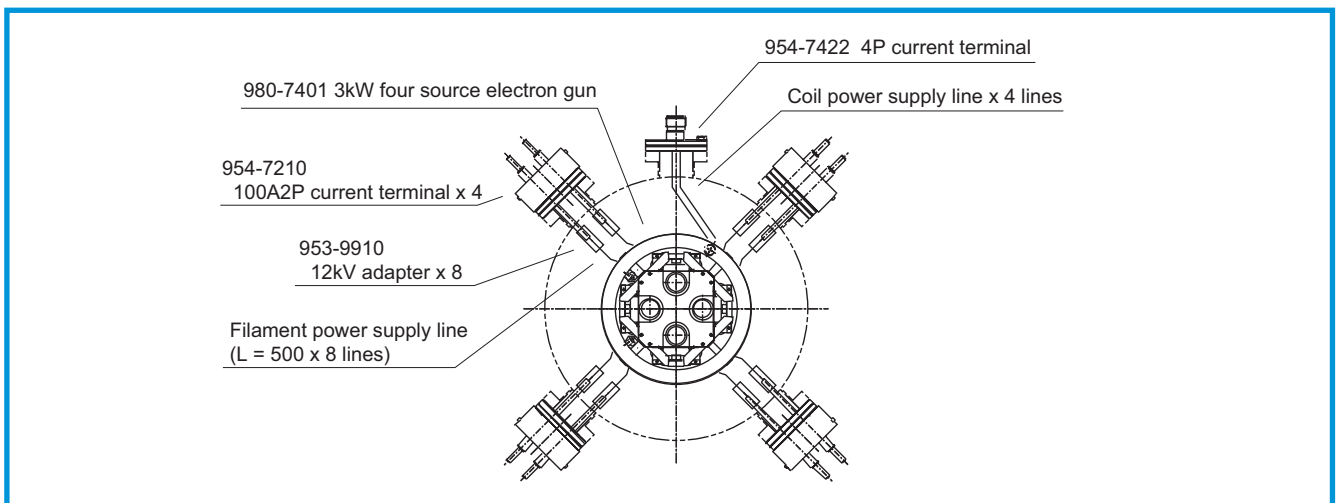
US Patent Number : 5034590

Taiwan Patent Number : 044859

• Dimensions diagram



• Attachment method



# Electron Gun Controllers

## ■ 922-9203 2kW E-type electron gun controller



This high-voltage DC power source is designed for E-type electron guns.

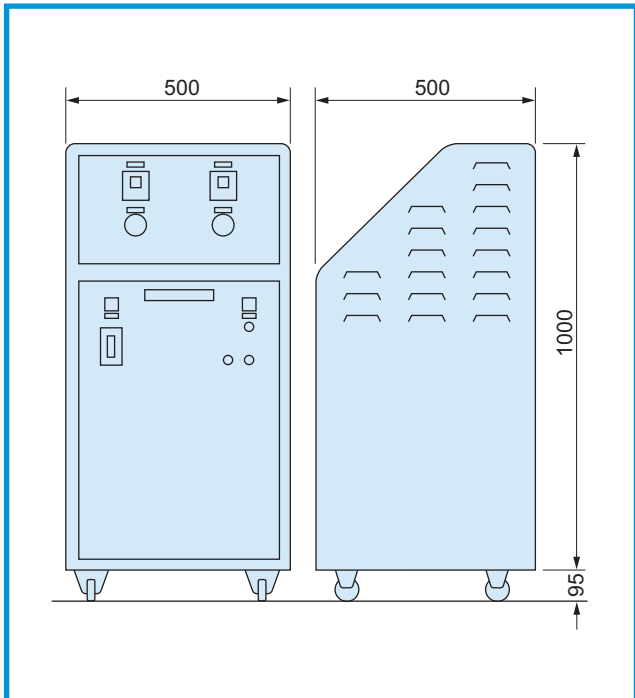
### ● Features

1. Compact, affordable high-voltage DC power source that is easy to handle.
2. Built-in circuits prevent discharge and water shortage of the electron gun.

### ● Specifications

DC output voltage	-3.5kV DC to -4.6kV
DC output current	DC0 to 500mA
Filament output	10V ACx30A
Input requirement	200V ACx15A 1φ50/60Hz A ground
Dimensions	W500xD500xH1200
Weight	130kg
Operation	Manual operation from front panel only (No external control function)
Applicable electron gun	980-7100, 980-7102 980-7104

### ● Dimensions diagram



### ● Attachments

Input code (5m)	x1
Output cable assembly (3m)	x1
Protection cord (3m)	x1
Ground cord (5m)	x1
Fuse (5A)	x3
Return cable (5m)	x1

(Note) Use the EGP-230 or EGP-210RS if deposition rate control in combination with the deposition controller is required. This is necessary because emission cannot be changed by external control.

## ■ EGP-230 3kW E-type electron gun controller

This high-voltage DC power source is designed for the 2kW to 3kW small E-type electron guns.



### ● Features

1. The function used to externally control the emission can be used to control the rate using signals from film thickness controllers such as the Inficon XTC/2.
2. An absolute value input method is used for emission control, allowing direct input with either 0 to +10V or 0 to -10V.
3. HV ON/OFF and the amount of emission can be controlled externally, enabling automation of the equipment.
4. Circuits are built in to prevent discharge, together with various protective functions such as a panel with a limit switch.

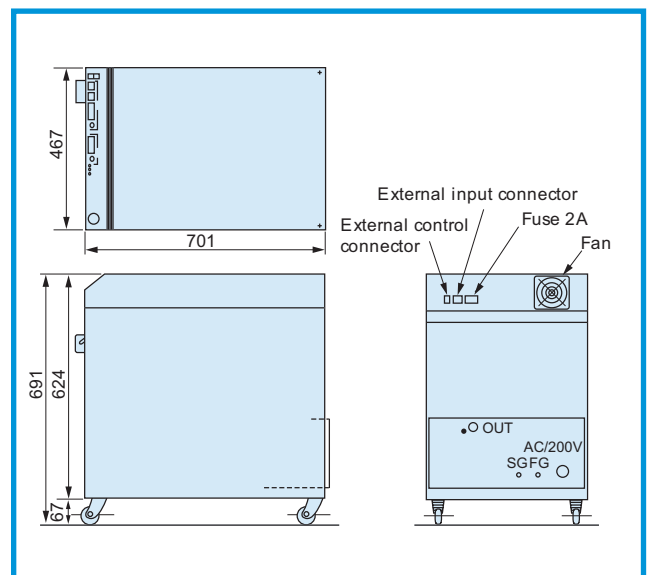
### ● Attachments

Input cable (5m)	x1
Output cable (5m)	x1
Return cable (5m)	x1
Fuse (2A)	x2
Fuse (0.5A)	x1
External controller connector	x1
Manual	x1

### ● Specifications

Item	Specifications
Power input	200V AC±10% x11A 3φ 50/60Hz, A ground
Input voltage	3810VA (efficiency 78%)
Output voltage (power)	0 to 5kV DC (3kW)
Output voltage control method	Electric slidax feedback
Output current (emission)	0 to 600mA (High: 0 to 600mA Low: 0 to 60mA)
Emission current control method	Thyristor phase control
Filament output	8/6V ACx35A (Switched with internal connector)
Protective function	<ul style="list-style-type: none"> <li>• Limit switch installed on each panel</li> <li>• External protection support (Example, vacuum, cooling water, HV connector)</li> <li>• Over-current protection (Operates at approx. 780mA or more)</li> </ul>
External emission Control input	Absolute value circuit: 0 to -10V or 0 to +10V input allowed
External input function	<ul style="list-style-type: none"> <li>• High-voltage HV ON / OFF possible</li> <li>• Protection input</li> </ul>
Dimensions	W467xH691xD701mm
Weight	Approx. 150kg
Applicable electron gun	980-7100, 980-7102 980-7300, 980-7302 980-7104, 980-7401

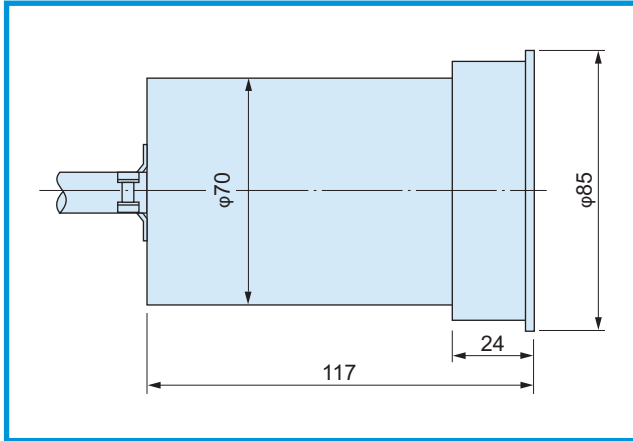
### ● Dimensions diagram



### ■ Notes on attaching the output cable

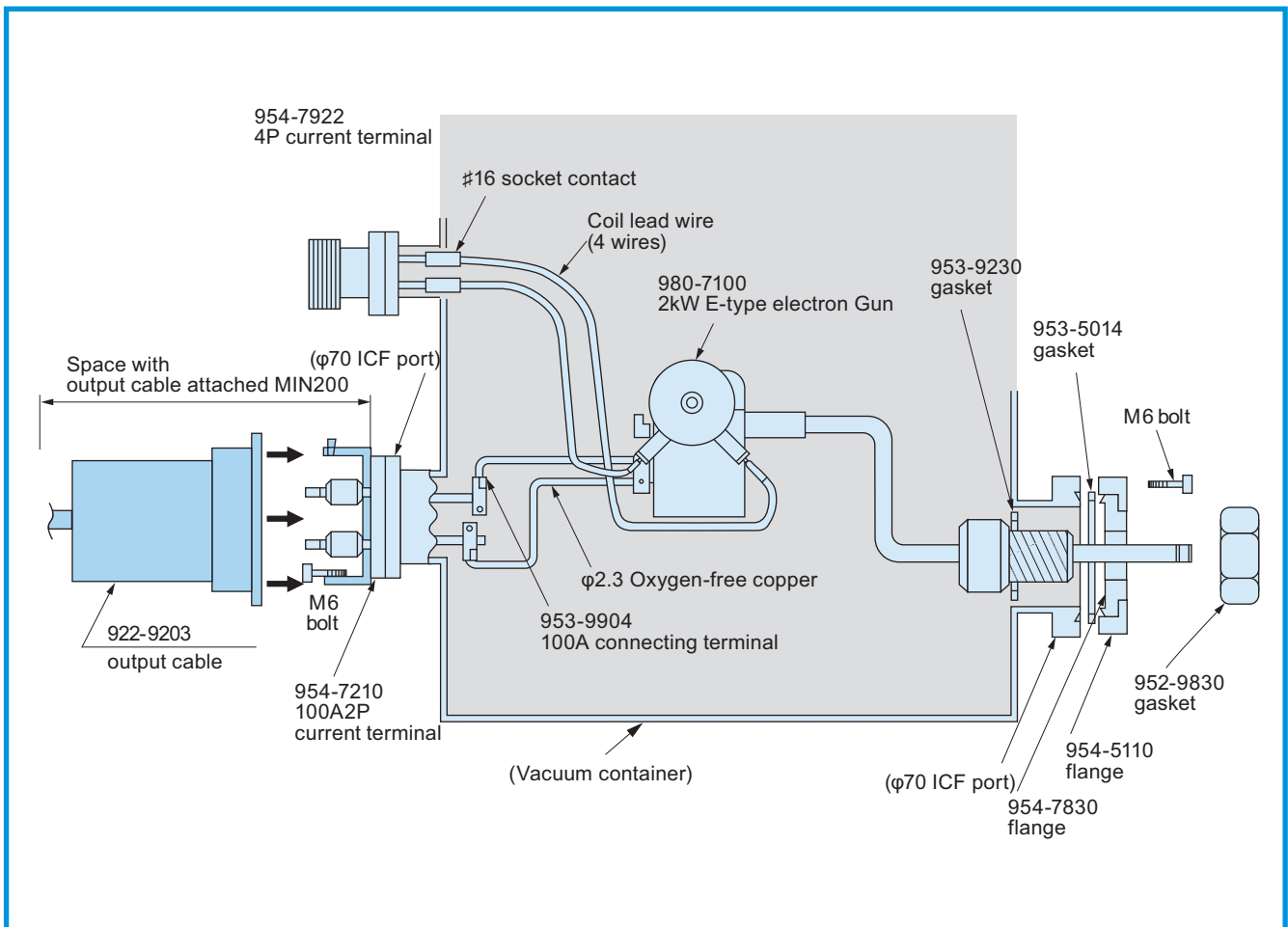
When using an E-type electron gun, space for connecting the output cable from the controller must be provided.

One 922-9203 output cable (2P connector ×1) (up to four for the 3kW source E-type electron gun) is used for the 2kW and 3kW E-type electron guns.



922-9203 output cable

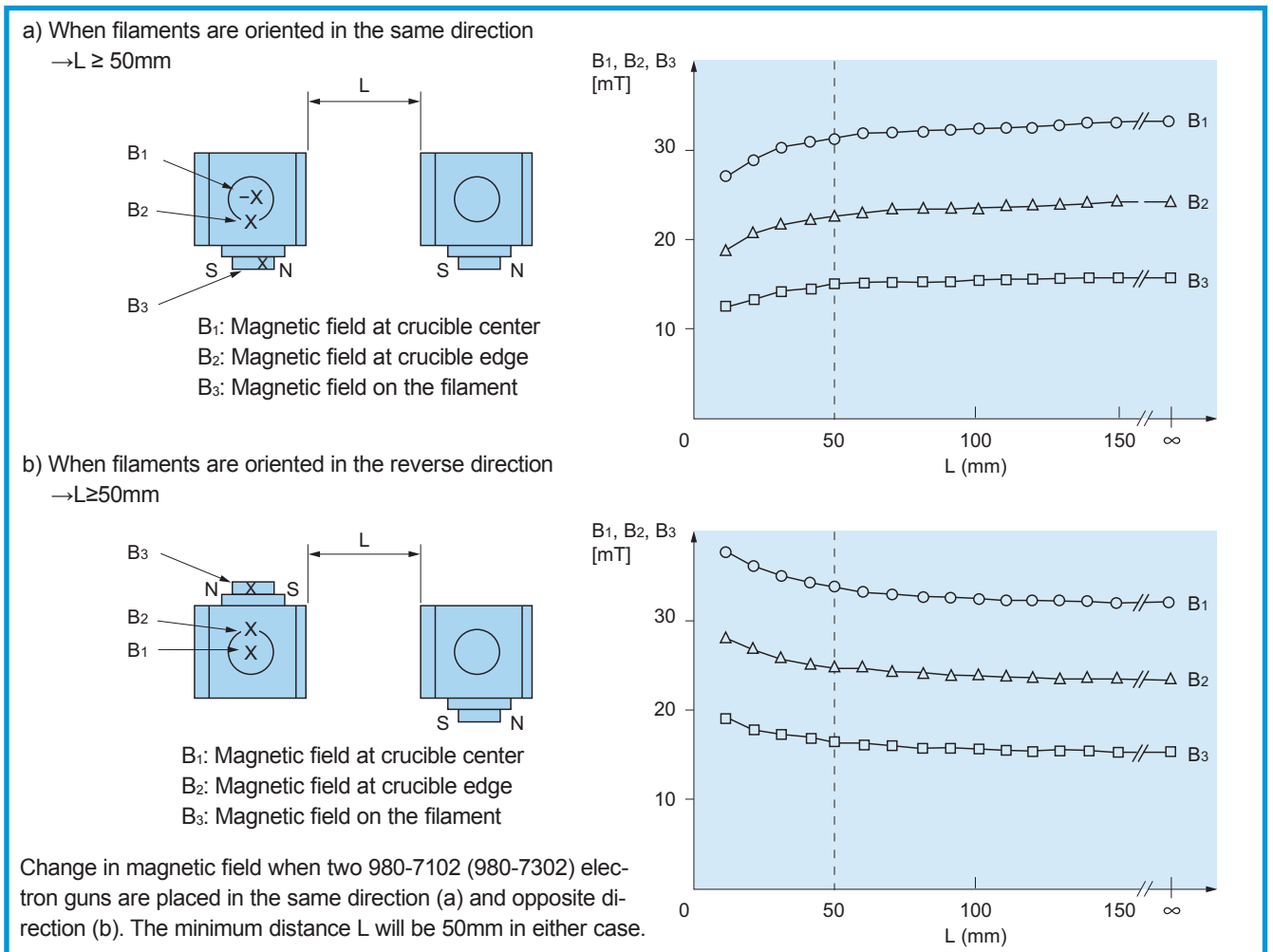
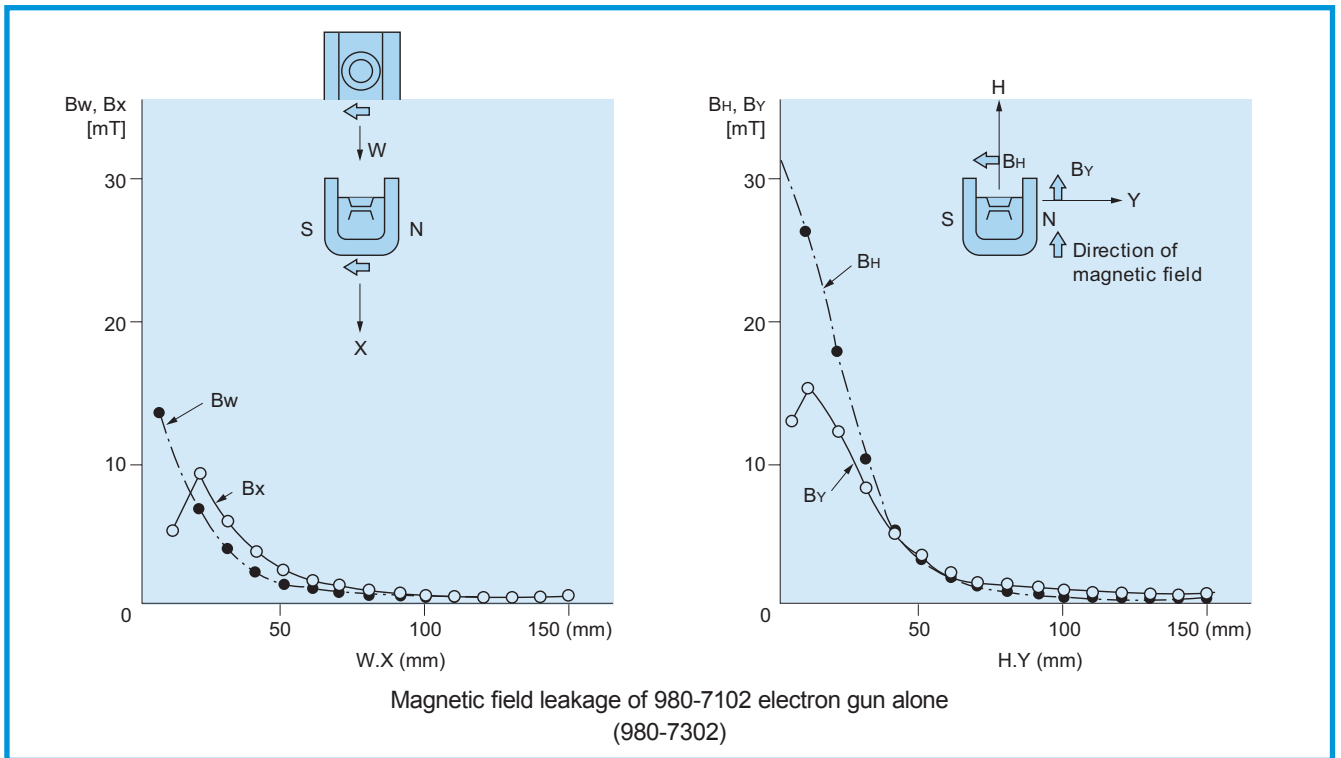
### ● Example of attaching the output cable (for the 980-7100 2kW E-type electron gun)

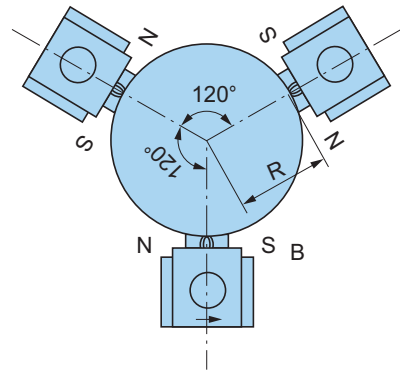
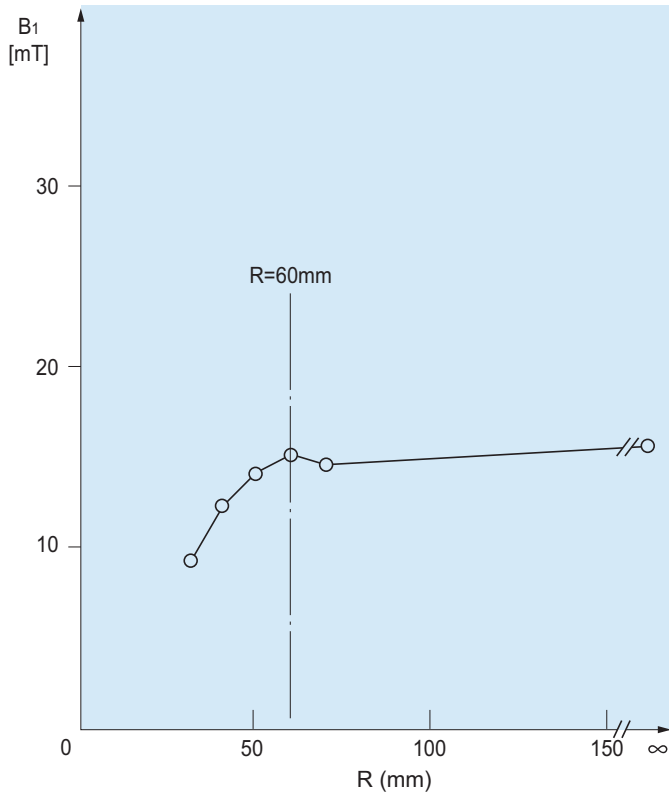


• **Notes on installing multiple 2kW electron guns**

When installing more than one 2kW electron gun in the same chamber, they must be kept sufficiently apart to prevent mutual interference due to electro-

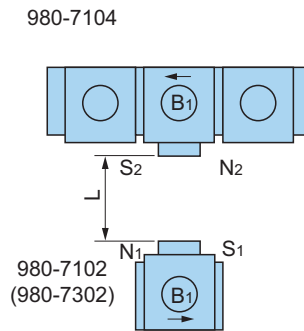
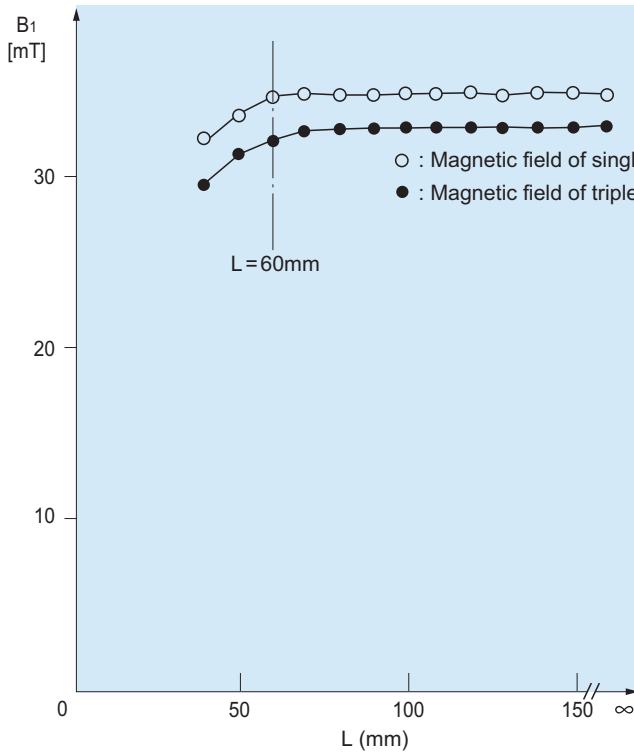
magnetic field leakage. Otherwise, the beam convergence and bombarding location will be adversely affected. Refer to the following data to determine the arrangement of the actual electron guns.





B<sub>1</sub> : Magnetic field on the filament  
 ← : Direction of magnetic field

Relationship between the radius (R) and magnetic field when the 980-7102 (980-7302) electron gun is placed on the same circumference. Minimum radius R=60mm.



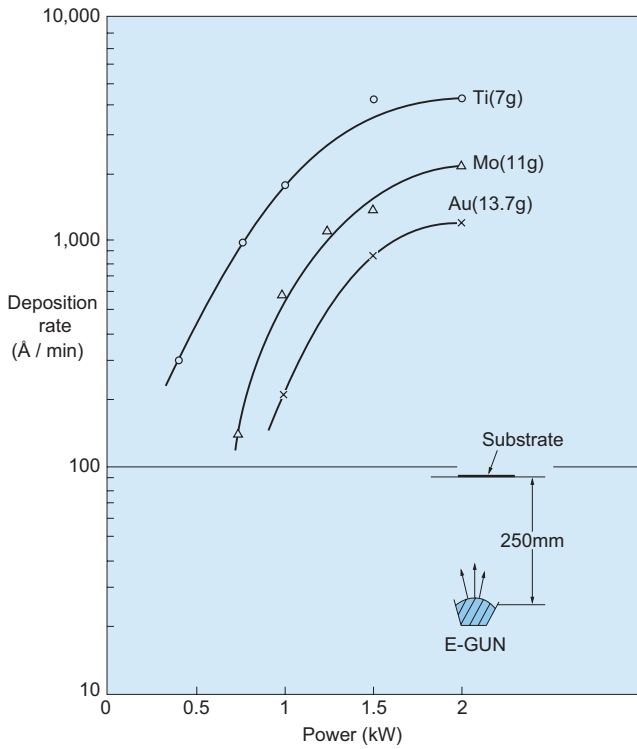
B<sub>1</sub> : Magnetic field at crucible center  
 ← : Direction of magnetic field

Relationship of the distance (L) and magnetic field between the 980-7104 2kW triple-barrel electron gun and 980-7102 (980-7302) electron gun. Minimum dimensions L=60mm.



■ Technical Notes • Typical deposition rate example

(The data in this section is the average of the typical deposition rates measured with a crystal thin film meter 250mm above a crucible using our E-type electron guns.)



Deposition rate of 2kW E-type electron gun  
 Electron gun: 980-7102 E-type electron gun  
 Sample volume: Shown in parentheses

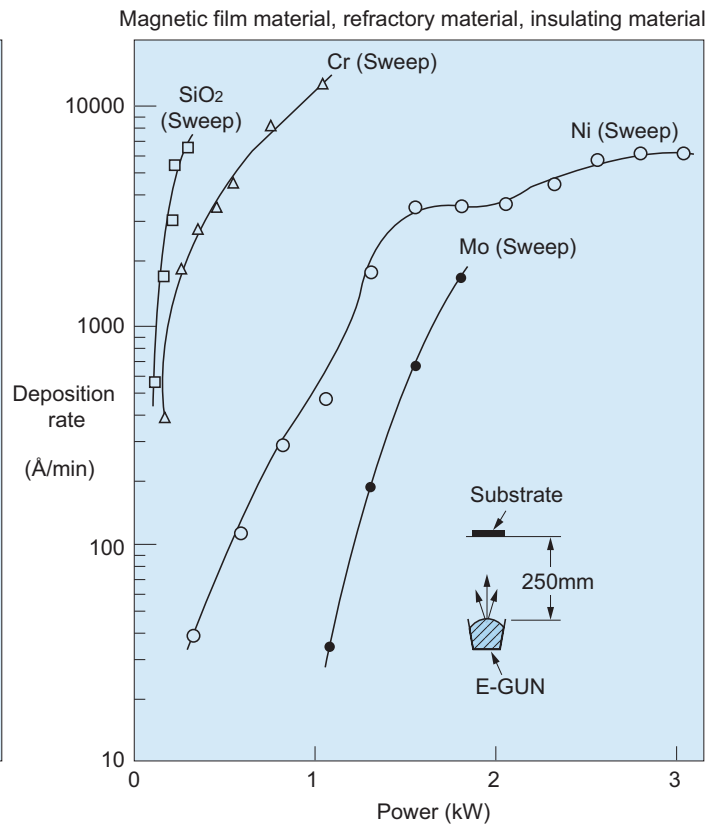
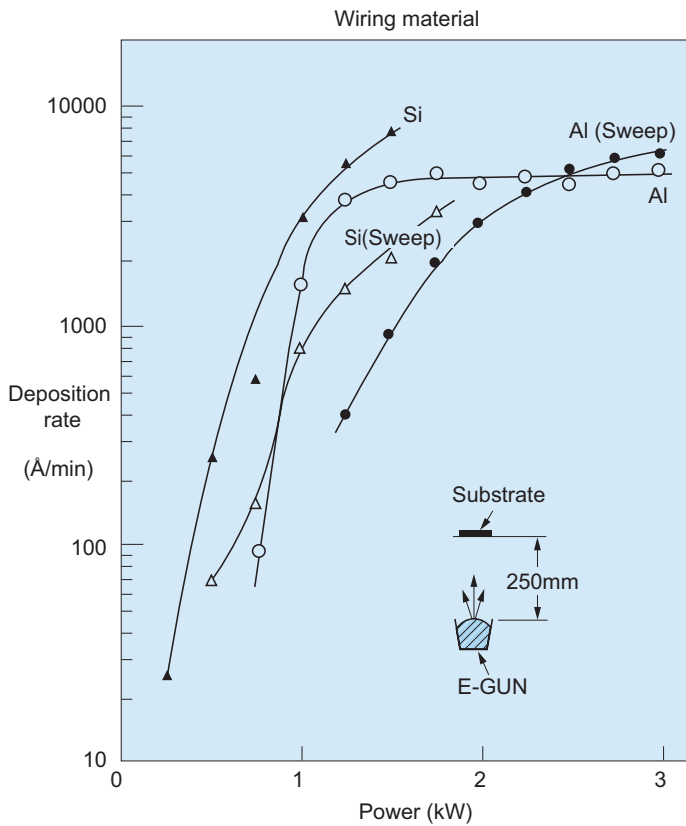
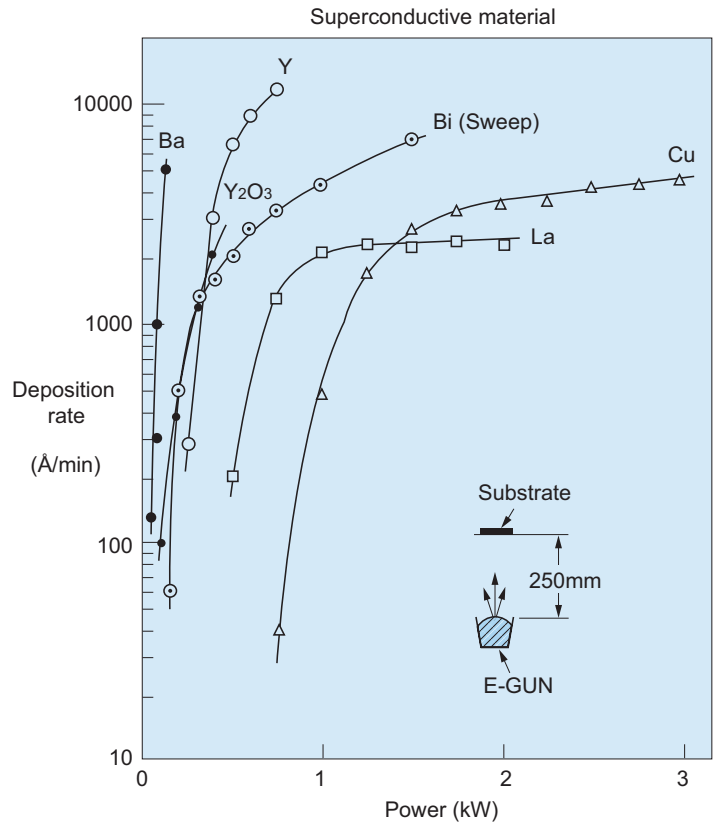
980-7300 Deposition rate of 3kW single-shot E-type electron gun with sweep

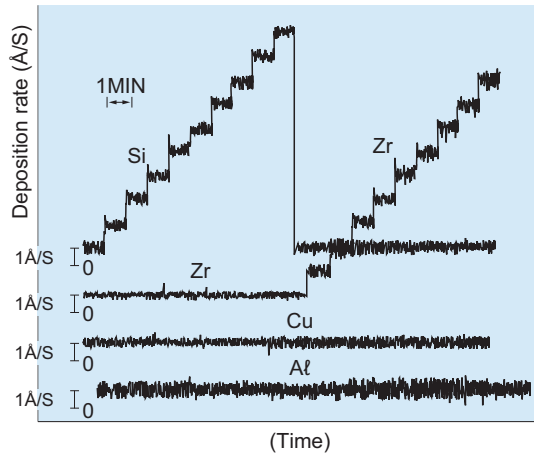
Electron Gun : 980-7300

Sample volume : 2.5mL

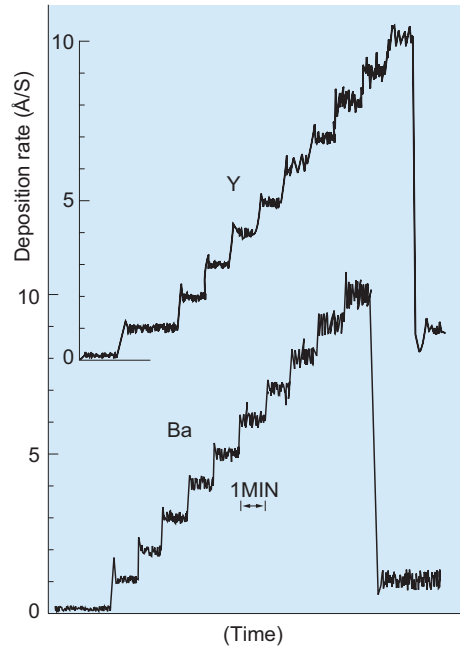
Sweep : Those that are indicated as sweep  
(Bi, AL, Si, Cr, Mo, SiO<sub>2</sub>).  
Others are stationary.

The deposition rate described here is just a measurement example. The deposition rate characteristic depends on factors such as the sample volume, surface condition, degree of vacuum, and sweep status.





Four source simultaneous deposition rate Control example (Si, Zr, Cu, Al)



Y, Ba simultaneous rate control example

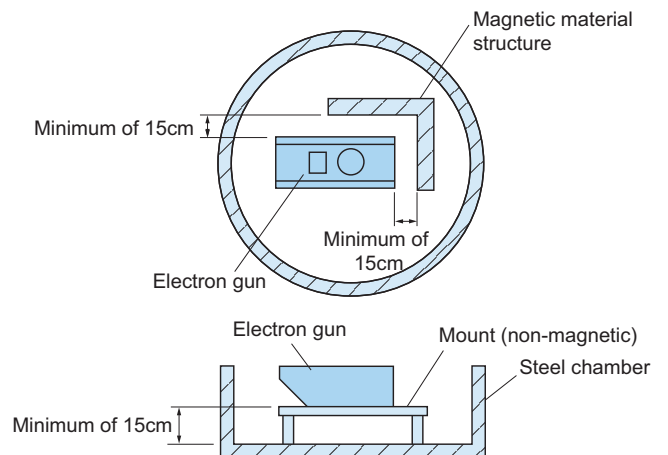
Rate control example with 3kW four source E-type electron gun (Tetra gun)  
 Electron gun: 980-7401 E-type electron gun  
 Control: With crystal film thickness controller

• Precautions on installing the electron gun

For E-type electron guns, the electron beam is deflected by the magnetic field of the gun. Therefore, if a magnetic structure is in the vicinity of the electron gun, the magnetic field of the gun will be affected and the bombarding location of the electron beam changed. In extreme cases, the electron beam may miss the crucible and damage the electron gun. For iron vacuum chambers, in particular, the electron gun must be at least 15cm away from the base plate of the chamber. In addition, when using a mount, use non-magnetic material such as SUS.

• On-site adjustment of the electron gun

After the E-type electron gun is delivered and installation, protective wiring, and plumbing of the water pipes have been completed, we will perform on-site adjustment of the electron gun to confirm that it is safe to use.



## ■ Ordering information

Parts number	Model	Description	Remarks	Code
<b>Electron gun</b>				
VMT-9119	980-7102	2kW Electron Beam Gun	Crucible capacity 1mL	40000
P25-05870	980-7100	2kW Electron Beam Gun	980-7102+980-7301 electron beam sweepable, crucible capacity 1mL	40001
VSM-0302	980-7104	2kW 3 Series Electron Beam Gun	For $\phi$ 300, crucible capacity 1mLx3	40010
VSM-0303	980-7104	2kW 3 Series Electron Beam Gun	For $\phi$ 400, crucible capacity 1mLx3	40011
P25-05919	980-7302	3kW Electron Beam Gun	Crucible capacity 2.5mL	40030
P25-05920	980-7300	3kW Electron Beam Gun	980-7302+980-7301 electron beam sweepable, crucible capacity 2.5mL	40031
A21-01279	980-7401	3kW Electron Beam Gun (four source)	Four source simultaneous deposition capable, 3.8mL	40040
<b>Power supply</b>				
752-0178	922-9203	Electron Beam Gun Controller	2kW single-shot, triple-barrel power supply	40500
U13-00400	EGP-230	Electron Beam Gun Controller	3kW power supply	40503
<b>Options</b>				
A26-04817	980-7301	Sweep Unit	For 2kW single-shot, 3kW single-shot	40320
594-3481	954-7912	3P Current Feedthrough	for $\phi$ 70 ICF	36163
753-0001	954-7605	Rotary Motion Feedthrough	for crucible rotation	36521

Note) Contact us for more information about CE (RoHS).

## **Vacuum Components Catalog**

**CANON ANELVA CORPORATION**

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**5-1 Kurigi 2-chome, Asao-ku, Kawasaki-shi, Kanagawa**

**Phone+81-44-980-3503 (DIAL IN)**

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English: 2nd Edition Issue 1 issued November 2014

(Based on Japanese 9th Edition Issue 1 issued May 2014)

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