COMPONENTS PORTFOLIO

CANON ANELVA CORPORATION

https://anelva.canon/en/

■ Contents

Components Portfolio

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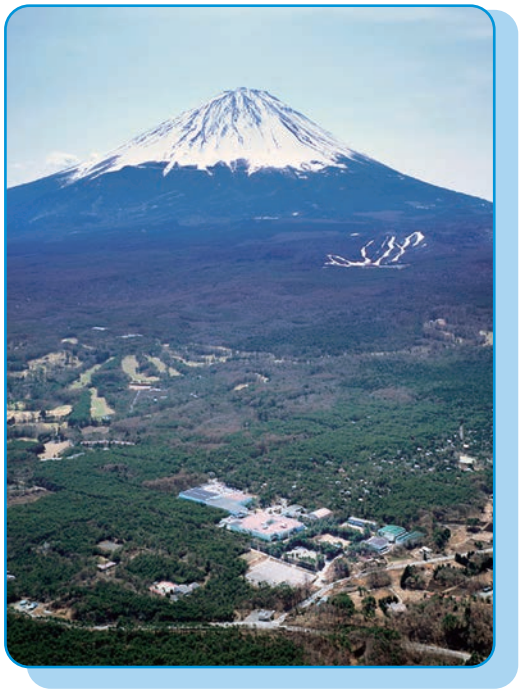
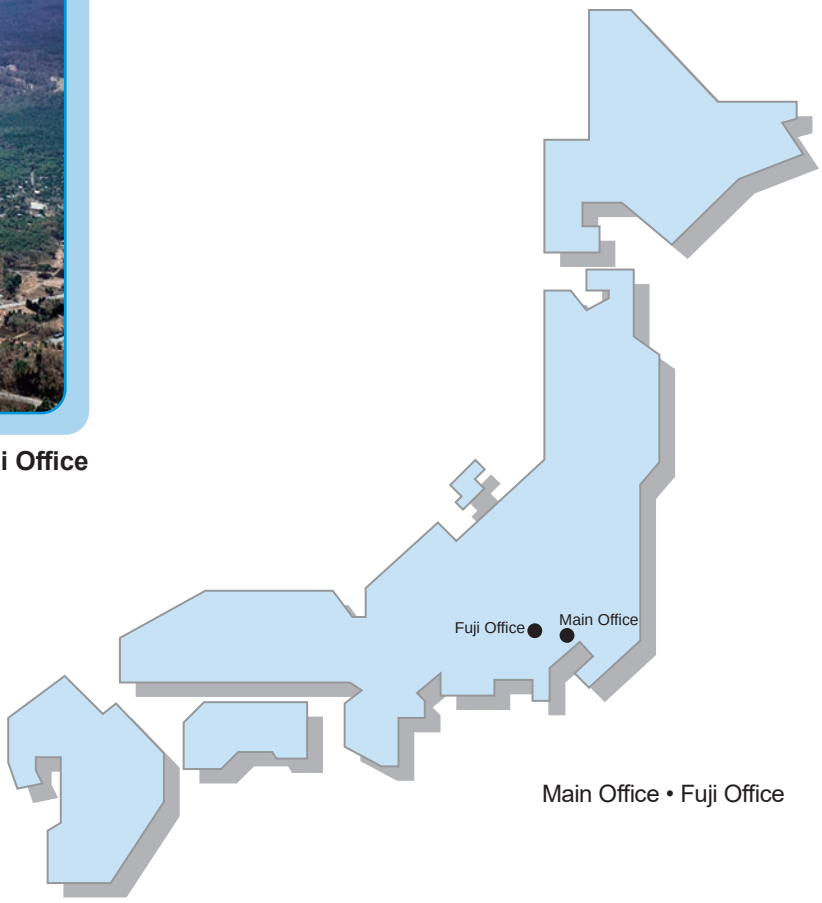


Fuji Office



Main Office • Fuji Office

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Memorandum

Measurement Instruments & Controllers

Vacuum Gauges

- Transducer Vacuum Gauge Series
- Vacuum Gauge Series

Quadrupole Mass Spectrometer

- Transducer type
- Vacuum Gauge Series

Leak Detectors

- Helium Leak Detectors

Excellent cost performance

Transducer Vacuum Gauge Series

■ Summary

Transducer vacuum gauges that can handle a wide range of pressures from atmospheric pressure to 10^{-8} Pa.

These vacuum gauges can be used in various industries as well as R&D, including cutting-edge semiconductor and flat panel manufacturing equipment.

They offer excellent cost performance with their compact design and reduced wiring demands, and are environmentally friendly, achieving a CE marking*1 and RoHS compliance.

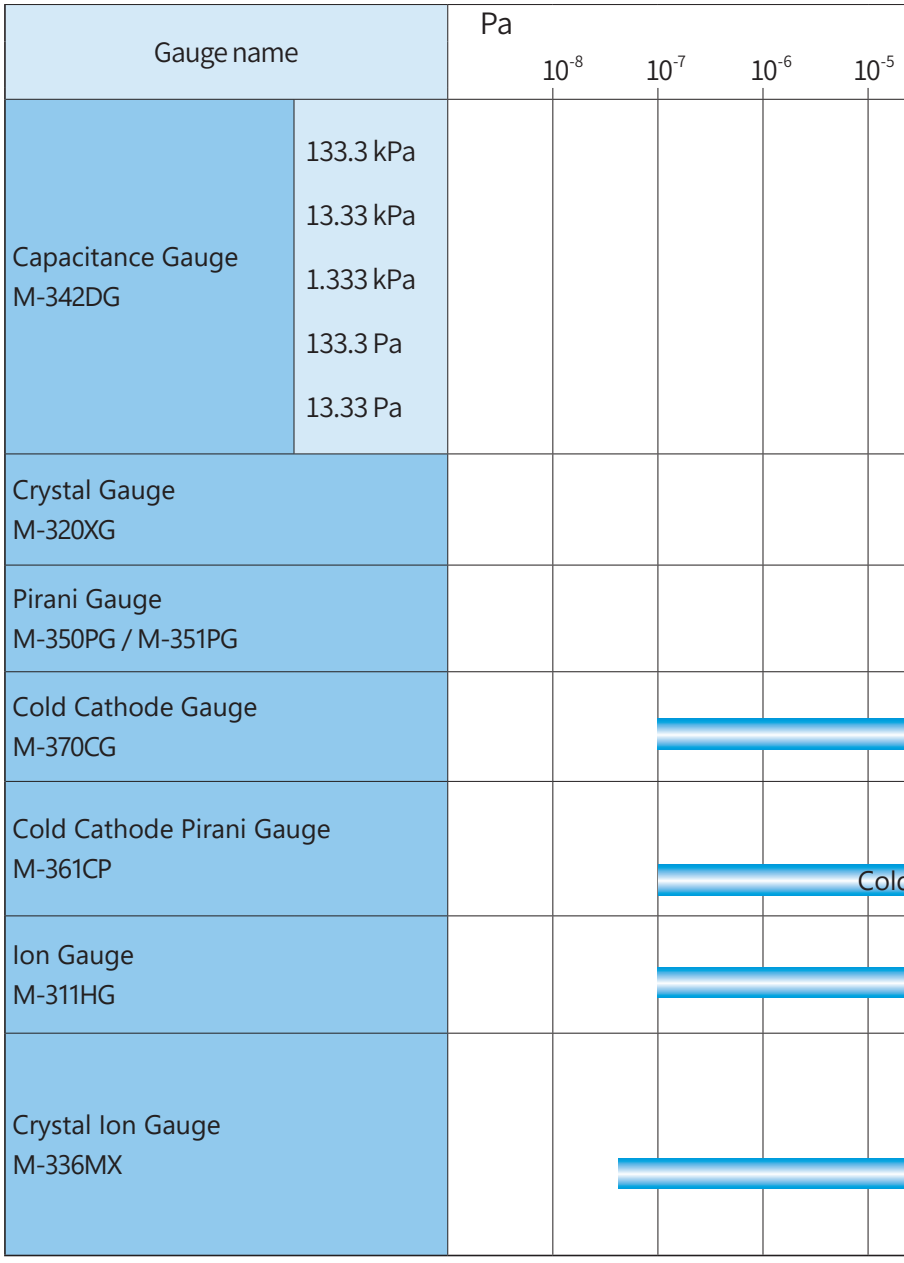
● Features

- A lineup of vacuum gauges with various features
- Covers a wide range from atmospheric pressure up to 10^{-8} Pa
- Combined sensor and control unit is compact and reduces wiring needs
- A lineup with various output types to meet the demands of your application
- A line up of displays to meet the demands of your application (compatible with all models)
- CE marking*1, RoHS compliant

● Applications

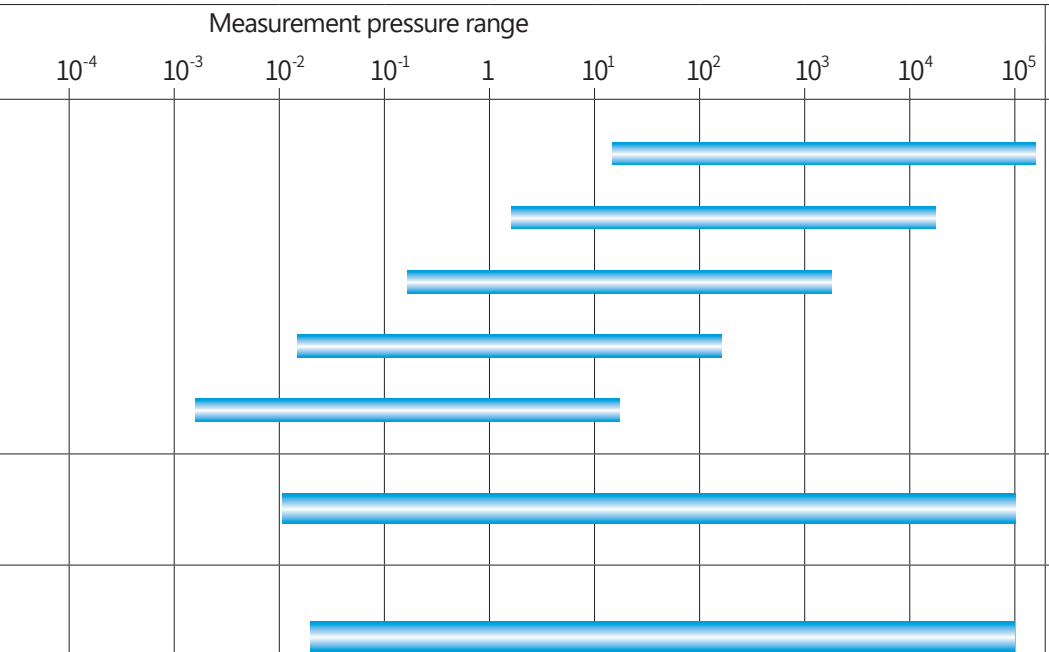
Supports a wide range of measurements from R&D to industrial equipment

- Semiconductor manufacturing equipment
- electronic component manufacturing equipment
- Accelerator-related equipment
- Space chambers
- Electron beam equipment
- Various analyzers
- Other vacuum devices
- Food products , Medical applications



※1 The Crystal Gauge M-320XG does not have a CE marking.

CE ※1
RoHS



Features
• High-precision and stable absolute pressure measurement • Compact,low power consumption
• High-precision measurement in low vacuum conditions • Atmospheric pressure sensor function
• Light and compact, low-cost • Supports a wide range of applications
• Handles a wide range of processes • Low maintenance costs
• Reduce costs with a dual-purpose device • Handles a wide range of processes
• Trustworthy sensors with proven performance • High-precision pressure measurement
• Reduce costs with a dual-purpose device • High-precision pressure measurement • Atmospheric pressure sensor function • Filament lifespan detection feature (optional)

Capacitance Gauge

M-342DG

CE
RoHS

■ Summary

This temperature-corrected diaphragm vacuum gauge can measure absolute pressure stably with high precision, as the impact of the external environment is minimized through the use of a small-sized silicon MEMS chip in the pressure sensor.

■ Features

1. High precision, stable pressure measurement
   - Excellent zero point stability
   - Low temperature dependence
   - Excellent vibration resistance
2. Compact and low power consumption
   - Weight 200 g、Size W46 mm × H49 mm × L106 mm compact, lightweight ※1

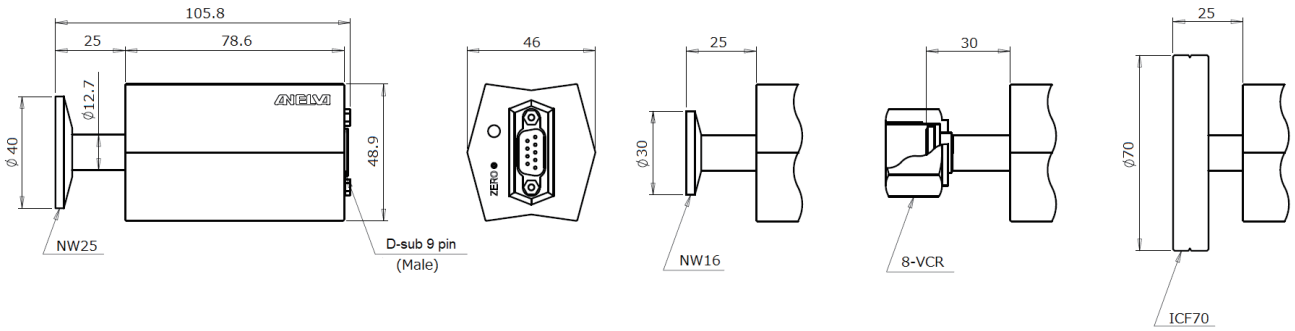
     ※1:Size and weight of the coupling NW16 specifications
   - Power consumption 0.5 W

※ Not suitable for applications where corrosive gas is used. Please consult us for details.

■ Specifications

Type		Capacitance Gauge				
		M-342DG-1D	M-342DG-1N	M-342DG-11	M-342DG-12	M-342DG-13
Full Scale Pressure	(Pa)	13.33	133.3	1.333 k	13.33 k	133.3 k
Accuracy	(% of reading)	0.20 (at 23°C)				
Zero Temperature Coefficient	(% of full-scale/°C)	0.01	0.005	0.002		
Span Temperature Coefficient	(% of reading/°C)	0.01		0.005		
Resolution	(% of full-scale)	0.01	0.005			
Lowest Reading	(% of full-scale)	0.01				
Lowest Suggested Pressure for Reading	(% of full-scale)	0.05				
Lowest Suggested Pressure for Control	(% of full-scale)	0.5				
Response Time	(ms)	100	30			
Pressure Limit		200 kPa (However, the internal pressure of NW16 and NW25 must not become positive.) *130 kPa (Absolute pressure) for M-342DG-1D type				
Input Voltage	(VDC)	+13.5 ～ 26.4				
Power Consumption	(W)	0.5				
Analog Output	(VDC)	0 ～ 10				
I/O connector		D-sub 9 pin male (mating screw: #4-40 inch)				
Maximum Cab le Length	(m)	100 (0.3 mm^2)				
Zero Adjustment Methods		Push Switch / Remote				
Operating Temperature/ Storage Temperature	(°C)	0 ～ 50 ／ -20 ～ 70 (Not operating)				
Gas contacting part material		Stainless steel、Si、Glass、Fluorine Rubber				
Dimensions	(mm)	105.8 ×48.9 ×46 (NW25)				
Fitting Type, Weight		NW16（200 g）、NW25（210 g）、8-VCR Fimele（250 g）、ϕ 70ICF（460 g）				
Conformity		CE marking、RoHS、IP40				

Dimensions diagram



Ordering information

Part Number	Model	Discription	Remarks	Code
8B1-0011-240	M-342DG-1D-N16	Capacitance Gauge (13.33 Pa)	With NW16 flange	22735
8B1-0011-241	M-342DG-1D-N25		With NW25 flange	22736
8B1-0011-242	M-342DG-1D-C70		With ϕ 70ICF flange	22737
8B1-0011-243	M-342DG-1D-VC8		With 8-VCR (Fimele)	22738
8B1-0011-206	M-342DG-1N-N16	Capacitance Gauge (133.3 Pa)	With NW16 flange	22710
8B1-0011-207	M-342DG-1N-N25		With NW25 flange	22711
8B1-0011-208	M-342DG-1N-C70		With ϕ 70ICF flange	22712
8B1-0011-209	M-342DG-1N-VC8		With 8-VCR (Fimele)	22713
8B1-0011-193	M-342DG-11-N16	Capacitance Gauge (1.333 kPa)	With NW16 flange	22715
8B1-0011-194	M-342DG-11-N25		With NW25 flange	22716
8B1-0011-195	M-342DG-11-C70		With ϕ 70ICF flange	22717
8B1-0011-196	M-342DG-11-VC8		With 8-VCR (Fimele)	22718
8B1-0011-173	M-342DG-12-N16	Capacitance Gauge (13.33 kPa)	With NW16 flange	22720
8B1-0011-174	M-342DG-12-N25		With NW25 flange	22721
8B1-0011-166	M-342DG-12-C70		With ϕ 70ICF flange	22722
8B1-0011-175	M-342DG-12-VC8		With 8-VCR (Fimele)	22723
8B1-0011-168	M-342DG-13-N16	Capacitance Gauge (133.3 kPa)	With NW16 flange	22725
8B1-0011-169	M-342DG-13-N25		With NW25 flange	22726
8B1-0011-170	M-342DG-13-C70		With ϕ 70ICF flange	22727
8B1-0011-171	M-342DG-13-VC8		With 8-VCR (Fimele)	22728

Crystal Gauge

M-320XG

RoHS

Summary

Achieves high-precision atmospheric pressure measurement with excellent repeatability by using a crystal resonator in the pressure sensor.

It can also be used as an atmospheric pressure sensor.

Features

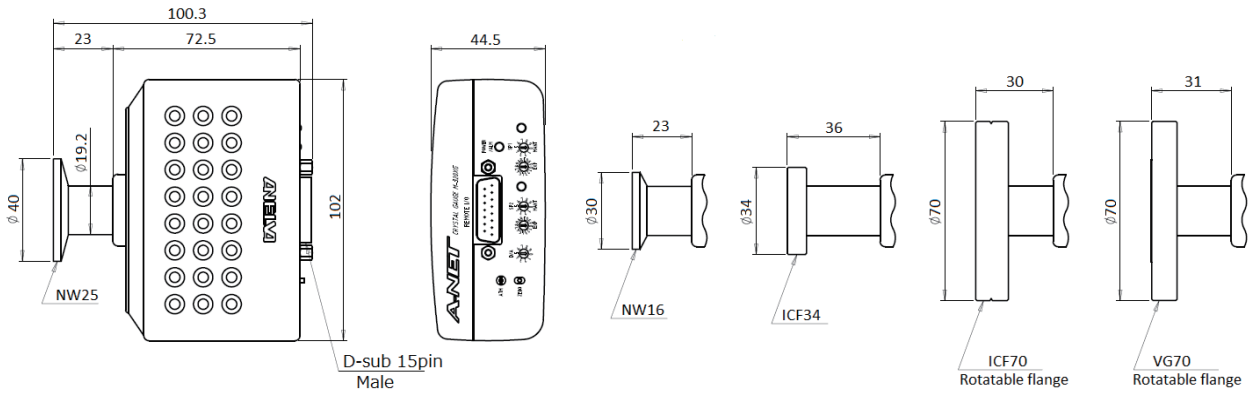
- High-precision measurement in low vacuum conditions
- Atmospheric pressure sensor function
- Vacuum gauge without filament (heat source)
- Replaceable sensor

Specifications

Type	M-320XG
Pressure measurement range	10^{-2} ～ 1×10^{5} Pa
Accuracy	±20%：1×10^{-1} ～ 1×10^{0} Pa ±15%：1×10^{0} ～ 1×10^{5} Pa (Except 1×10^{2} ～ 5×10^{3} Pa)
Repeatability	±5%：1×10^{0} ～ 1×10^{5} Pa (Except 1×10^{2} ～ 5×10^{3} Pa)
Input voltage	DC+22 ～ 33 V
Power consumption	2 W
Power consumption (pressure signal)	DC 0 ～ 10 V：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 (1×10^{1}、1×10^{2}、1×10^{3}、1×10^{4}、1×10^{5} Pa)
Set point	2 contact output (1A 30V, DC) (photocoupler output)
Remote I/O	INPUT: ① Gas type setting Switch with 2 bit signal ② Zero adjustment ③ AATM setting OUTPUT: 2 set point outputs
I/O connector	D-sub15 pin (Pin type)
Maximum Cable Length	300 m (0.34 mm^2) ※1
Zero adjustment	Push switch or software adjustment by remote I/O
Operating Temperature	5 ～ 50°C
Storage Temperature	-20 ～ 70°C (not operating)
Sensor allowable temperature range	150°C MAX (Without electronics)
Suitable sensor	XG1
Sensor material (main component)	Sensor : Quartz resonator Case : Stainless steel Insulator：Kovar glass
Dimensions	100.3 × 102 × 44.5 mm (NW25)
Flange shape and weight	NW16 (225 g)、NW25 (240 g)、φ34ICF (245 g)、φ70ICF (485 g)、VG70 (420 g)
Conformity	RoHS

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

Dimensions diagram



Ordering information

Part Number	Model	Discription	Remarks	Code
8B1-0010-414	M-320XG/N16	A-NET Crystal Gauge	With NW16 flange	21561
8B1-0010-415	M-320XG/N25	A-NET Crystal Gauge	With NW25 flange	21562
8B1-0010-417	M-320XG/C34	A-NET Crystal Gauge	With ϕ 34 ICF flange	21580
8B1-0010-418	M-320XG/C70	A-NET Crystal Gauge	With ϕ 70 ICF flange	21581
8B1-0010-416	M-320XG/VG70	A-NET Crystal Gauge	With ϕ 70 VG flange	21582
8B1-0013-956	XG-1/NW16	Crystal Gauge Sensor	With NW16 flange	21575
8B1-0013-957	XG1/NW25	Crystal Gauge Sensor	With NW25 flange	21576
8B1-0012-601	XG1/ICF34	Crystal Gauge Sensor	With ϕ 34 ICF flange	21577
8B1-0012-602	XG1/ICF70	Crystal Gauge Sensor	With ϕ 70 ICF flange	21578
8B1-0013-958	XG1/VG70	Crystal Gauge Sensor	With ϕ 70 VG flange	21579
8B1-0018-906	601320-005	M320 Gauge cable fOR M-601/603 (5 m)	For M-320XG-M-601 GC/603 GC display connection	22784
8B1-0018-907	601320-010	M320 Gauge cable fOR M-601/603 (10 m)	For M-320XG-M-601 GC/603 GC display connection	22785

Pirani Gauge

M-350PG / M-351PG

CE
RoHS

Summary

Light, compact and low-cost, measures from atmospheric pressure to 10^{-2} and is suitable for a wide range of applications.

Features

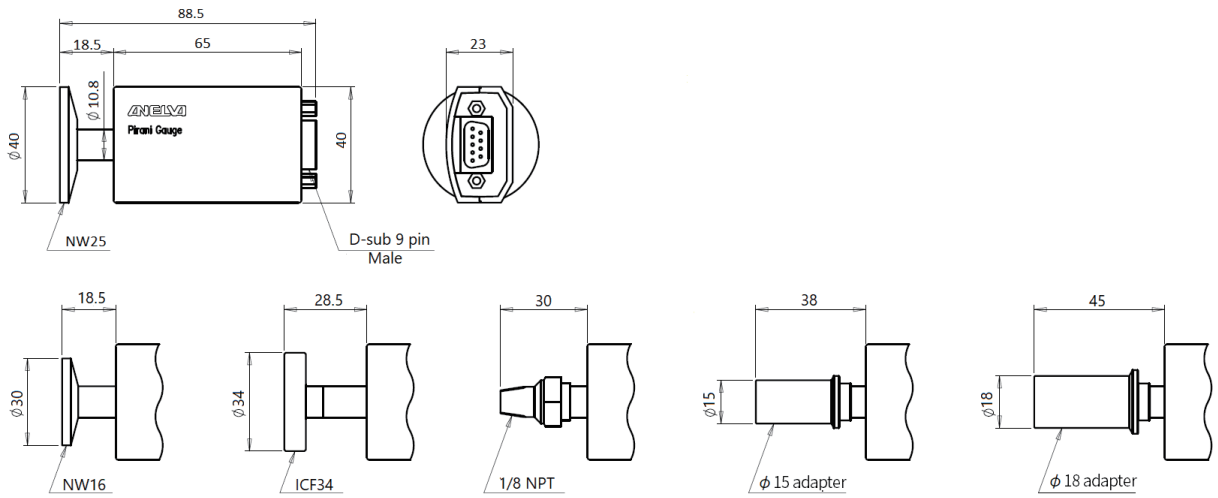
- Light and compact, low-cost
- 2 types of filaments are available (M-350: tungsten, M-351: nickel)
- Replaceable sensor

Specifications

Type		Pirani Gauge			
		M-350PG-SD Standard Type	M-350PG-SP Type with Set Point	M-350PG-RS RS485 Type ※1	M-351PG-SP Nickel filament Type with Set Point
Pressure measurement range		5×10^{-2} ～ 1×10^{5} Pa			
Accuracy		±50%：5×10^{-2} ～ 1×10^{-1} Pa ±15%：1×10^{-1} ～ 1×10^{4} Pa ±50%：1×10^{4} ～ 1×10^{5} Pa			
Repeatability		±2%：1×10^{-1} ～ 1×10^{4} Pa			
Input voltage		DC+14 ～ 30 V			
Power consumption		1 W			2 W
Analog output		0 ～ 10 V		—	0 ～ 10 V
Set point		—	2 Contact Output (1A 30V DC)		
Interface		—		RS485	—
I/O connector		D-sub 9 pin (Pin type)			
Maximum cable length		200 m (0.34 mm^2) ※2			
Zero points adjustment		Push switch			
Operating Temperature		5 ～ 60°C			
Storage Temperature		-20 ～ 70°C (at no operation)			
Sensor allowable temperature range		O-ring Type：150°C MAX (Without Electronics) Metal seal type：300°C MAX			
Allowed overload pressure		1MPa (limited to coupler shape NPT and inert gas,absolute Pressure)			
Suitable sensor		MP1			MP2
Sensor material (main component)	Filamemt	Tungsten			Nickel
	Case	Stainless steel			
	Insulator	Kovar glass			Kovar glass+Al_2O_3 coated
Dimensions		88.5 × 40 × 23 mm (NW25) Note: The outer dimensions of the flange are excluded			
Flange shape and weight		NW16、NW25、φ 34 ICF、1/8NPT、φ 15 Gauge Port、φ 18 Gauge Port			NW16、NW25、1/8NPT
		M-350PG / 351PG-SP NW16 (81 g) 、NW25 (96 g) 、1/8NPT (73 g)			
Conformity		CE marking , RoHS , IP40			

※1 The RS485 type is not compatible with the M-601/603GC display.
※2 The maximum length of the gauge cable is 100m when connecting an M-601/603GC display unit.

Dimensions diagram



Ordering information

Parts Number	Model	Description	Remarks	Code
8B1-0010-835	M-350PG-SD/N16	Pirani Gauge	With NW16 flange	22500
8B1-0010-836	M-350PG-SD/N25	Pirani Gauge	With NW25 flange	22501
8B1-0010-837	M-350PG-SD/P15	Pirani Gauge	For ϕ 15 gauge port	22502
8B1-0010-838	M-350PG-SD/P18	Pirani Gauge	For ϕ 18 gauge port	22503
8B1-0010-883	M-350PG-SD/C34	Pirani Gauge	With ϕ 34 ICF flange	22504
8B1-0010-882	M-350PG-SD/NPT	Pirani Gauge	With 1/8"NPT (male)	22505
8B1-0010-839	M-350PG-SP/N16	Pirani Gauge (w Setpoins)	With NW16 flange	22506
8B1-0010-840	M-350PG-SP/N25	Pirani Gauge (w Setpoins)	With NW25 flange	22507
8B1-0010-841	M-350PG-SP/P15	Pirani Gauge (w Setpoins)	For ϕ 15 gauge port	22508
8B1-0010-842	M-350PG-SP/P18	Pirani Gauge (w Setpoins)	For ϕ 18 gauge port	22509
8B1-0010-965	M-350PG-SP/C34	Pirani Gauge (w Setpoins)	With ϕ 34 ICF flange	22510
8B1-0010-916	M-350PG-SP/NPT	Pirani Gauge (w Setpoins)	With 1/8” NPT (male)	22511
8B1-0010-843	M-350PG-RS/N16	Pirani Gauge (RS485)	With NW16 flange	22512
8B1-0010-844	M-350PG-RS/N25	Pirani Gauge (RS485)	With NW25 flange	22513
8B1-0010-845	M-350PG-RS/P15	Pirani Gauge (RS485))	For ϕ 15 gauge port	22514
8B1-0010-846	M-350PG-RS/P18	Pirani Gauge (RS485)	For ϕ 18 gauge port	22515
8B1-0011-179	M-350PG-RS/C34	Pirani Gauge (RS485)	With ϕ 34 ICF flange	22516
8B1-0011-061	M-350PG-RS/NPT	Pirani Gauge (RS485)	With 1/8” NPT (male)	22517
8B1-0014-339	MP1/N16	Pirani Gauge Sensor	With NW16 flange	22527
8B1-0014-352	MP1/N25	Pirani Gauge Sensor	With NW25 flange	22528
8B1-0014-387	MP1/C34	Pirani Gauge Sensor	With ϕ 34 ICF flange	22529
8B1-0014-657	MP1/NPT	Pirani Gauge Sensor	With 1/8” NPT (male)	22530
8B1-0014-612	MP1/P15	Pirani Gauge Sensor	For ϕ 15 gauge port	22531
8B1-0014-613	MP1/P18	Pirani Gauge Sensor	For ϕ 18 gauge port	22532
8B1-0010-971	M-351PG-SP/N16	Pirani Gauge (Nickel filament)	With NW16 flange	22665
8B1-0011-008	M-351PG-SP/N25	Pirani Gauge (Nickel filament)	With NW25 flange	22666
8B1-0015-292	MP2/N16	Pirani Gauge Sensor (Nickel filament)	With NW16 flange	22668
8B1-0015-370	MP2/N25	Pirani Gauge Sensor (Nickel filament)	With NW25 flange	22669

Cold Cathode Gauge

M-370CG

Summary

A solid cold cathode gauge (cold cathode ionization gauge) that does not use a hot filament.

Compatible with a wide range of processes and achieves stable pressure measurement in high vacuum conditions.

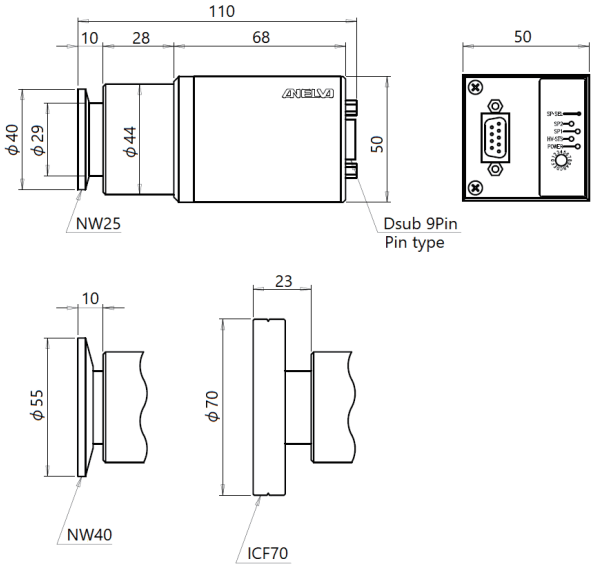
Features

- Uses a unique light trigger mechanism that reduces measurement stoppages
- Handles a wide range of processes
- Low maintenance costs
- Maintenance only requires part replacement

Specifications

Type	Cold Cathode Gauge	
	M-370CG-SP Type with set point	M-370CG-RS RS485 Type *1
Pressure measurement range	1×10^{-7} ～ 1×10^{0} Pa	
Accuracy	±30%：1×10^{-6} ～ 1×10^{0} Pa	
Repeatability	±5%：1×10^{-6} ～ 1×10^{0} Pa	
Input voltage	DC+15 ～ 30 V	
Power consumption	2.4 W	
Analog output	0 ～ 10 V	—
Set point	2 Contact Output (1A 30V DC)	
Interface	—	RS485
I/O connector	D-sub 9 pin (Pin type)	
Maximum cable length	300 m (1 mm^2) ※2	
Operating Temperature	5 ～ 55°C	
Storage Temperature	-20 ～ 70°C (at no operation)	
Sensor allowable temperature range	150°C MAX (Without electronics)	
Suitable sensor	CC1	
Sensor material (main component)	Electrode : Mo, Insulator : Al_2O_3 Case : Stainless steel	
Dimensions	110×50×50 mm (NW25)	
Flange shape and weight	NW25 (485 g)、NW40 (501 g) ϕ 70ICF (735 g)	
Conformity	CE marking , RoHS , IP40	

Dimensions diagram



※1 The RS485 type is not compatible with the M-601/603GC display.

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

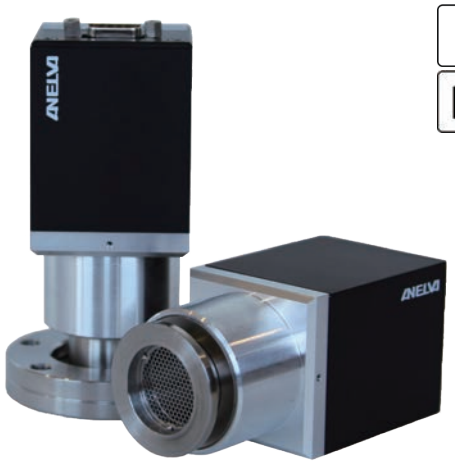
Note: The ignition of CC gauge may be delayed significantly under conditions of high partial pressure of active gas such as H2 and O2, or large volume use of these gases. Please contact us when using the gauge under conditions of these gases.

Ordering information

Parts Number	Model	Description	Remarks	Code
8B1-0011-288	M-370CG-SP/N25	Cold Cathode Gauge	With NW25 flange	22806
8B1-0011-289	M-370CG-SP/N40	Cold Cathode Gauge	With NW40 flange	22807
8B1-0011-290	M-370CG-SP/C70	Cold Cathode Gauge	With ϕ 70 ICF flange	22808
8B1-0011-291	M-370CG-RS/N25	Cold Cathode Gauge (RS485)	With NW25 flange	22809
8B1-0011-292	M-370CG-RS/N40	Cold Cathode Gauge (RS485)	With NW40 flange	22810
8B1-0011-293	M-370CG-RS/C70	Cold Cathode Gauge (RS485)	With ϕ 70 ICF flange	22811
8B1-0018-759		M-361CP/370CG Maintenance kit	Pole piece, Mesh	22790

Cold Cathode Pirani Gauge

M-361CP



Summary

A combination gauge that combines a solid cold cathode gauge (cold cathode ionization gauge) and a Pirani gauge.

One single unit that can provide stable pressure measurement over a wide pressure range, from atmospheric pressure to high vacuum.

System cost is reduced with a dual-purpose device.

Features

- Uses a unique light trigger mechanism that reduces measurement stoppages
- Handles a wide range of processes
- Reduce costs with a dual-purpose device
- Low maintenance costs
- Maintenance only requires part replacement

Specifications

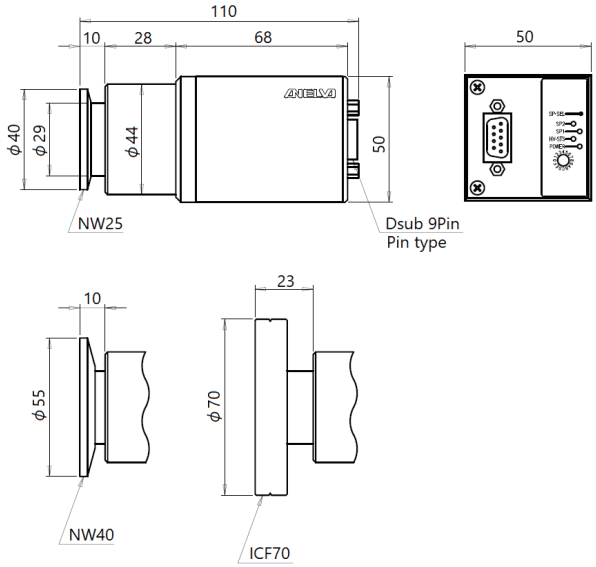
Type	Cold Cathode Pirani Gauge	
	M-361CP-SP Type with set point	M-361CP-RS S485 Type ※1
Pressure measurement range	1×10^{-7} ～ 1×10^{5} Pa	
Accuracy	±30%：1×10^{-6} ～ 1×10^{4} Pa ±50%：1×10^{4} ～ 1×10^{5} Pa	
Repeatability	±5%：1×10^{-6} ～ 1×10^{4} Pa	
Input voltage	DC+15 ～ 30 V	
Power consumption	2.4 W	
Analog output	0 ～ 10 V	—
Set point	2 Contact Output (1A 30V DC)	
Interface	—	RS485
I/O connector	D-sub 9 pin (Pin type)	
Maximum cable length	300 m (1 mm²) ※2	
Zero points adjustment	Push switch	
Operating Temperature	5 ～ 55°C	
Storage Temperature	-20 ～ 70°C (at no operation)	
Sensor allowable temperature range	150°C MAX (Without electronics)	
Suitable sensor	CP2	
Sensor material (main component)	Filamemt：W , Electrode : Mo Insulator : Al_2O_3, Case : Stainless steel	
Dimensions	110×50×50 mm (NW25)	
Flange shape and weight	NW25 (485 g)、NW40 (501 g) ϕ 70ICF (735 g)	
Conformity	CE marking , RoHS , IP40	

※1 The RS485 type is not compatible with the M-601/603GC display.

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

Note: The ignition of CC gauge may be delayed significantly under conditions of high partial pressure of active gas such as H2 and O2, or large volume use of these gases. Please contact us when using the gauge under conditions of these gases.

Dimensions diagram



Ordering information

Parts Number	Model	Description	Remarks	Code
8B1-0011-263	M-361CP-SP/N25	Cold Cathode Pirani Gauge	With NW25 flange	22800
8B1-0011-264	M-361CP-SP/N40	Cold Cathode Pirani Gauge	With NW40 flange	22801
8B1-0011-265	M-361CP-SP/C70	Cold Cathode Pirani Gauge	With ϕ 70 ICF flange	22802
8B1-0011-266	M-361CP-RS/N25	Cold Cathode Pirani Gauge (RS485)	With NW25 flange	22803
8B1-0011-267	M-361CP-RS/N40	Cold Cathode Pirani Gauge (RS485)	With NW40 flange	22804
8B1-0011-268	M-361CP-RS/C70	Cold Cathode Pirani Gauge (RS485)	With ϕ 70 ICF flange	22805
8B1-0018-759		M-361CP/370CG Maintenance kit	Pole piece, Mesh	22790

Ion Gauge

M-311HG

CE
RoHS

Summary

A vacuum gauge that uses a miniature B-A gauge (hot cathode vacuum gauge) with a long history of reliability and proven performance, with excellent repeatability and accuracy.
A wide range type that can measure from 10 Pa to high vacuum.

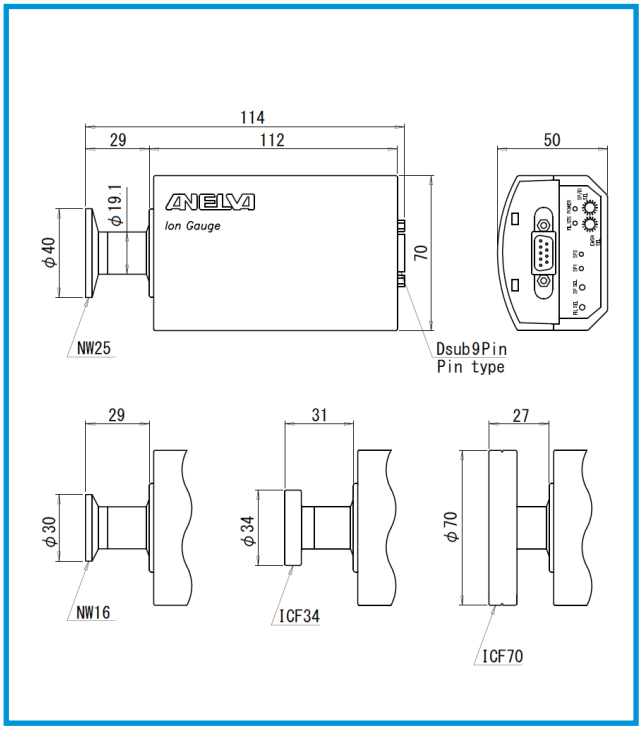
Features

- Wide range pressure measurement
- Trustworthy sensors with proven performance
- High-precision pressure measurement
- Emission current can be set according to the application
- Replaceable measuring sphere

Specifications

Type	Ion Gauge	
	M-311HG-SP Type with set point	M-311HG-RS RS485 type ※1
Pressure measurement range	1×10^{-7} ～ 10 Pa	
Measuring accuracy	±15%：1×10^{-6} ～ 1×10^{0} Pa	
Reproducibility	±5%：1×10^{-6} ～ 1×10^{0} Pa	
Input voltage	DC+20 ～ 28 V	
Power consumption	12 W	
Analog output	0 ～ 10 V	—
Set point	2 Contact Output (1A 30V DC)	
Interface	—	RS485
I/O connector	D-sub 9 pin (Pin type)	
Maximum cable length	300 m (1 mm²) ※2	
Operational temperature range	5 ～ 50°C	
Storage temperature range	-20 ～ 70°C (at no operation)	
Sensor allowable temperature range	O-ring type：150°C MAX Metal seal type：300°C MAX (Without electronics)	
Suitable sensor	Miniature B-A Gauge (MG-2I Series)	
Sensor material (main component)	Filamemt：Yttria coated iridium Case：SUS304	
Dimensions	144×70×50 mm (NW25)	
Flange shape and weight	NW16 (409 g)、NW25 (423 g) ϕ 34ICF (428 g)、ϕ 70ICF (668 g)	
Conformity	CE marking, RoHS,IP40	

Dimensions diagram



※1 The RS485 type is not compatible with the M-601/603GC display.
※2 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
8B1-0015-826	M-311HG-SP/N16	Ion Gauge	With NW16 flange	22670
8B1-0015-827	M-311HG-SP/N25	Ion Gauge	With NW25 flange	22671
8B1-0015-828	M-311HG-SP/C70	Ion Gauge	With ϕ 70 ICF flange	22672
8B1-0015-829	M-311HG-SP/C34	Ion Gauge	With ϕ 34 ICF flange	22673
8B1-0015-830	M-311HG-RS/N16	Ion Gauge (RS485 Type)	With NW16 flange	22674
8B1-0015-831	M-311HG-RS/N25	Ion Gauge (RS485 Type)	With NW25 flange	22675
8B1-0015-832	M-311HG-RS/C70	Ion Gauge (RS485 Type)	With ϕ 70 ICF flange	22676
8B1-0015-833	M-311HG-RS/C34	Ion Gauge (RS485 Type)	With ϕ 34 ICF flange	22677
8G1-0505-480	MG-2I/NW16	Miniature B-A Gauge Sensor	With NW16 flange	21163
8B1-0018-082	MG-2I/NW25	Miniature B-A Gauge Sensor	With NW25 flange	21164
8G1-0505-482	MG-2I/ICF34	Miniature B-A Gauge Sensor	With ϕ 34 ICF flange	21165
8B1-0018-045	MG-2I/ICF70	Miniature B-A Gauge Sensor	With ϕ 70 ICF flange	21166

Crystal Ion Gauge

M-336MX

CE
RoHS

Summary

A combination gauge that uses a crystal gauge with excellent repeatability and precision for measurement in low vacuum conditions, as well as a miniature B-A gauge (hot cathode vacuum gauge) with a long history of reliability and proven performance in high vacuum conditions.

A single unit that can provide high-precision measurement over a wide pressure range, from atmospheric pressure to high vacuum.

System cost is reduced with a dual-purpose device.

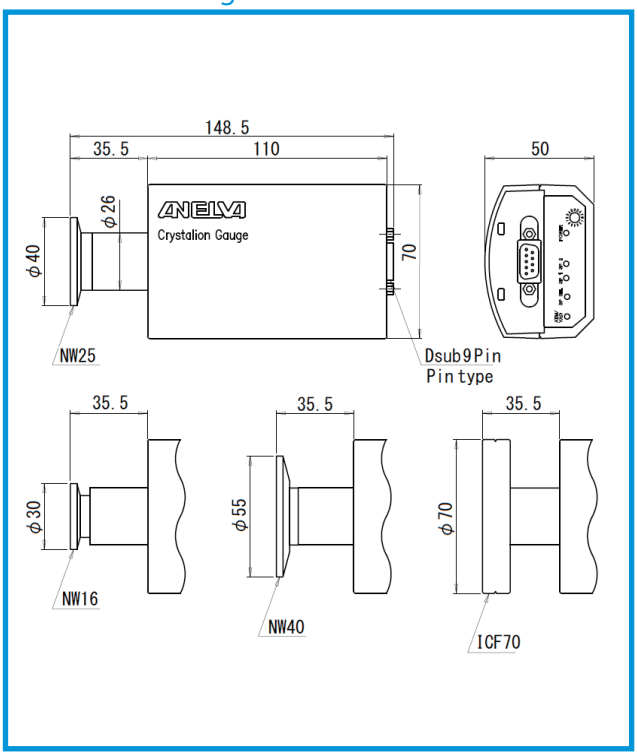
Features

- Reduce costs with a dual-purpose device
- High-precision pressure measurement
- Atmospheric pressure sensor function
- Filament lifespan detection feature (optional)
- Replaceable sensor

Specifications

Type	Crystal Ion Gauge	
	M-336MX-SP Type with set point	M-336MX-RS RS485 type ※1
Pressure measurement range	4×10^{-8} ～ 1×10^{5} Pa ※2 ※3	
Measuring accuracy	±15%：1×10^{-6} ～ 1×10^{1} Pa ±20%：5×10^{1} ～ 1×10^{5} Pa (Except 1×10^{0} ～ 5×10^{1}、1×10^{2} ～ 5×10^{3} Pa)	
Reproducibility	±5%：1×10^{-6} ～ 1×10^{5} Pa	
Input voltage	+20 ～ 28 V DC	
Power consumption	12 W	
Analog output	0 ～ 10 V	—
Set point	2 Contact Output (1A 30V DC)	
Interface	—	RS485
I/O connector	D-sub 9 pin (Pin type)	
Maximum cable length	300 m (1 mm^2) ※4	
Zero points adjustment	Push switch	
Operational temperature range	5 ～ 50°C	
Storage temperature range	-20 ～ 70°C (at no operation)	
Sensor allowable temperature range	150°C MAX (Without electronics)	
Suitable sensor	MX1	
Sensor material (main component)	Craystal Gauge : Quartz resonator B-A gauge Filament : Yttria coated iridium Case: ：SUS304	
Dimensions	148.5×70×50 mm (NW25)	
Flange shape and weight	NW16 (429 g)、NW25 (435 g) NW40 (472 g)、φ 70ICF (671 g)	
Conformity	CE marking, RoHS,IP40	

Dimensions diagram



※1 The RS485 type is not compatible with the M-601/603GC display.
※2 "4 × 10^{-8} Pa", the lower limit of the pressure measurement range, is the soft X-ray limit of this gauge.
※3 The lower limit pressure for actual measurement is ICF:10^{-7} Pa, NW:10^{-6} Pa.
※4 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
8B1-0010-853	M-336MX-SP/N16	Crystal Ion Gauge	With NW16 flange	22545
8B1-0010-855	M-336MX-SP/N25	Crystal Ion Gauge	With NW25 flange	22546
8B1-0010-890	M-336MX-SP/N40	Crystal Ion Gauge	With NW40 flange	22547
8B1-0010-856	M-336MX-SP/C70	Crystal Ion Gauge	With φ 70ICF flange	22548
8B1-0010-857	M-336MX-RS/N16	Crystal Ion Gauge (RS485 Type)	With NW16 flange	22549
8B1-0010-858	M-336MX-RS/N25	Crystal Ion Gauge (RS485 Type)	With NW25 flange	22550
8B1-0010-943	M-336MX-RS/N40	Crystal Ion Gauge (RS485 Type)	With NW40 flange	22551
8B1-0010-859	M-336MX-RS/C70	Crystal Ion Gauge (RS485 Type)	With φ 70 ICF flange	22552
8B1-0012-375	MX1/N16	Crystal Ion Gauge Sensor	With NW16 flange	22559
8B1-0012-369	MX1/N25	Crystal Ion Gauge Sensor	With NW25 flange	22560
8B1-0012-362	MX1/N40	Crystal Ion Gauge Sensor	With NW40 flange	22561
8B1-0012-359	MX1/C70	Crystal Ion Gauge Sensor	With φ 70 ICF flange	22562

Display Unit (1 ch/3 ch)

M-601GC / 603GC

Summary

The display is compatible with the transducer type vacuum gauge series.

The display is easy to see, greatly improving operability.

Choose between the 1ch type and the 3ch type according to your application.

Features

- Can be connected to all gauges (automatic gauge recognition)
- RS232C interface standard equipped
- Can display 3 channels simultaneously (M-603GC)
- Choose from digital or analog display (M-603GC)
- Trend graph display (M-603GC)

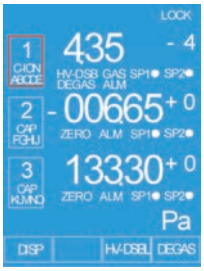
1ch display unit

3ch display unit

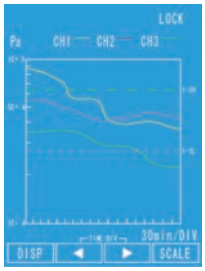
Specification

Type	M-601GC (1 Ch connection type)	M-603GC (3 Ch connection type)
Input voltage	AC90 ～ 250 V 50/60 Hz	
Power consumption	50 VA	100 VA
Operating temperature	5 ～ 50°C	
Storage temperature	-20 ～ 60°C	
Gauge recognition	Auto	
Number of connected channels	1ch	3ch (Simultaneously displayable)
Connected gauge (-RS type excluded)	• Capacitance gauge • Crystal gauge • Pirani gauge • Cold cathode gauge • Cold cathode pirani gauge • Ion gauge • Crystal ion gauge	
Set point	2 points	2 points/ ch
Analog output	1	1 / ch
Recorder output	1	1/ ch
Communication function	RS232C	
Dimensions	84 × 106.3 × 212 mm	128.5 × 106.3 × 212 mm
Weight	1.3 kg	2.1 kg
Display	Backlit LCD	Color TFT LCD
Conformity	CE marking, RoHS, IP30	

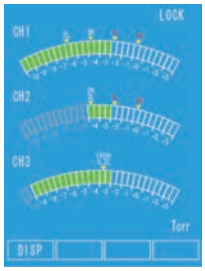
3ch display unit Display mode



Digital

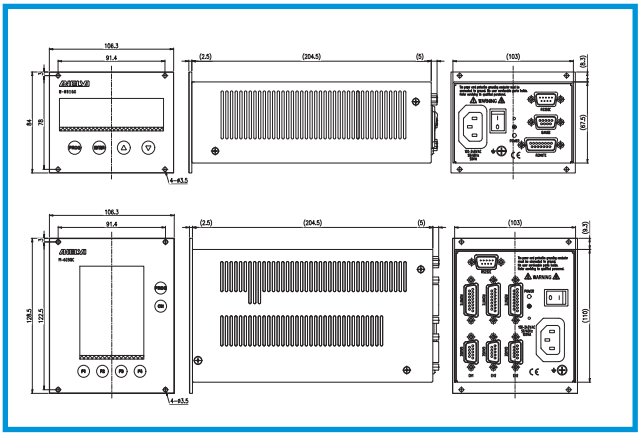


Trend graph



Analog meter

Dimensions diagram



Ordering information

Part Number	Model name	Product name	Remarks	Code
8B1-0014-655	M-601GC	Display Unit (1CH)	No external control connector, AC cable	22563
8B1-0014-656	M-603GC	Display Unit (3CH)	No external control connector, AC cable	22564
8A1-0934-611	601-005-M	Gauge Cable for M-601/603GC (5m)		22467
8A1-0934-612	601-010-M	Gauge Cable for M-601/603GC (10m)		22468
8A1-0934-613	601-015-M	Gauge Cable for M-601/603GC (15m)		22469
8A1-0402-633		Connector for Gauge (D-Sub9P)		22570
8A1-0402-631		Power Cable for M601/603GC	3 m	22571
8D1-0006-055		SCREWDRIVER(PLASTICS)	Ordering unit 10E	22572
8A1-0402-634		I/O Connector for M-601/603GC (D-Sub15P)		22573

Memorandum

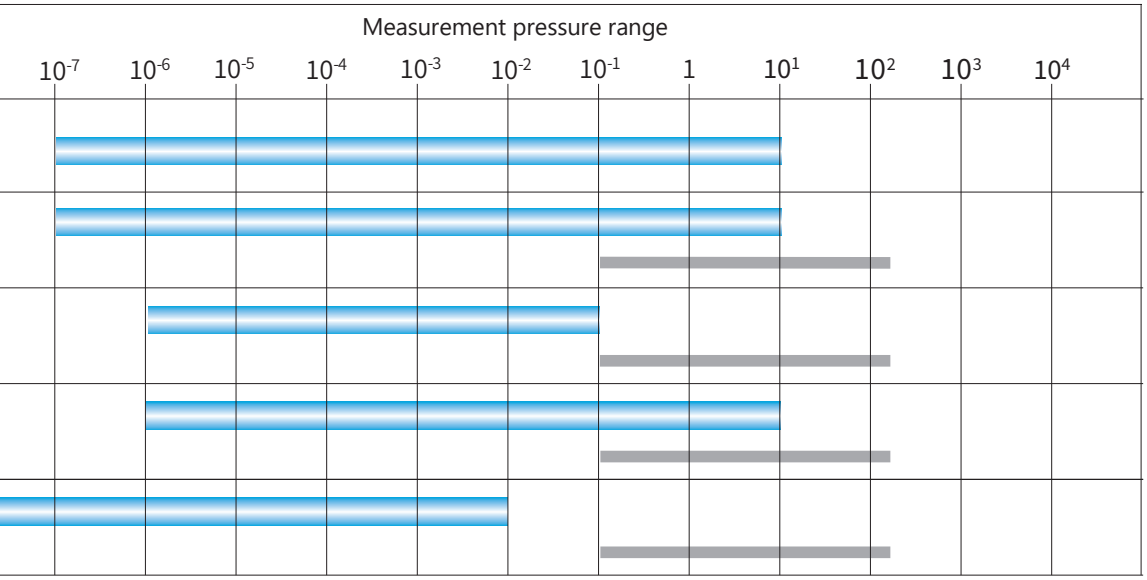
Vacuum Gauge Series

Summary

We offer a wide range of vacuum gauges, from low vacuum to ultra-high vacuum, to suit a variety of applications.

Selection guide

Control unit	Measurement gauge	Pa	10^{-8}
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)		


Measurement pressure range
10-7
10-6
10-5
10-4
10-3
10-2
10-1
1
101
102
103
104

Wide Range Ionization Vacuum Gauge

M-431HG

CE
RoHS

Summary

M-431HG is a vacuum gauge control power supply exclusively for the miniature gauge series.

Features

1. External I/O and RS-232C communication functions equipped as standard.
2. Wide input voltage.
3. CE marking Rocompliant.

Applications

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

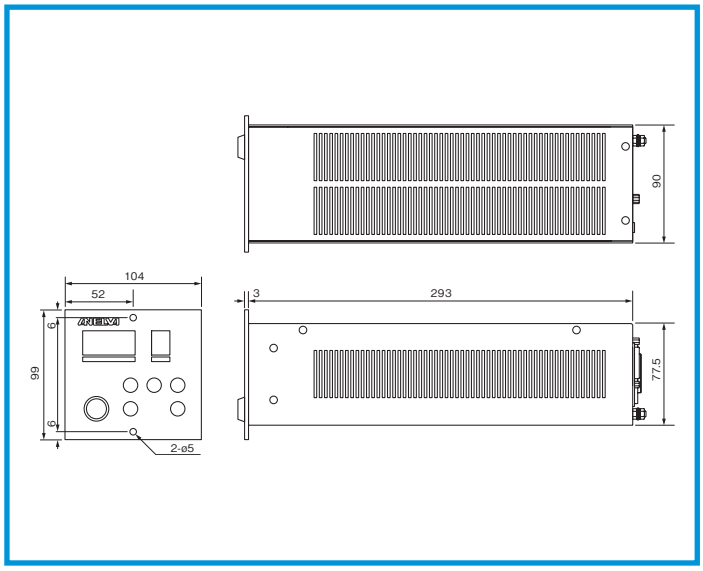
Specifications

Type	M-431HG
Measurement gauge	Miniature B-A Gauge MG-2 Series
Pressure display range	0.01×10^{-7} ～ 13.2×10^{0} Pa ※1
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 10 V)
Analog output	0 to 10 V (APC compatible output)
External control function (Remote operation)	IINPUT: 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)	W104 mm × H99 mm ×D296 mm
Weight	1.2 kg
Power consumption	50 VA 90 to 240 V AC 50/60Hz ※2
Emission current	10 μA, 100 μA, 1 mA (auto switched, or fixed)
Degas	Grid electrical heating method, 3 min timer
Filament switching	Key and remote I/O control
Filament protection	Filament turns off at 13.3 ×100 Pa or above. Over range setting or emission current ±50% variation
Standard configuration	Vacuum gauge main unit (measurement gauge and cables not included)
Conformity	RoHS, CE marking

※1. Refer to the section on measuring gauge MG-2 for the measurement range.

※2. 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 (80°C heat-resistant temperature)
  Standard length 5 m, 10 m, 15 m, 20 m
- Bakable cable also available (250°C heat-resistant temperature)
  Standard length 5 m, 10 m, 15 m, 20 m

■ Ordering information

Part Number	Model	Discription	Remarks	Code
8B1-0016-083	430-901	Cable for Miniature B-A Gauge (5 m)	For MG-2/2F	21672
8B1-0016-094	430-902	Cable for Miniature B-A Gauge (10 m)	For MG-2/2F	21673
8B1-0016-084	430-903	Cable for Miniature B-A Gauge (15 m)	For MG-2/2F	21674
8B1-0012-887	430-904	Cable for Miniature B-A Gauge (20 m)	For MG-2/2F	21675
8B1-0013-952	430-911	Bakable Cable for MG-2 (5 m)	Maximum operating temperature range 250°C	21676
8B1-0013-953	430-912	Bakable Cable for MG-2 (10 m)	Maximum operating temperature range 250°C	21677
8B1-0013-562	430-913	Bakable Cable for MG-2 (15 m)	Maximum operating temperature range 250°C	21678
8B1-0013-563	430-914	Bakable Cable for MG-2 (20 m)	Maximum operating temperature range 250°C	21679
8B1-0014-590	M-431HG	Wide Range Ion Gauge	For MG-2	21685

Refer to the measuring gauge ordering information for measurement gauges

Wide Range Ionization Vacuum Gauge

M-833HG

CE
RoHS

■ 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.
6. Compliant with RoHS and CE marking.

■ Applications

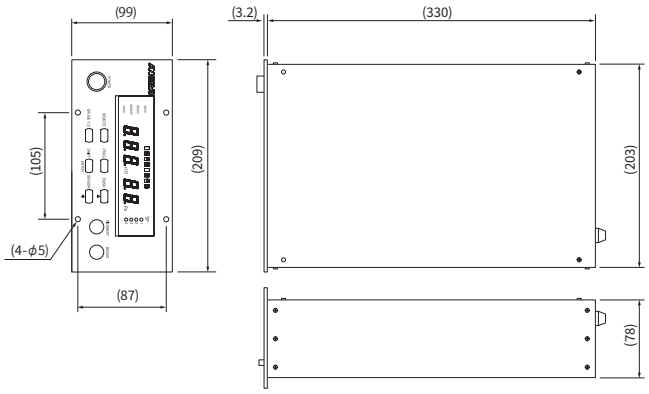
- Automated vacuum equipment pressure measurement.
- Sputtering process pressure measurement and control.
- Multi-chamber system pressure measurement.
- General vacuum equipment pressure measurement.

■ Specifications

Type	M-833HG
Measurement gauge	Miniature gauge MG-2 Series
Pressure display range	0.01×10^{-7} ～ 1.32×10^{1} Pa ※1
Pressure display	Measurement range auto switch
Set point	Two set points equipped as standard (open collector)
D/A output	Mantissa output, Exponent output, Combined output (LOG, Linear)
Analog output	When set to APC mode (0.1 to 2.5 V)
External control function (Remote operation)	INPUT： Filament ON/OFF, Degas ON/OFF, Filament inhibit ON/OFF, Range hold 1 ON/OFF, Range hold 2 ON/OFF, Filament 1/2 switching, Gauge select (when option is in use) OUTPUT：Filament ON/OFF, Degas ON/OFF, Remote/Local, Set point (2 Points), Gauge select status (when option is in use), Power ON/OFF, Filament 1/2, Alarm
Dimensions	W209 mm × H99 mm × D330 mm
Weight	1.9 kg (without option boards installed)
Power supply	100 ～ 240 V AC 100 VA or less 50 / 60 Hz ※2
Emission current	10 μA, 100 μA, 1 mA (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)
Conformity	CE marking , RoHS

※1. Refer to the section on measuring gauge MG-2 for the measurement range.
※2. The cable included with the M-833HG is for use at 100V. Please contact us when using at 200V.

Dimensions diagram



Accessories

Cables

- Dedicated gauge cable (80°C heat-resistant temperature)
  Standard length 5 m, 10 m, 15 m, 20 m
- Bakable cable also available (250°C heat-resistant temperature)
  Standard length 5 m, 10 m, 15 m, 20 m

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.
Set Points Board	Expansion and relay output of pressure set points are possible.
RS-232C 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
8B1-0015-014	M-833HG	Wide Range Ion Gauge	Miniature gauge dedicated power supply, cable/no measurement gauge	21734
8B1-0036-818	722-TC (R)	TC Gauge Board	TG-550C for M-723HG, 823HG, 833HG, 923HG with 5 m cable	21491
8B1-0015-378	722-BCD (R)	BCD Output Board	With connector for M-723HG, 823HG, 833HG, 923HG	21492
8B1-0015-377	722-SPB	Set Points Board	With connector for M-723HG, 823HG, 833HG, 923HG	21480
8B1-0015-376	722-232C (R)	RS-232C Board	With connector for M-723HG, 823HG, 833HG, 923HG	21495
8B1-0015-381	831-331 (R)	Gauge Selector Box for M-833HG	No cable, for MG-2	21777
8B1-0016-749	831-323	Gauge Selector Box for MG-2	For M-833HG, including cable (5 m between main unit,2 m between gauge)	21775
8B1-0016-083	430-901	Cable for Miniature B-A Gauge (5 m)	For MG-2/2F 用	21672
8B1-0016-094	430-902	Cable for Miniature B-A Gauge (10 m)	For MG-2/2F 用	21673
8B1-0016-084	430-903	Cable for Miniature B-A Gauge (15 m)	For MG-2/2F 用	21674
8B1-0012-887	430-904	Cable for Miniature B-A Gauge (20 m)	For MG-2/2F 用	21675
8B1-0013-952	430-911	Bakable Cable for MG-2 (5 m)	Maximum operating temperature range 250°C	21676
8B1-0013-953	430-912	Bakable Cable for MG-2 (10 m)	Maximum operating temperature range 250°C	21677
8B1-0013-562	430-913	Bakable Cable for MG-2 (15 m)	Maximum operating temperature range 250°C	21678
8B1-0013-563	430-914	Bakable Cable for MG-2 (20 m)	Maximum operating temperature range 250°C	21679

Refer to the measuring gauge ordering information for measurement gauges

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

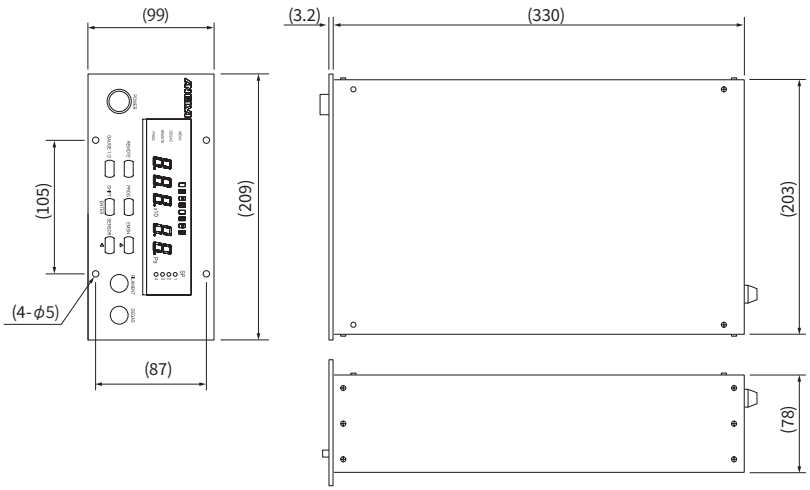
- Automated vacuum equipment pressure measurement.
- Sputtering process pressure measurement and control.
- Multi-chamber system pressure measurement.
- General vacuum equipment pressure measurement.

■ Specifications

Type	M-723HG	M-823HG	M-923HG
Measurement gauge head	UGD-1S B-A gauge	BRG-1B wide range B-A gauge	NIG-2F/NIG-2TF Nude Ion Gauge
Pressure display range	0.01× 10^{-6} ～ 1.32× 10^{-1} Pa ※1	0.01× 10^{-6} ～ 1.32× 10^{-1} Pa ※1	0.01× 10^{-9} ～ 1.32× 10^{-1} Pa ※1
Range switching	Auto switching (range hold possible)		
Set point	Two set points set as standard (open collector)		
D/A output	Mantissa output, Exponent output, Combined output (LOG, Linear)		
Analog output	When set to APC mode (0.1 to 2.5 V)		
External control function (Remote operation)	INPUT： Filament ON/OFF, Degas ON/OFF, Filament-inhibit, Range hold 1, Range hold 2, Filament 1/2 switching, Gauge select (when option is in use) OUTPUT： Filament ON/OFF, Degas ON/OFF, Remote/Local status, Set point (2 points), Gauge 1/2 select (when using the gauge selector option), Power ON/OFF, Filament 1/2, Alarm		
Dimensions	W209 mm × H99 mm × D330 mm		
Weight	5.4 kg (without option boards installed)		
Power requirements	90 ～ 110 V AC 200 VA or less 50/60 Hz (also supports 115/200/230 V AC) ※2		
Degas	Grid electrical heating		Electron bombardment
Filament switching	Key and remote I/O control (Except M-823HG)		
Filament protection	Over range setting or emission current ±50% variation		
Standard configuration	Vacuum gauge main unit (measurement gauge and cables not included)		

※ 1.Refer to the section on measuring gauge MG-2 for the measurement range.
※ 2. The cable included with the M-723/M-823/M-923HG is for use at 100V. Please contact us when using at 200V.

■ Dimensions diagram



■ Accessories

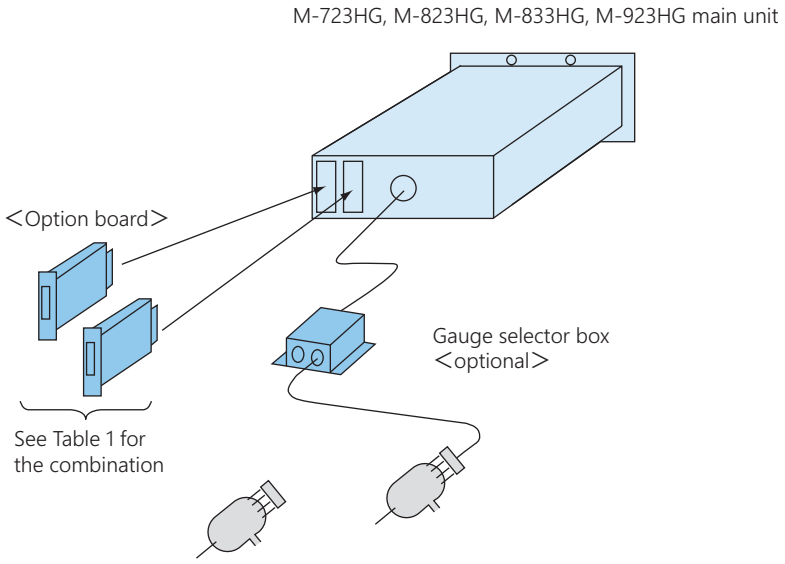
Option board combinations

Functions can be enhanced using an option board.

Table 1

	Set point board	TC gauge board	BCD output board	RS-232C board	Gauge selector box
Set point board		○	○	○	○
TC gauge board	○	○	○	○	○
BCD output 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 100 V AC 1 A, 30 V DC 1A
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 TG-550C and one cable.
BCD output board	Enables BCD output of pressure values.
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 5 m, 10 m, 15 m, 20 m 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
8B1-0015-935	M-723HG	Ion Gauge	JIS rack type	21704
8B1-0015-944	M-823HG	Wide Range Ion Gauge	JIS rack type	21728
8B1-0015-427	M-923HG	UHV Vacuum Gauge	JIS rack type	21747
8B1-0017-634	921-303	Gauge Selector Box (for M-922HG)	For M-923HG, including cable (5m between main unit, 2m between gauge)	21745
8B1-0036-818	722-TC (R)	TC Gauge Board	For M-723HG/823HG/833HG/ 923HG with TG-550C and 5 m cable	21491
8B1-0015-378	722-BCD (R)	BCD Output Board	For M-723HG/823HG/833HG/923HG with connector	21492
8B1-0015-377	722-SPB (R)	Set Points Board	For M-723HG/823HG/833HG/923HG with connector	21480
8B1-0015-376	722-232C (R)	RS-232C Board	For M-723HG/823HG/833HG/923HG with connector	21495
8B1-0016-447	820-901	Cable for B-A Gauge (5 m)	M-723HG/823HG, standard 5 m	21645
8B1-0016-487	820-902	Cable for B-A Gauge (10 m)	M-723HG/823HG, standard 10 m	21646
8B1-0016-491	820-903	Cable for B-A Gauge (15 m)	M-723HG/823HG, standard 15 m	21647
8B1-0016-496	820-904	Cable for B-A Gauge (20 m)	M-723HG/823HG, standard 20 m	21648
8B1-0016-165	921-901	Cable for Nude Ion Gauge (5 m)	For M-923HG, 5 m	21750
8B1-0013-530	921-902	Cable for Nude Ion Gauge (10 m)	For M-923HG, 10 m	21751
8B1-0016-170	921-903	Cable for Nude Ion Gauge (15 m)	For M-923HG, 15 m	21752
8B1-0016-171	921-904	Cable for Nude Ion Gauge (20 m)	For M-923HG, 20 m	21753
8B1-0013-529	921-911	Bakable Cable for Nude Ion Gauge (5 m)	For M-923HG, 5 m	21754
8B1-0016-596	921-912	Extension Cable for Nude Ion Gauge (5 m)	For 921-911 extension, 5 m	21755
8B1-0013-559	921-913	Extension Cable for Nude Ion Gauge (10 m)	For 921-911 extension, 10 m	21756
8B1-0013-560	921-914	Extension Cable for Nude Ion Gauge (15 m)	For 921-911 extension, 15 m	21757
8B1-0413-470	921-801	Rack Mount Panel	For M-723HG･823HG･833HG･923HG	21765

Refer to the section on measuring gauge MG-2 for the measurement range.

CC-Link equipped ionization vacuum gauge

Ionization Vacuum Gauge

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

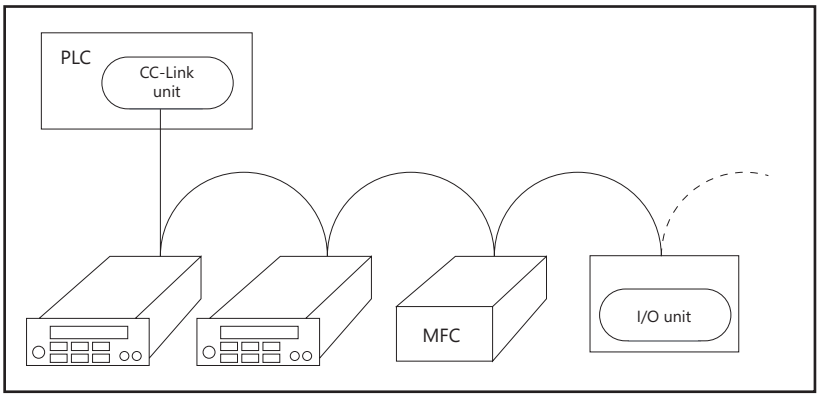
■ Specifications

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 CCLink.

Association for efficient wired FA control. CCLink 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	Gauge selector board	Set point board	BCD output board	RS-232C board
◎	◎	○	○	×

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

■ Ordering information

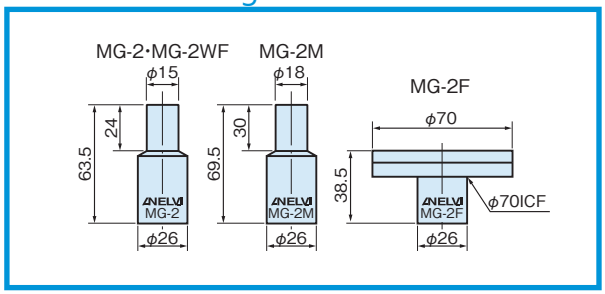
Parts Number	Model	Description	Remarks	Code
8B1-0019-628	M-723HG-CC	Ion Gauge (CC-Link)	For UGD-1S	21708
8B1-0017-609	M-823HG-CC	Wide Range Ion Gauge (CC-Link)	For BRG-1B	21729
8B1-0015-278	M-833HG-CC	Wide Range Ion Gauge (CC-Link)	For MG-2 series	21735
8B1-0016-034	M-923HG-CC	UHV Vacuum Gauge (CC-Link)	For NIG-2F series	21748

Measurement gauge

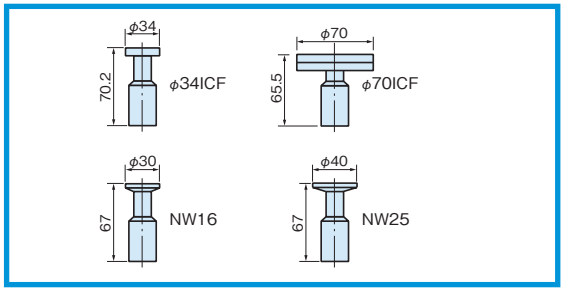
Miniature Gauge MG-2, MG-2M, MG-2I, MG-2F, MG-2WF

The miniature B-A gauge MG-2/MG-2M/MG-2F 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 (measureable to 1Pa range), such as for sputtering, can be measured with a single gauge. The MG-2 and MG-2M are connected to a gauge adapter (O-ring insertion type). The MG-2 is for ϕ15mm and the MG-2M is for ϕ18mm. With its emphasis on measuring ultimate pressure, the MG-2F is mounted directly to the ϕ70ICF.

Dimensions diagram



Flange examples



Specifications

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

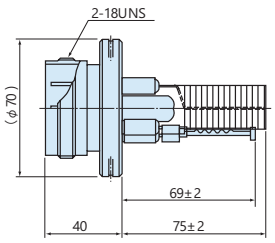
Note 1) Linearity limit.
Note 2) The practically measurable lower limit pressure depends on the flange shape.
Note 3) Inert gases such as nitrogen and argon can be measured up to 13Pa.
Note 4) The lowest measureable value of MG-2W/F is one order of magnitude higher than the standard MG-2.

Ordering information

Parts Number	Model	Description	Remarks	Code
8B1-0010-405	MG-2	Miniature B-A Gauge Head	ϕ 15 type	21160
8B1-0010-408	MG-2F	Miniature B-A Gauge Head	With ϕ 70 ICF	21161
8B1-0010-410	MG-2M	Miniature B-A Gauge Head	ϕ 18 type	21162
8G1-0505-480	MG-2I/NW16	Miniature B-A Gauge Head	With NW16	21163
8B1-0018-082	MG-2I/NW25	Miniature B-A Gauge Head	With NW25	21164
8G1-0505-482	MG-2I/ICF34	Miniature B-A Gauge Head	With ϕ 34 ICF	21165
8B1-0018-045	MG-2I/ICF70	Miniature B-A Gauge Head	With ϕ 70 ICF	21166
8B1-0010-494	MG-2F/WF	Miniature B-A Gauge Head	Tungsten filament type, With ϕ 70 ICF	21167
8G1-0501-693	MG-2WF	Miniature B-A Gauge Head	Tungsten filament type, for ϕ 15 gauge port	21170

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 (Cannon 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.



NIG-2F/2TF Dimensions Diagram

■ Specifications

Type	NIG-2F 954-7902	NIG-2TF 954-7903
Gauge Type	Nude Type B-A	
Shape	Nude Type	
Connection with measured vacuum chamber	φ 70ICF	
measurement range	10^{-9} ～ 10^{-1} Pa	
Standard sensitivity	0.19 Pa^{-1} with respect to N_2	
X-ray limit	Approx. 2.7 × 10^{-9} Pa	
Baking temperature	400°C	
Filament	Filament Material: Tungsten (x2)	Filament Material: Tungsten (x2)
Supported vacuum gauge power supply	M-923HG	
Applications	Up to 10^{-9} Pa / Ultra-high vacuum equipment (for bakable equipment)	

■ Ordering information

Parts Number	Model	Description	Remarks	Code
8G1-0528-648	954-7902	NIG-2F Nude Ion Gauge Head	Cannon pluggable	21120
8D1-0500-823	954-7903	Nude Ion Gauge (Yttria Coat Filament)		21119
8G1-0550-155	954-7905	Filament Kit for Nude Ion Gauge	For NIG-2F	21140
8G1-0498-142	954-7906	Yttria Coat Filament Kit	For NIG-2TF	21142

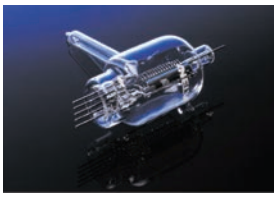
B-A Gauge UGD-1S

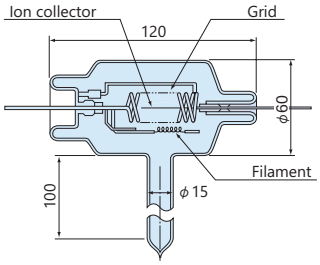
This is a sealed glass tube type B-A ionization vacuum gauge measurement for measuring pressure in the 10^{-2} Pa and under range.

The UGD-1S is a Kovar glass sealed B-A gauge.

The filament is a tungsten wire.

Degassing is performed by grid electrical heating. Therefore, pressure can be measured even during degassing.



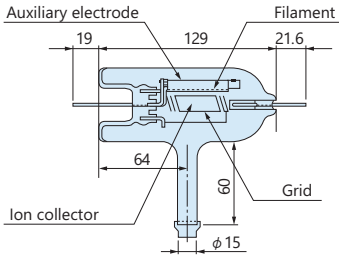


UGD-1S Dimensions Diagram

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 thoria 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 φ 15 adapter or is glass sealed to a glass adapter with φ 70 ICF attached.

∗ Patent No. JP1623097



BRG-1B Dimensions Diagram

■ Specifications

Type		UGD-1S	BRG-1B
Gauge Type		B-A Gauge	Range B-A Gauge
Shape		Glass tube	
Connection with measured vacuum chamber		ϕ 15 gauge port (O-ring)	
measurement range		10^{-6} ～ 0.1 Pa	10^{-6} ～ 10 Pa
Standard sensitivity		0.075 Pa^{-1} with respect to N_2	
X-ray limit		Approx. 1.3×10^{-8} Pa	
Baking temperature		400°C (150°C or less with O-ring seal)	
Material	Filament	Tungsten (x2)	Thoria coated iridium (x1)
	Body	Kovar glass (vacuum sealed)	Tungsten glass (open)
Supported vacuum gauge power supply		M-723HG	M-823HG
Applications		General vacuum use	B-A gauge, sputter etc. measurable up to high pressure (10 Pa)

■ Options

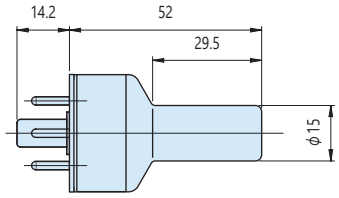
ϕ 15 glass tube of each glass gauge (UGD-1S, BRG-1B) can be cut to your specified length, so please contact us for this.

■ Ordering information

Parts Number	Model	Description	Remarks	Code
8G1-0501-490	BRG-1B	BRG-1B Wide Range B-A Gauge Head	For ϕ 15 gauge port	21225
8G1-0528-644	UGD-1S	B-A Gauge Head	For ϕ 15 gauge port	21121

Thermocouple Gauge TG-550C

SUS304 is used for the material. This gauge can be used from atmospheric pressure and is installed with a ϕ 15 adapter.
(The maximum heating temperature is 150°C with the connectors removed.)



TG-550C Dimensions Diagram

■ Specifications

Type		TG-550C
Gauge Type		Thermocouple Gauge
Shape		Metal vessel
Connection with measured vacuum chamber		ϕ 15 gauge port (O-ring)
Measurement range		10^{-1} ～ 200 Pa
Material	Body	Stainless steel (SUS304)
Supported vacuum gauge power supply		M-012DM ※1 M-723HG/823HG/833HG/923HG ※2
Applications		For measurement during roughing pump

※ 1. Sales ended in December 2021.
※ 2.The extended function option "722-TC(R) TC gauge board" is required.

■ Ordering information

Parts Number	Model	Description	Remarks	Code
8B1-0015-240	TG-550C	Thermo-Couple Gauge Head	For ϕ 15 gauge port	21015

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.

Quadrupole mass spectrometers that meet demands for high-sensitivity analysis and low gas emission

Quadrupole mass spectrometers (transducer type)

CE RoHS

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

■ Summary

Our product line features a variety of models that can handle up to a mass number of 200 for a broad range of purposes, from research to industrial.
They are suitable for every customer's usage environment and needs. They are also environment-conscious products, conforming to both CE and RoHS standards.

■ Features

1. High sensitivity • High functionality

- Uses a secondary electron multiplier tube for the detector (M-101/201QA-TDM)
- Two types of filaments are available: yttria coated iridium (Y) and tungsten (W)
- Wide dynamic range
- Compatible with leak test mode

2. Low outgassing analyzer tube

- Uses a low gas emission ion source
- Provides a degassing function ※1

※1 Excluding M-070QA-TDF.

3. QUADVISION3

- 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

4. Standard equipped with a variety of I/O functions

- Auto measurement signal
- Analog signal input
- Set point output (2 points)

■ Selection guide

Application field \ Detector	M-070QA-TDF	M-101QA-TDF	M-101QA-TDM	M-201QA-TDM
	FC	FC	FC / SEM	FC / SEM
Residual gas monitoring in high vacuum equipment	◎	◎	◎	◎
High-accuracy gas analysis	○	○	◎	◎
Organic gas analysis ※2	—	—	—	○
Inorganic gas analysis	○	○	◎	◎
Thermobalance / Thermodesorption gas analysis	○	○	○	◎
Specific surface analysis	—	○	◎	◎
Catalyst analysis	—	○	◎	◎
Exhaust gas analysis	—	○	◎	◎
Furnace analysis	—	○	◎	◎
Residual gas monitoring in PVD process equipment	—	—	—	—
Leak test	◎	◎	◎	◎

◎：Best, ○：Good, FC：Faraday cup SEM：secondary electron multiplier

※2 The M-401QA is recommended for organic gas analysis

● Filament selection

Application ＼ filaments	Yttria-coated iridium filaments (Y)	Tungsten filaments(W) ※3
Main applications	General purpose, residual gas analysis, atmospheric/oxidized gas analysis	Reducing gas, reactive gas analysis

※3 Only the M-101QA/M-201QA can be selected

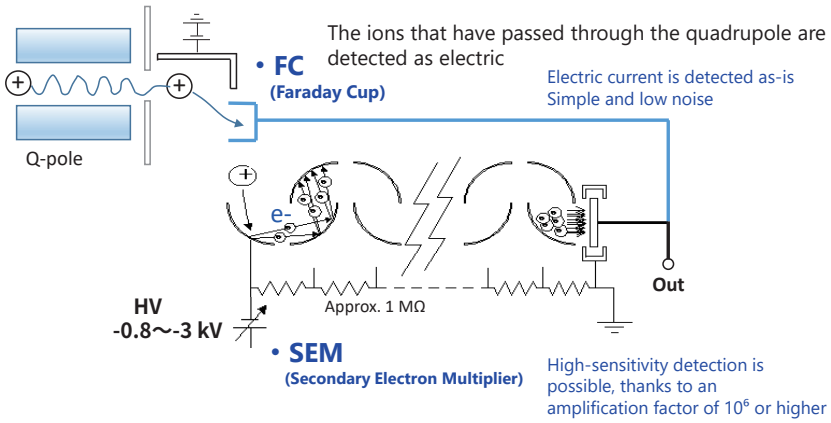
Specifications

Model name			Standard model		High-sensitivity model	
			M-070QA-TDF	M-101QA-TDF Y/W	M-101QA-TDM Y/W	M-201QA-TDM Y/W
Basic performance	Measurable range of mass numbers		1～70	1～100		1～200
	Resolution		M/ΔM ≧ 2M @ 50% of peak height (M/ΔM ≧ 1M @ 10% of peak height)			
	Sensitivity (N_2)	FC※1	1.5×10^{-6} A / Pa or more	7.0×10^{-6} A / Pa or more	2.5×10^{-6} A / Pa or more	1.8×10^{-6} A / Pa or more
		SEM※1	—		2.5 A / Pa or more	1.8 A / Pa or more
	Minimum detectable partial pressure		6.7×10^{-9} Pa or less	5.0×10^{-10} Pa or less	1.0×10^{-12} Pa or less	1.0×10^{-12} Pa or less
	Operating pressure		2.7×10^{-2} Pa or lower	1.3×10^{-2} Pa or lower		
	Dynamic range		6 digits	7 digits		
Specifications	Detector	FC	○			
		SEM	—		○	
	Filament type		Yttria-coated iridium (Y)	Yttria-coated iridium (Y)、Tungsten (W)		
	Baking temperature		250°C (Analyzer tube only)			
	Degassing function		—	Electron bombardment		
	Connection flange		ϕ 70 ICF			
	Rated input voltage		AC100 V～AC240 V			
	Maximum power consumption		60 W	90 W		
	Weight	Analyzer tube	1.5 kg	1.4 kg	1.6 kg	
		Controller	2.1 kg	2.2 kg		
	Communication interface		RS-232C (Cross cable) / 485※2			
	Standard software		QUADVISION3			
Conformity			CE marking、RoHS			

※1 The differences between a FC (Faraday Cup) and SEM (Secondary Electron Multiplier) are described below.

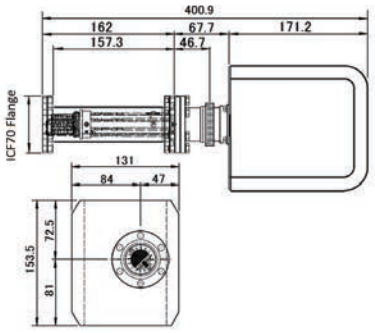
※2 When using a converter for communication, be sure to use the specified product.RS-232 :COM-1 (USB) H、UPORT1110 RS-485:COM-1PD(USB) H

＜Differences between FC and SEM＞

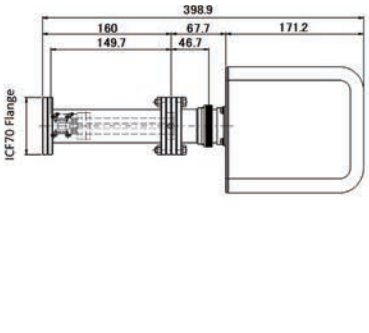


Dimensions diagram

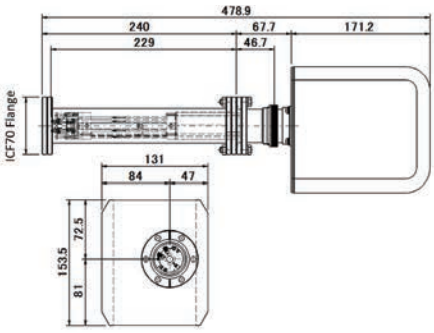
M-070QA-TDF



M-101QA-TDF



M-101QA-TDM、M-201QA-TDM



■ Ordering information

Part Number	Model name	Product name	Remarks	code
8B1-0013-955	M-201QA-TDM (W)	Quadrupole mass spectrometer	200 amu, M type, W-FIL, an AC adapter included, no communication cable※1	20090
8B1-0013-954	M-201QA-TDM (Y)	Quadrupole mass spectrometer	200 amu, M type, Y-FIL, an AC adapter included, no communication cable※1	20091
8B1-0013-960	M-101QA-TDM (W)	Quadrupole mass spectrometer	100 amu, M type, W-FIL, an AC adapter included, no communication cable※1	20092
8B1-0013-959	M-101QA-TDM (Y)	Quadrupole mass spectrometer	100 amu, M type, Y-FIL, an AC adapter included, no communication cable※1	20093
8B1-0014-049	M-101QA-TDF (W)	Quadrupole mass spectrometer	100 amu, F type, W-FIL, an AC adapter included, no communication cable※1	20094
8B1-0014-050	M-101QA-TDF (Y)	Quadrupole mass spectrometer	100 amu, F type, Y-FIL, an AC adapter included, no communication cable※1	20095
8B1-0036-813	M-070QA-TDF	Quadrupole mass spectrometer	100 amu, F type, Y-FIL, an AC adapter included, no communication cable※1	20096
8B1-0017-917		RS-232C cable (1.5 m)	Cross cable	20393
8V1-2006-701		RS-232C cable (3 m)	Cross cable	20294
8V1-2006-990		RS-232C cable (5 m)	Cross cable	20295
8V1-2006-924		RS-232C cable (10 m)	Cross cable	20293
8V1-2009-639	COM-1 (USB) H	USB-RS-232C Converter ※2	Comes with driver CD	20430
8B1-0036-315	UPORT1110	USB-RS-232C Converter ※2	No driver CD, can be downloaded from manufacturer's website	20432
8B1-0014-119		RS-485 cable (5 m)	RS-485 cable (5 m) + Y cable(0.2 m)	20296
8B1-0014-120		RS-485 cable (10 m)	RS-485 cable (10 m) + Y cable(0.2 m)	20297
8B1-0014-121		RS-485 cable (15 m)	RS-485 cable (15 m) + Y cable (0.2 m)	20298
8B1-0014-122		RS-485 cable (20 m)	RS-485 cable (15 m) + Y cable(0.2 m) ※3	20299
8B1-0017-427	COM-1PD/USB/H	USB-RS485 Converter ※2	Comes with driver CD	20392
8B1-0014-094		AC adapter	Comes with M-070/080/101/201QA standards	20195
8B1-0014-138		AC adapter extension cable (5 m)	For M-070/080/101/201QA.	20395
8B1-0019-326		AC adapter extension cable (10 m)	For M-070/080/101/201QA.	20396
8B1-0014-140		AC adapter extension cable (15 m)	For M-070/080/101/201QA.	20397
8B1-0013-852	TD-W-FIL	W filament	For M-101/201	20490
8B1-0013-802	TD-Y-FIL	Y filament	For M-101/201	20491

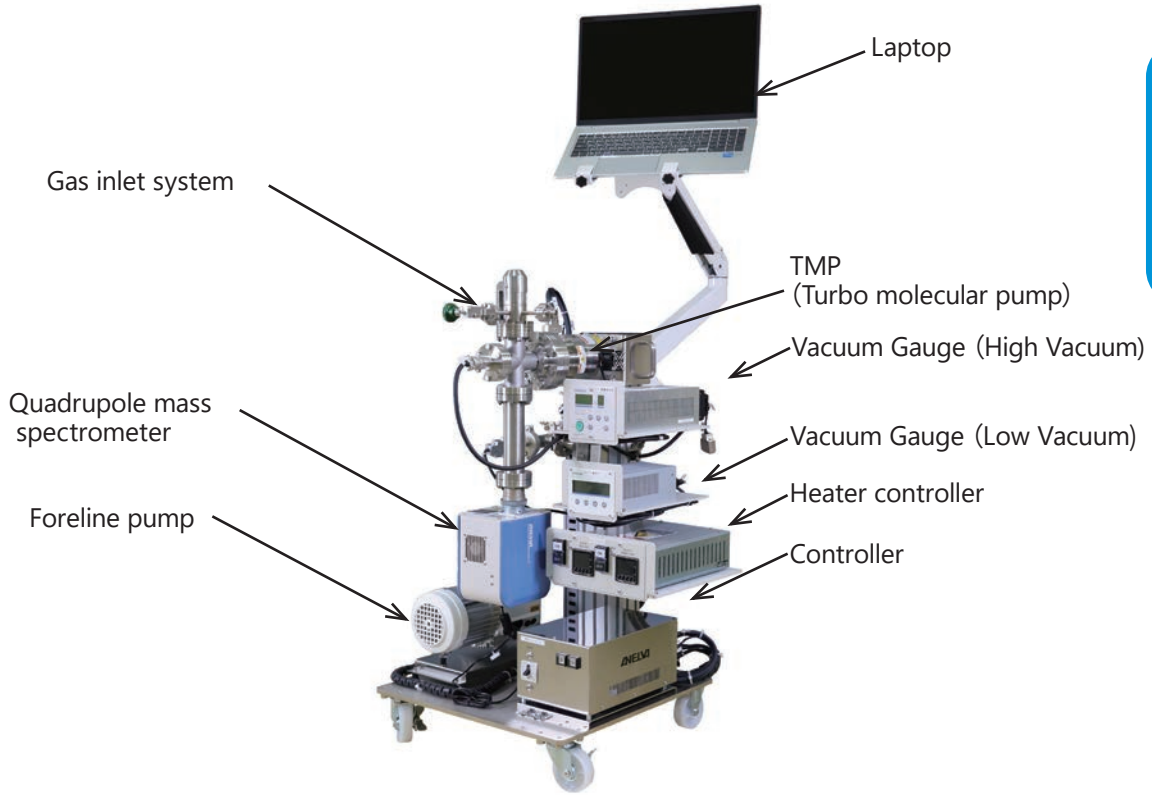
※1 The quadrupole mass spectrometer includes dedicated software QUADVISION (CD version).

※2 Please use a designation product by all means if customer use a converter for communication. RS-232 :COM-1 (USB) H、UPORT1110 RS-485:COM-1PD(USB) H

※3 Contact us if you need the cable longer than 20m

Gas Analysis System

By combining a quadrupole mass spectrometer with a vacuum exhaust system (foreline pump + TMP), gas analysis outside the operating range pressure of the quadrupole mass spectrometer is possible.
For the vacuum exhaust system, the optimal gas-introducing part is selected according to the external shape and form of the object under measurement and the pressure of the gas being measured, in order to meet the needs of the application.
(Photograph is for reference only)



Example of vacuum exhaust system

Examples of supported applications

- Vacuum equipment residual gas analysis
- Thermobalance emission gas analysis
- Thermodesorption gas analysis
- Furnace gas analysis & monitoring
- Charged gas analysis
- Exhaust gas analysis
- Vacuum heat treatment furnace gas analysis
  Reactors, vacuum heat treatment furnaces, carburizing furnaces, etc.
- Testing & evaluation equipment
  Atmospheric gas concentration analysis, pump evaluation equipment, etc.

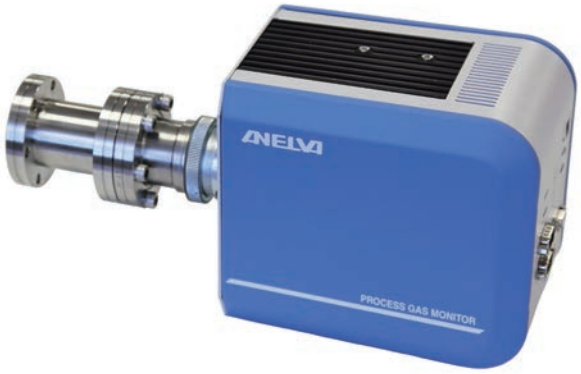
Quadrupole mass spectrometer that can operate at 2.0 Pa and lower

RoHS

Process gas monitor (transducer type)

M-080QA-HPM

Both sputtering process monitoring and residual gas analysis



Summary

A process gas monitor that can operate from ultra-high vacuum to the pressure range during the sputtering process with our proprietary technology. The ability to monitor the partial pressure during the process allows for gas abnormalities, leaks, and other problems to be detected, preventing product defects caused by process abnormalities.

Features

- Operating pressure range: 2.0 Pa and lower
- High-sensitivity measurement over a broad pressure range
  From sputtering pressure range to ultra-high vacuum
- Highly sensitive, in-process detection of impurities and hydrogen
- Software that is useful for both equipment control and quality control

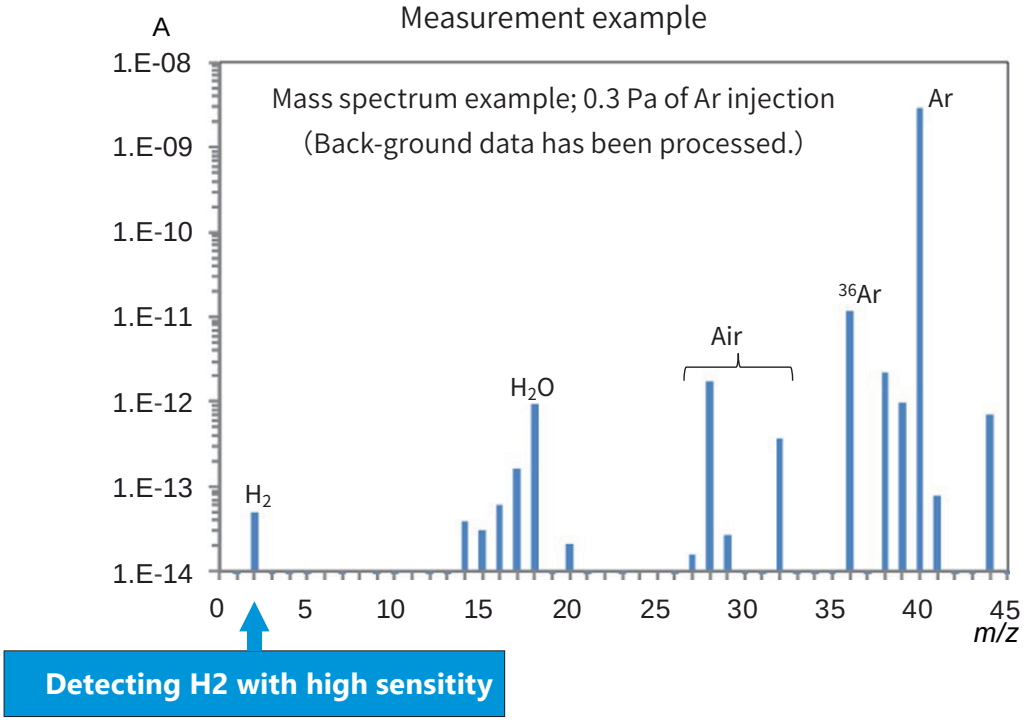
Application

- Quality control during deposition process

※ An oxygen process type is also available

- Residual gas analysis
- Leak check

Measurement example

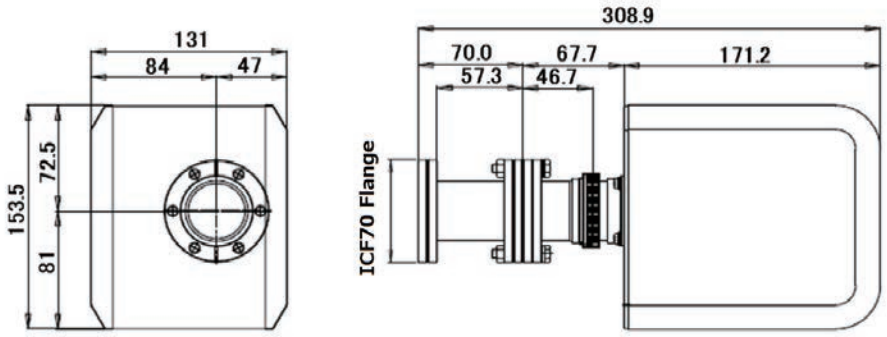


Specifications

Model name			M-080QA-HPM
Basic Perfomance	Measurable range of mass numbers		1 ～ 80
	Resolution		M/Δ M ≧ 1M @ 10% of peak height
	Sensitivity (Ar)	FC	7.5×10^{-9} A / Pa or more
		SEM	7.5×10^{-5} A / Pa or more
	Minimum Detection Limits		5 ppm (Without H_2) H_2 : 100 ppm
	Operating pressure		2.0 Pa or lower (linear operating pressure 1.3 Pa or lower)
Specifications	Detector	FC	○
		SEM	○
	Filament type		Yttria-coated iridium (1 set) ※1
	Baking temperature		200°C (Analyzer tube only)
	Connection flange		ϕ 70 ICF
	Rated input voltage		AC 100 V ～ AC 240 V
	Maximum power consumption		90 W
	Weight	Analyzer tube	1.1 kg
		Controller	2.2 kg
	Communication interface		RS-232C (Cross cable) / 485 ※2
	Standard software		QUADVISION3
Conformity			RoHS

※ 1 For use in an oxygen process, please consult with us separately
※ 2 When using a converter for communication, be sure to use the specified product.RS-232 :COM-1 (USB) H、UPORT1110 RS-485:COM-1PD(USB) H

Dimensions diagram



Ordering information

Part Number	Model	Description	Remarks	Code
8B1-0011-259	M-080QA-HPM	Process Gas Monitor	AC adapter and QUADVISION included, no communication cable	20097
8B1-0017-917		RS-232C Cable (1.5 m)	Cross cable	20393
8V1-2006-701		RS-232C Cable (3 m)	Cross cable	20294
8V1-2006-990		RS-232C Cable (5 m)	Cross cable	20295
8V1-2006-924		RS-232C Cable (10 m)	Cross cable	20293
8V1-2009-639	COM-1 (USB) H	USB-RS-232C Converter ※1	Comes with driver CD	20430
8B1-0036-315	UPORT1110	USB-RS-232C Converter ※1	No driver CD, can be downloaded from manufacturer's website	20432
8B1-0014-119		RS-485 Cable (5 m)	RS-485 cable (20 m) + Y cable (0.2 m)	20296
8B1-0014-120		RS-485 Cable (10 m)	RS-485 cable (10 m) + Y cable(0.2 m)	20297
8B1-0014-121		RS-485 Cable (15 m)	RS-485 cable (15 m) + Y cable (0.2 m)	20298
8B1-0014-122		RS-485 Cable (20 m)	RS-485 cable (20 m) + Y cable (0.2 m) ※2	20299
8B1-0017-427	COM-1PD (USB) H	USB-RS485 Converter ※1	Comes with driver CD	20392
8B1-0014-094		AC Adapter	Comes with M-070/080/101/201QA standards	20195
8B1-0014-138		AC Adapter Extension Cable (5 m)	For M-070/080/101/201QA	20395
8B1-0019-326		AC Adapter Extension Cable (10 m)	For M-070/080/101/201QA	20396
8B1-0014-140		AC Adapter Extension Cable (15 m)	For M-070/080/101/201QA	20397

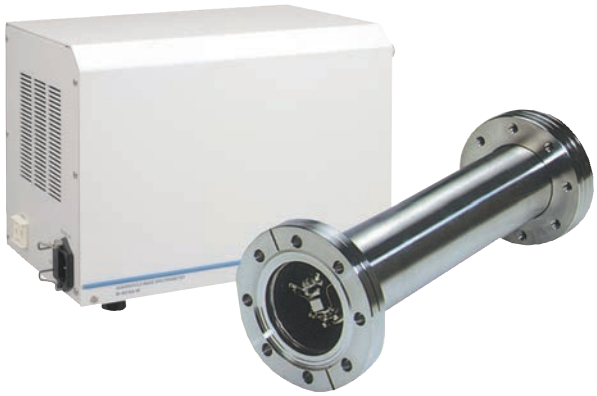
※ 1 When using a converter for communication, be sure to use the specified product.RS-232 :COM-1 (USB) H、UPORT1110 RS-485:COM-1PD(USB) H
※ 2 Contact us if you need the cable longer than 20m

High mass numbers, high-speed measurement, high-sensitivity measurement

RoHS

Quadrupole Mass Spectrometer

M-401QA



■ Summary

A compact mass spectrometer that can measure mass numbers 1 to 410 with our proprietary technology
High-speed and high-sensitivity measurement compared to transducer type quadrupole mass spectrometers

■ Features

1.High-speed Measurement

(M-401QA-MGS ☐ /MUS ☐)

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

2.High-sensitivity (M-401QA-MGH ☐ /MUH ☐)

・Minimum detectable partial pressure
≤ 1.0 × 10^{-12} Pa
8-digits dynamic range (M-401QA-MGH ☐)

※ The square at the end of the model name differs depending on the filaments.

3.Two types of ion source

・Gas introduction type (box type) and UHV type (cage type) are available

Gas introduction type: Stable measurement with gas introduction, general analytical applications

UHV type: Residual gas analysis in an ultra-high vacuum

4. Low gas emission analyzer tube

・Uses a low gas emission ion source
・Provides a degassing function

■ Selection guide

Application Area \ Detector	High-speed type		High-sensitivity type	
	M-401QA-MGSY/W Gas introduction type	M-401QA-MUSY/W UHV type	M-401QA-MGHY/W Gas introduction type	M-401QA-MUHY/W UHV type
Ultra-high vacuum equipment residual gas analysis	○	◎	○	◎
Organic gas analysis	◎	◎	◎	◎
Inorganic gas analysis	○	○	◎	○
Thermobalance・thermodesorption gas analysis	◎	○	◎	◎
Trace gas analysis	○	○	◎	◎
PFC gas analysis	○	○	○	○

◎ : Best, ○ : Good,

● Filament selection

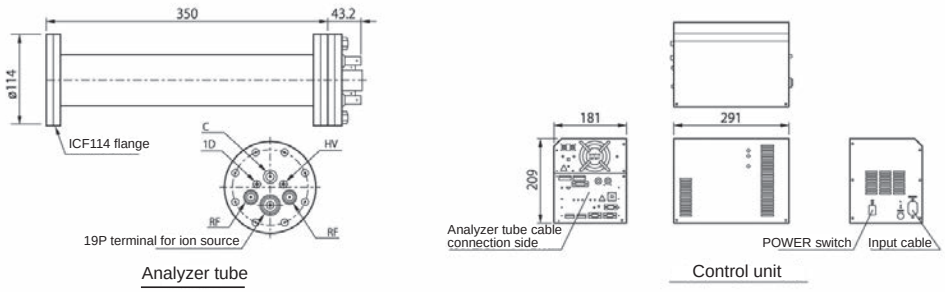
Application ＼ Filament	Yttria-coated iridium filaments (Y)	Rhenium tungsten (ReW)
Main applications	General purpose, residual gas analysis, atmospheric/oxidized gas analysis	Reducing gas, reactive gas analysis

■ Dimensions diagram

Model			High-speed type		High-sensitivity type	
			M-401QA-MGSY/W	M-401QA-MUSY/W	M-401QA-MGHY/W	M-401QA-MUHY/W
Basic performance	Measurable range of mass numbers		1 ～ 410			
	Resolution		M/ΔM ≧ 2M @ 50% of peak height (M/ΔM ≧ 1 M @ 10% of peak height)			
	Sensitivity (N_2)	SEM	4.0×10^{-1} A/Pa	4.0 A/Pa	4.0×10^{-1} A/Pa	4.0 A/Pa
	Minimum detected partial pressure		≦ 5.0×10^{-12} Pa		≦ 1.0×10^{-12} Pa	
	Operating pressure		1.3×10^{-2} Pa or lower			
	Dynamic range		7 digits		8 digits	7 digits
	(high-speed)		5 digits		-	-
Specifications	Ion source shape		Gas introduction type (box type)	UHV type (cage type)	Gas introduction type (box type)	UHV type (cage type)
	Filament type		Yttria coated iridium (Y)、Rhenium tungsten (ReW)			
	Baking temperature		300°C (Analyzer tube only)			
	Degas function		Ion source heater	Electron bombardment	Ion source heater	Electron bombardment
	Sweep speed		1 ms/amu ～		10 ms/amu ～	
	Connection flange		ϕ 114 ICF			
	Rated input voltage		AC100 V ～ AC240 V			
	Maximum power consumption		300 W			
	Weight	Analyzer tube	5.1 Kg			
		Controller	6.2 Kg			
	Communication interface		RS-485/USB ※1			
	Standard software		QUADVISION3			
Conformity			RoHS			

※1 When using a converter for communication, be sure to use the specified product.RS-485:COM-1PD(USB) H

■ Dimensions diagram



■ Ordering information

Part Number	Model	Description	Remarks	code
8B1-0015-975	M-401QA-MGSY	Quadrupole Mass Spectrometer (Gas Introduction type Ion source)	410amu, gas introduction type (box type),high-speed type, Y203-FIL, no communication cable. ※1	20110
8B1-0015-977	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
8B1-0015-970	M-401QA-MGHY	Quadrupole Mass Spectrometer (Gas Introduction type Ion source)	410amu, gas introduction type (box type),high-sensitivity type, Y203-FIL, no communication cable ※1	20112
8B1-0015-972	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
8B1-0015-974	M-401QA-MGSW	Quadrupole Mass Spectrometer (Gas Introduction type Ion source)	410amu, gas introduction type (box type),high-speed type, ReW-FIL, no communication cable ※1	20114
8B1-0015-976	M-401QA-MUSW	Quadrupole Mass Spectrometer (UHV Type Ion source)	410amu, UHV type (cage type) ,high-speed type, ReW-FIL, no communication cable ※1	20115
8B1-0015-969	M-401QA-MGHW	Quadrupole Mass Spectrometer (Gas Introduction type Ion source)	410amu, gas introduction type (box type),high-sensitivity type, ReW-FIL, no communication cable ※1	20117
8B1-0015-971	M-401QA-MUHW	Quadrupole Mass Spectrometer (UHV Type Ion source)	410amu, UHV type (cage type), high-sensitivity type, ReW-FIL, no communication cable ※1	20118
8B1-0014-119		RS485 Y Cable Set (5 m)	RS-485 cable 5m + Y cable (0.3m)	20296
8B1-0014-120		RS485 Y Cable Set (10 m)	RS-485 cable 10m + Y cable (0.3m)	20297
8B1-0014-121		RS485 Y Cable Set (15 m)	RS-485 cable 15m + Y cable (0.3m)	20298
8B1-0014-122		RS485 Y Cable Set (20 m)	RS-485 cable 20m + Y cable (0.3m) ※2	20299
8B1-0017-427	COM-1PD/USB/H	USB-RS485 Converter ※3	Comes with driver CD	20392
8B1-0013-249	401G-Y203-FIL	Y Filament for M-401QA (box type)		20130
8B1-0014-385	401U-Y203-FIL	Y Filament for M-401QA (cage type)	Replacement and installation are performed by us	20131
8B1-0012-169	401G-REW-FIL	ReW Filament for M-401QA (box type)		20320
8B1-0015-948	401U-REW-FIL	ReW Filament for M-401QA (cage type)	Replacement and installation are performed by us	20323

※ 1 The quadrupole mass spectrometer includes dedicated software QUADVISION (CD version).
※ 2 Contact us if you need the cable longer than 20m
※ 3 When using a converter for communication, be sure to use the specified product.RS-485:COM-1PD(USB) H

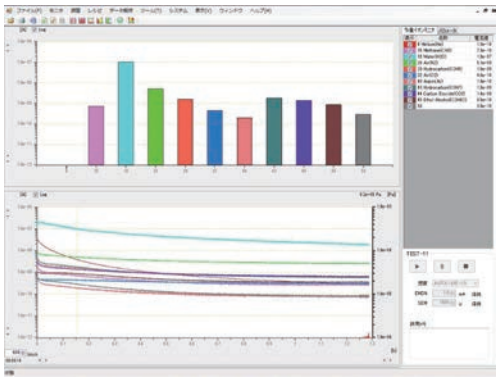
Software dedicated to quadrupole mass spectrometers

QUADVISION3

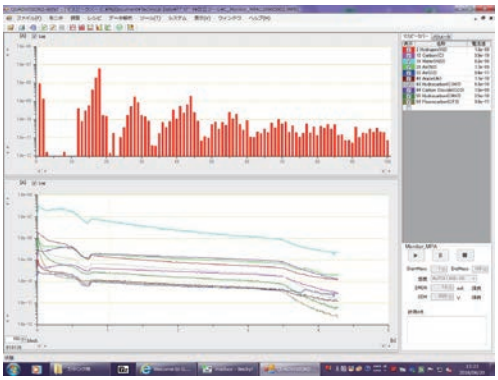
Simple operations, easy measurements　　Remote control available

■ Measurement mode

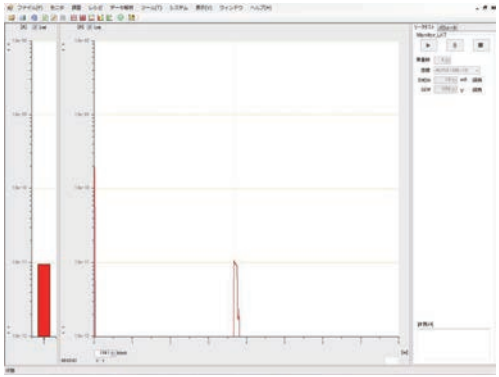
① Selected Ion Monitor (SIM)
② Mass Peak Monitor (MPM)
③ Leak Test (LT)
④ Partial Press Monitor (PPM)



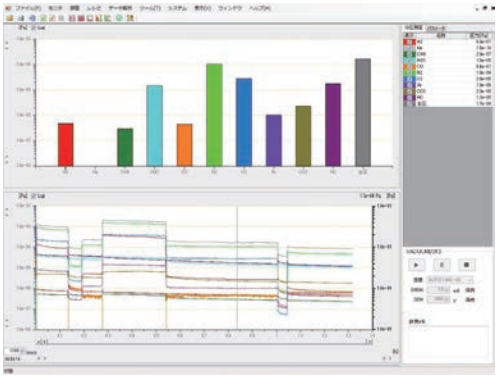
① Selected Ion Monitor (SIM)



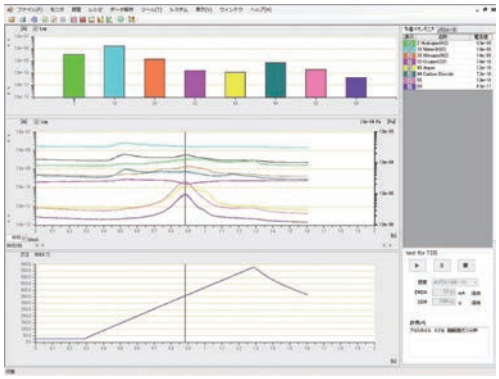
② Mass Peak Monitor (MPM)



③ Leak test (LT)



④ Partial Press Monitor (PPM)



Temperature reading (optional)

Settings screen

■ QUADVISION specifications

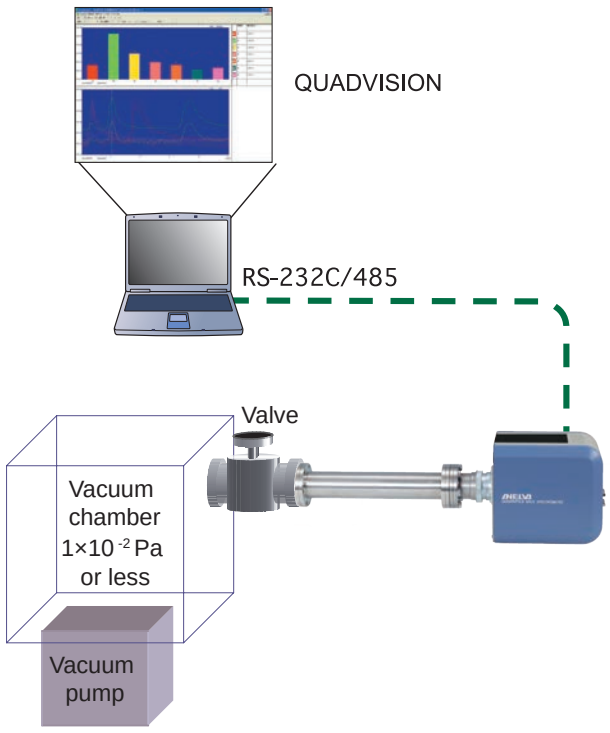
Applicable quadrupole mass spectrometers	M-070QA-TDF M-101/201QA Series M-080QA-HPM	RS-232C/485 communication ※1
	M-401QA Series	USB/RS-485 communication ※1
Measurement mode	Selected Ion Monitor (SIM)	Trend monitor of mass numbers with up to 16 channels
	Mass Peak Monitor (MPM)	Continuous measurement of mass spectra within a specified range
	Leak Test (LT)	Leak test using a specified mass number
	Partial Press Monitor (PPM) ※2	Partial pressure measurement of 10 fixed components (H2, He, CH4, H2O, CO, N2, HC, O2, Ar, CO2, and total pressure)
Other functions	Recipe function	
	Area calculation	
	Adjustment mode (Mass number calibration, waveform adjustment)	
	Conversion of saved data into CSV format	
	Status check	
	Automatic measurement, analog input (0 to 10 V), set point output	
	Reading of pressure	Pressure values can be loaded into QUADVISION3 via RS-232C communication. ※3
Option	Reading of temperature	Temperature values can be loaded into QUADVISION3 via RS-232C communication. ※4
	NIST conversion	Saved data can be converted to a format searchable in the NIST library.
Personal computer specifications	OS	Windows 7、8.1、10、11
	Interface	RS-232C (9P Cross) /485 Port/USB ※1

※1 When using a converter for communication, be sure to use the specified product.RS-232 :COM-1 (USB) H、UPORT1110 RS-485:COM-1PD(USB) H
※2 M-080QA-HPM not applicable
※3 Reading the pressure requires our specific vacuum gauge and cable.
※4 Reading the temperature requires our specific temperature controller and cable.
Windows is a registered trademark or trademark of Microsoft Corporation in the United States and in other countries.

■ Ordering information

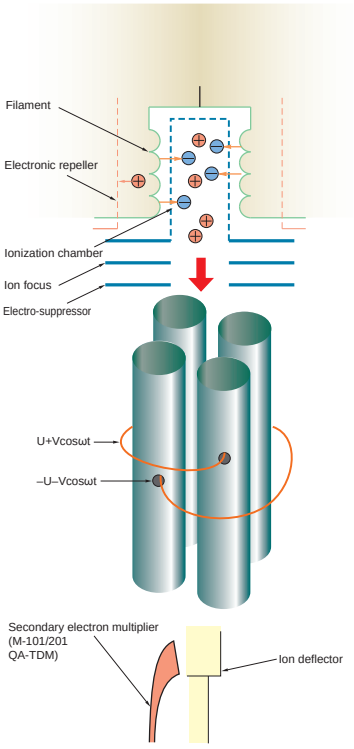
Part Number	Model name	Product name	Remarks	code
8B1-0018-295	QUADVISION3 (JP)	QUADRUPOLE MASS SPECTROMETER SOFTWARE (JP)	Comes standard with spectrometer	20424
8B1-0018-556	QUADVISION3 (EN)	QUADRUPOLE MASS SPECTROMETER SOFTWARE (EN)	Please specify when purchasing the spectrometer	20425
8B1-0019-087		NIST library data conversion software	For QUADVISION3	20427
8B1-0019-067		Temperature reading software	For QUADVISION3	20426

■ Mass filter connection diagram



●When installing to a process chamber, installing a valve to protect the analysis tube is recommended.

■ Analyzer tube principle diagram



Ion source
Ionizes the neutral gas molecules with thermal electrons emitted from the filament.

Quadrupole electrode
Filters the ions by applying high-frequency voltage and DC voltage.

Ion detector
Detects ions as current value signals.

Industry leading sensitivity, stability, and response

HELEN series Helium Leak Detector

Summary

The HELEN series features a diverse lineup ranging from compact and lightweight general-purpose models to high sensitivity, high-volume exhaust models and sniffer-dedicated devices.

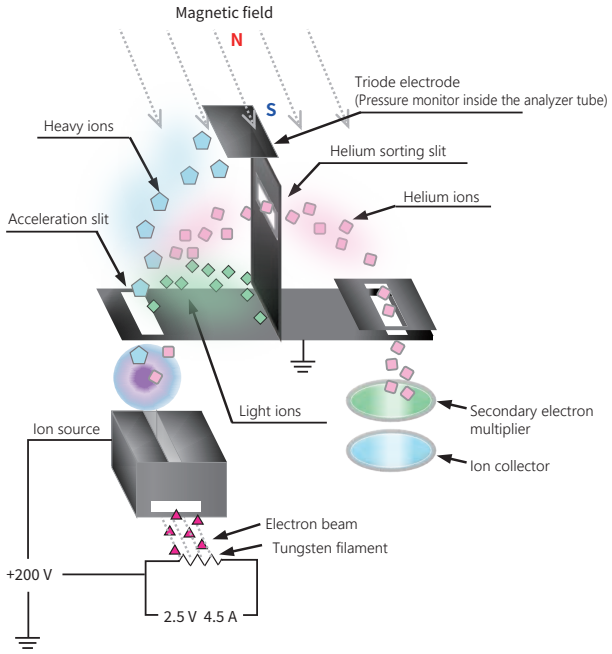
They are perfect for leak tests as well as for field service of vacuum devices or various thin-film deposition systems used in production.

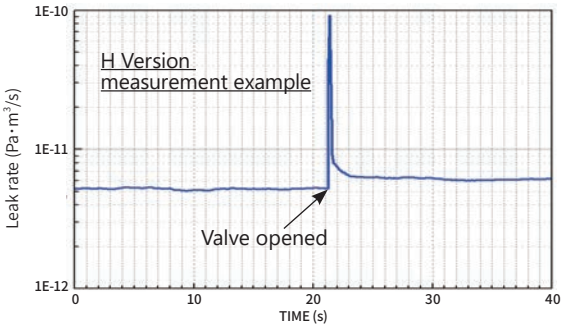
Also, the use of a long-life tungsten filament allows for use in automated testing systems used in mass production of automobiles, food products, and medical supplies.

Features

1. Achieves the highest level of sensitivity and responsiveness in the industry

Equipped with a secondary electron multiplier, this device can not only stabilize the background but can also swiftly detect minute leaks on the order of 10^{-13} Pa·m^3/s with good reproducibility.





1.0×10^{-12} Pa·m^3/scalibrated leak measurement result

2. Simple operation

- Use the (wired) hand controller to check values away from the HELEN main unit.
- The leak quantity is displayed using large, easy-to-see values, and there are a variety of screen displays.
- Operation switches use hard switches with an easy-to-identify design and a click-like operation.
- Control using two types of communication software is available (optional).
- The mobile software can be used for wireless measurements.

HELEN MOBILE main screen

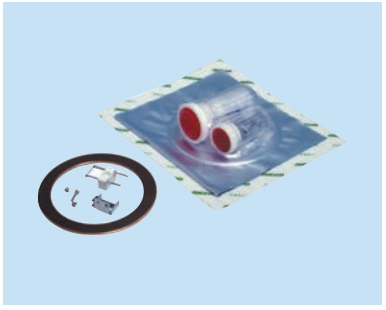
3. Support for various power supply voltages
   AC100 ～ 240 V　1 ϕ

4. Easy maintenance
   The customer can perform filament replacement to reduce maintenance costs.

5. It has a handle and large casters to support operation within a factory.

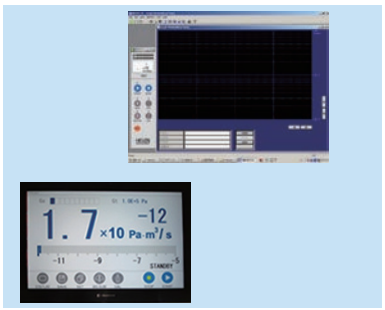
6. Accessories
   Accessories are available to support various kinds of measurements, including a sniffer and bombing.

Sniffer probe /Sniffer unit



Filament maintenance kit

Calibration leak



Dedicated PC software (two types)

Various carts

Transport case

Selection

M-212LD

Compact !

Highly mobile compact type.

M-212LD-D

Compact & Dry !

Low-particle, compact, and dry type equipped with a diaphragm pump.

Applications

- Vacuum parts
- Welded piping
- Welding bellows
- Airtight terminals

M-222LD

High power !

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

M-222LD-D

High power and dry !

Portable type equipped with a dry pump.

For a clean environment !

Applications

- Vacuum parts
- Welded piping
- Welding bellows
- Airtight terminals

M-222LD-H
M-222LD-D-H
M-222LD-D-H_500

High response & High power

High sensitivity, high response type equipped with the FINE mode as a standard that uses a platform with even higher performance than the high power type (TMP/valve block).

Provides wet, dry, and 500 L/min multi-stage roots dry pumps in the same package.

Applications

- Vacuum equipment
- Large panel devices
- Accelerators

M-232LD

Sniffer

Sniffer dedicated type
Equipped with many functions fit for sniffer measurement, including an atmospheric concentration tracking function and flow rate direct monitoring (optional).

Applications

- Food products
- Medical applications
- Refrigeration and air conditioning
- Aerospace applications
- Automobiles

System-embedded type

System

This model is for automated testing systems used in mass production.

With an auxiliary pump that can be placed s eparately, the device can be installed closer to the item being tested, allowing for more compact line construction.

Please inquire regarding specifications.

Applications

- Food products
- Medical applications
- Refrigeration and air conditioning
- Aerospace applications
- Automobiles

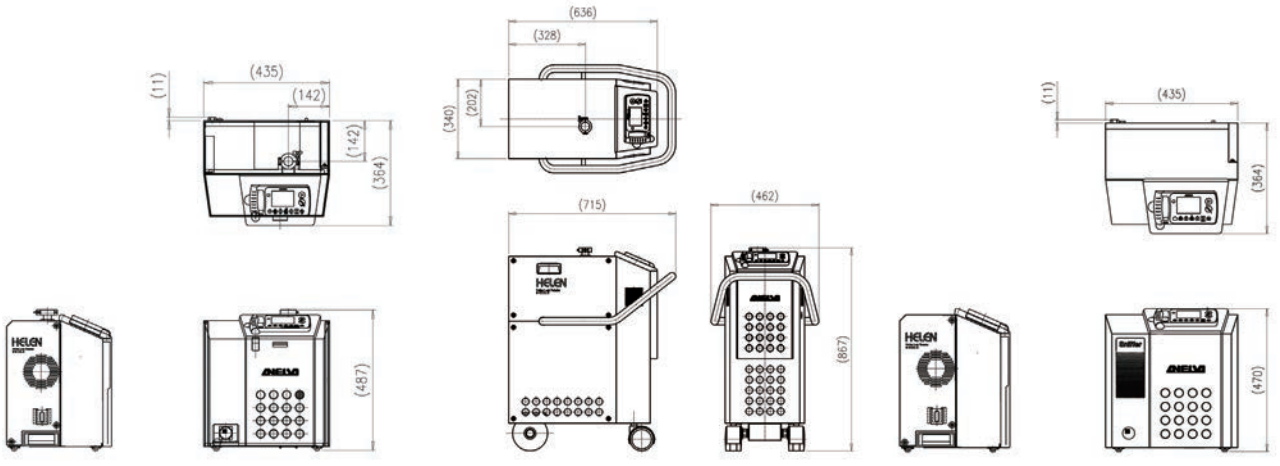
■ Specifications

Standard Type

Type	M-212LD	M-212LD-D	M-222LD	M-222LD-D	M-232LD
Version	Compact	Compact & dry	High power	High power & dry	Sniffer
Quantitative measurement range (Pa・m^3/s)	10^{-12} ～ 10^{-3}				10^{-8} ～ 10^{-1} (10^{-2} ～ 10^{5} ppm)
Inlet port exhaust speed(He) (L/s)	0.5 (Gross Mode) 2.0 (Middle Mode)	1.0 (Middle2 Mode) 4.0 (Middle1 Mode) 7.0 (Fine Mode)	1.8 (Gross Mode) 2.0 (Middle Mode)	2.0 (Gross Mode) 2.0 (Middle Mode)	Probe suction speed 0.3 Pa・m^3/s
Inlet port shape	NW25				—
Main pump	Turbo molecular pump 50 L/s				
	50 L/s	70 L/s	50 L/s		
Roughing pump	Rotary pump 30 L/min	Diaphragm pump 15 L/min	Rotary pump 236 L/min	Scroll type drypump 250 L/min	Rotary pump 30 L/min + Diaphragm pump
External interface	RS232C　Analog output (2 points) - Standard I/O				
Display	4.1 inch Color LCD				
Sniffer probe	981-9370 (Option)	※ 1	981-9371 (Option)		Standard
Power requirements[*2]	AC100 ～ 120 V、8 A	AC100 ～ 120 V、6.3 A	AC100 V、15 A	AC100～120 V、15 A[※3] AC200 ～ 240 V、10 A	AC100 ～ 120 V、8 A
Dimensions (WxHxD) (mm)	435 × 487 × 364		462 × 867 × 715		435 × 470 × 363
Weight (kg)	42	39	85		42

※ 1：Please consult with us.
※ 2：Supports 115V, 200V, and 230V according to your order specification.
※ 3：The provided fuses and input cables must be replaced.

■ Dimensions diagram



M-212LD
M-212LD-D

M-222LD
M-222LD-D

M-232LD

■ Specifications

High sensitivity Type

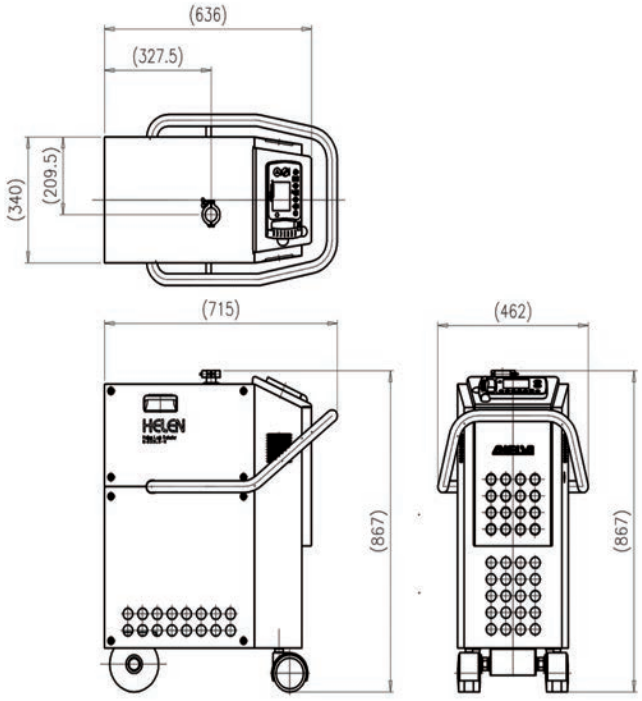
Type	M-222LD-H	M-222LD-D-H	M-222LD-D-H_500
Version	High power	High power & dry	High power & dry pump_500 L
Quantitative measurement range (Pa・m^3/s)	10^{-13} ～ 10^{-3}		10^{-12} ～ 10^{-3}
Inlet port exhaust speed(He) (L/s)	1.8 (Gross Mode) 4.0 (Middle Mode) 7.0 (Fine Mode)	2.0 (Gross Mode) 4.0 (Middle Mode) 7.0 (Fine Mode)	3.5 (Gross Mode) 4.0 (Middle Mode) 7.0 (Fine Mode)
Inlet port shape	NW25		
Main pump	Turbo molecular pump 70 L/s		
Roughing pump	Rotary pump 236 L/min	Scroll type drypump 250 L/min	Multi stage roots type dry pump 500 L/min Bypass exhaust
External interface	RS232C Analog output (2 points) - Standard I/O		
Display	4.1 inch Color LCD		
Power requirements※1	AC100 V、15 A	AC100 ～ 120 V、15 A※2 AC200 ～ 240 V、10 A	AC100 ～ 120 V、15 A※3 AC200 ～ 240 V、10 A
Dimensions (WxHxD) (mm)	462 × 867 × 715		
Weight (kg)	85		

※ 1：Supports 115V, 200V, and 230V according to your order specification.

※ 2：The provided fuses and input cables must be replaced.

※ 3：This varies depending on the specifications in your order.

■ Dimensions diagram



M-222LD-H

M-222LD-D-H

M-222LD-D-H_500

Ordering information

Part Number	Model	Discription	Remarks	Code
8B1-20K7-000	M-212LD	Helium Leak Detector	AC100 ～ 120 V, Compact type 2014VERSION	26640
8B1-20K8-000	M-212LD	Helium Leak Detector	AC200 ～ 230 V, Compact type 2014VERSION	26616
8B1-0038-063	M212LD-D	Helium Leak Detector	AC100 ～ 120 V, Compact type 2014VERSION	26619
8B1-20L1-000	M-222LD	Helium Leak Detector	AC100 V, High power type 2014VERSION	26650
8B1-20L2-000	M-222LD	Helium Leak Detector	AC200 V, High power type 2014VERSION	26654
8B1-20LH-000	M-222LD	Helium Leak Detector	AC110 ～ 120 V, High power type 2014VERSION	26625
8B1-20LJ-000	M-222LD	Helium Leak Detector	AC220 ～ 240 V, High power type 2014VERSION	26626
8B1-20KF-000	M-222LD-D	Helium Leak Detector	AC100 ～ 240 V, Dry pump type 2014VERSION	26651
8B1-0037-524	M-222LD-H	Helium Leak Detector	AC100 V, High power, High sencitivity type 2014VERSION	26655
8B1-0038-062	M-222LD-H	Helium Leak Detector	AC220 ～ 240 V, High power, High sencitivity type 2014VERSION	26656
8B1-0037-118	M-222LD-D-H	Helium Leak Detector	AC100 ～ 240 V, Dry pump,High sencitivity type 2014VERSION	26662
8B1-0038-089	M-222LD-D-H_500	Helium Leak Detector	AC100 ～ 120 V, High power, Dry pump type 2014VERSION	26658
8B1-0038-090	M-222LD-D-H_500	Helium Leak Detector	AC200 ～ 240 V、, High power, Dry pump type 2014VERSION	26558
8B1-20LN-000	M-232LD	Helium Leak Detector	AC100 ～ 120 V, suniffer dedicated type 2014VERSION	26660
8B1-20LZ-000	M-232LD	Helium Leak Detector	AC200 ～ 230 V, suniffer dedicated type 2014VERSION	26661
8B1-0017-323		Tool Case (HELEN2 Transport Case)	HELEN2 Transport Case	26680
8B1-0016-590		HELEN212 Transport Case	With casters	26681
8B1-0016-802		HELEN222 Transport Case	With casters	26682
8B1-0038-094	981-9361	ASL25V Helium Standard Leak	NW25, calibrated leak rate with valve:5×10^{-9}～2×10^{-8} Pa・m^3/s	26801
8B1-0036-815		ASL25N2 Helium Standard Leak	NW25, calibrated leak rate without valve:5×10^{-9}～2×10^{-8} Pa・m^3/s	26802
8G1-0456-019	981-9370	Sniffer Probe for 212/210	Suction rate:：0.1 Pa・m^3/s (for HELEN/ALD)	26810
8G1-0455-497	981-9371	Sniffer Probe for 222/220	Suction rate:：0.3 Pa・m^3/s (for HELEN/ALD)	26811
8D1-0006-657	981-9790	He Spray Gun		26830
8G1-0456-323	981-9351	Filament Maintenance Kit	Filament, gasket, ion chamber: 1 each (for HELEN/ALD)	26850
8G1-0454-305	981-9350	Filament Assembly	Filament only (for HELEN/ALD)	26851
8B1-0017-767		Filament Maintenance Kit O-ring type for HELEN	Filament, O-ring, ion chamber: 1 each (for M-232LD/2014VERSION)	26856

Sealed Transmissive Microfocus X-Ray Source

X-Ray Source

- ●G-311 Series
- ●G-511 Series

Sealed Transmissive Microfocus X-Ray Source
G-311 Series

CE
RoHS

This radiation source achieves 4μm resolution (at 10W) by adopting a diamond window transmission target, and is an X-ray source for industrial non-destructive inspection that enables high-resolution and high-speed imaging.

Features

1. 110kV voltage ramp time within 1s.
   - Quick image acquisition
2. Maintenance-free target
   - No need for target rotation
   - Improving equipment operation ratio
3. Warming-up within 3min.
   - Solution of the long waiting time at starting up X-ray equipment
   - No need for tube aging after long term storage
4. Self-diagnosis of X-ray tube lifetime
   - Scheduled maintenance of X-ray equipment
5. Pulsed X-ray available (50ms minimum)

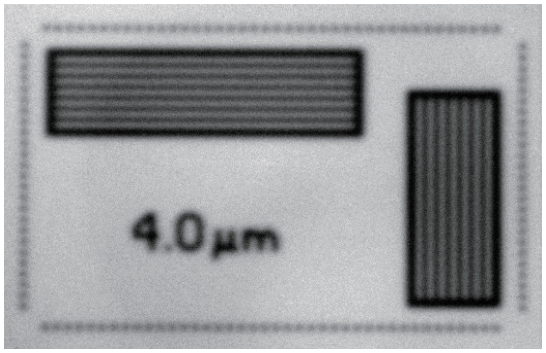
G-311VH-D / DP
(Standard Holder Type)

G-311VH-DL / DPL
(Long Holder Type)

Specifications

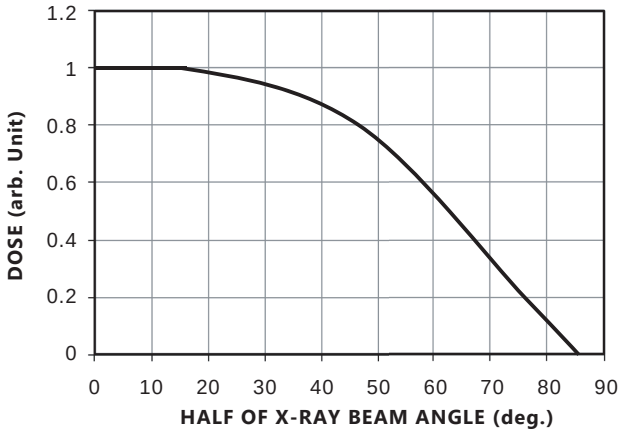
Parameter	G-311VH-D / DL	G-311VH-DP / DPL
Tube Voltage Operating Range	60 – 110 kV	
Tube Current Operating Range (Target Current)	10 – 300 μA	
Maximum Output	30 W	
Minimum Resolution (JIMA RT RC-02B)	4-8 μm	
X-ray Window Material	Diamond	
Focus-to-Object Distance (FOD)	Minimum 0.29 mm	
Target Material	Tungsten	
X-ray Beam Angle	168 deg. (Max.), 80 deg. (80% , Equidistance)	
Weight	Standard Holder Type：21 kg, Long Holder Type：24 kg	
Communication Interface	RS-232C	
External Contact Control Function	Irradiation Interlock function (2 circuits)	Irradiation Interlock function (2 circuits) Trigger input for Pulse Irradiation
Irradiation Off Timer	Minimum setting value: 1 s	
Pulse Irradiation Function	—	Minimum Pulse Width 50ms (Use the trigger input for Pulse Irradiation)
Input Voltage (DC)	24 V (+1.2, -1.2)	
Maximum Power Consumption	65 W	
Operating Ambient Temperature	10 – 45°C	
Storage Temperature	0 – 50°C	
Operating and Storage Humidity	≦ 85% (No Condensation)	
High Voltage Power Supply	Built-in	

● MICRO CHART IMAGE (JIMA RT RC-02B)

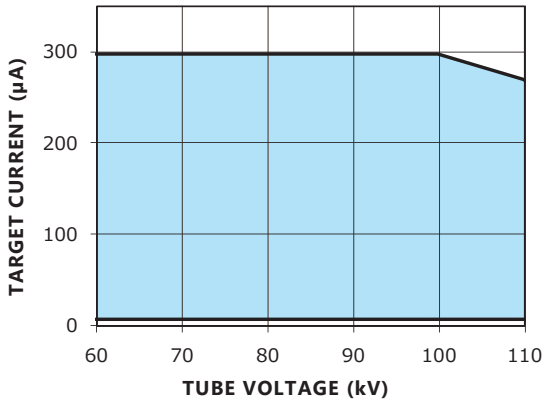


(250x)

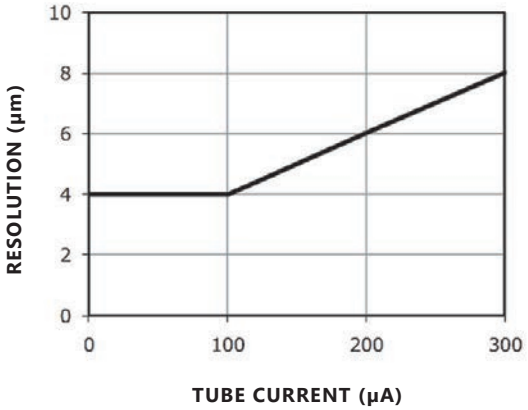
● X-RAY DOSE UNIFORMITY



● TUBE CURRENT OPERATIONAL RANGE



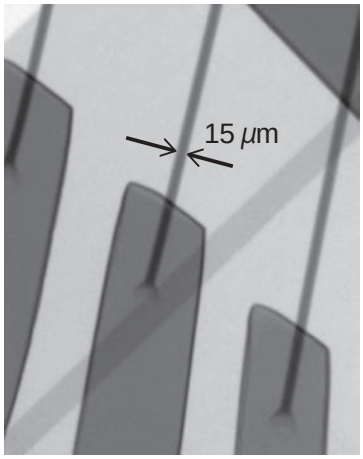
● FOCUS CHARACTERISTICS



※ The figures showed in each graph are typical values.

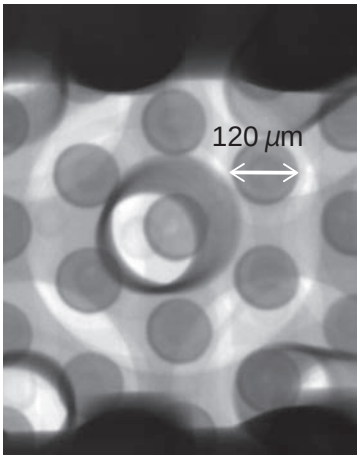
■ Image examples

Bonding wire



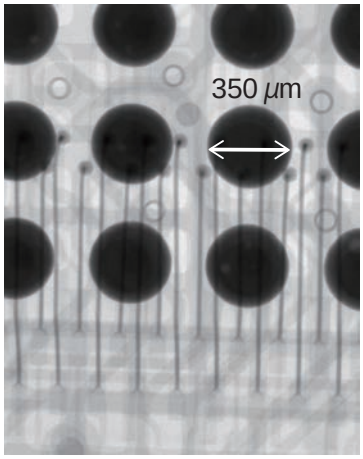
(300x)

Flip chip



(300x)

BGA



(120x)

■ Ordering infomation

Code	Parts Number	Model	Description	Remarks
49905	8B1-0036-628	G-311VH-D	Sealed Transmissive Microfocus X-Ray Source	Standard Holder Type
49906	8B1-0036-627	G-311VH-DP	Sealed Transmissive Microfocus X-Ray Source	Standard Holder Type With Pulse Irradiation Function
49916	8B1-103L-000	G-311VH-DL	Sealed Transmissive Microfocus X-Ray Source	Long Holder Type
49917	8B1-102A-000	G-311VH-DPL	Sealed Transmissive Microfocus X-Ray Source	Long Holder Type With Pulse Irradiation Function

Sealed Transmissive Microfocus X-Ray Source
G-511 Series

CE
RoHS

This radiation source achieves 2µm resolution (at 6W) by adopting a diamond window transmission target, and is an X-ray source for industrial non-destructive inspection that enables high-resolution and high-speed imaging.

Features

1. 110kV voltage ramp time within 1s.
• Quick image acquisition
2. Maintenance-free target
• No need for target rotation
• Improving equipment operation ratio
3. Warming-up within 3min.
• Solution of the long waiting time at starting up X-ray equipment
• No need for tube aging after long term storage
4. Self-diagnosis of X-ray tube lifetime
• Scheduled maintenance of X-ray equipment
5. Pulsed X-ray available (50ms minimum)

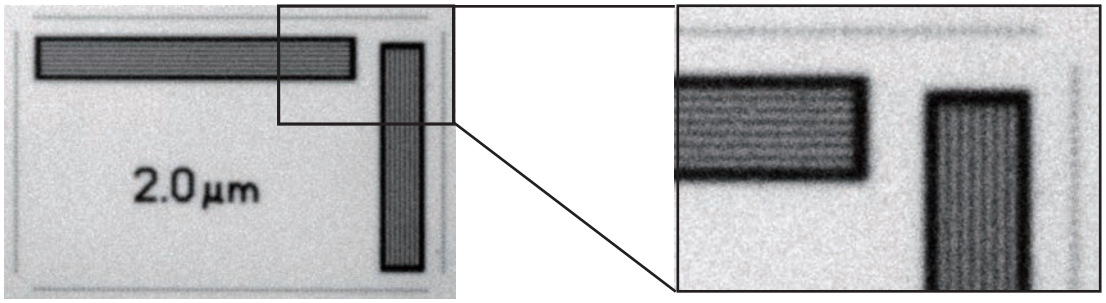
G-511VL-D / DP
(Standard Holder Type)

G-511VL-DL / DPL
(Long Holder Type)

Specifications

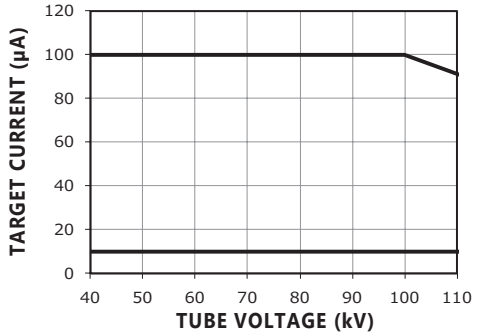
Parameter	G-511VL-D / DL	G-511VL-DP / DPL
Tube Voltage Operating Range	40 – 110 kV	
Tube Current Operating Range (Target Current)	10 – 100 µA	
Maximum Output	10 W	
Minimum Resolution (JIMA RT RC-02B)	2 µm	
X-ray Window Material	Diamond	
Focus-to-Object Distance (FOD)	Minimum 0.29 mm	
Target Material	Tungsten	
X-ray Beam Angle	168 deg. (Max.) , 80 deg. (80□, Equidistance)	
Weight	Standard Holder Type□21 kg□Long Holder Type□24 kg	
Communication Interface	RS-232C	
External Contact Control Function	Irradiation Interlock function (2 circuits)	Irradiation Interlock function (2 circuits) Trigger input for Pulse Irradiation
Irradiation Off Timer	Minimum setting value: 1 s	
Pulse Irradiation Function		Minimum Pulse Width 50ms (Use the trigger input for Pulse Irradiation)
Input Voltage (DC)	24 V (+1.2, -1.2)	
Maximum Power Consumption	40 W	
Operating Ambient Temperature	10 – 45℃	
Storage Temperature	0 – 50℃	
Operating and Storage Humidity	≦ 85%(No Condensation)	
High Voltage Power Supply	Built-in	

● MICRO CHART IMAGE (JIMA RT RC-02B)

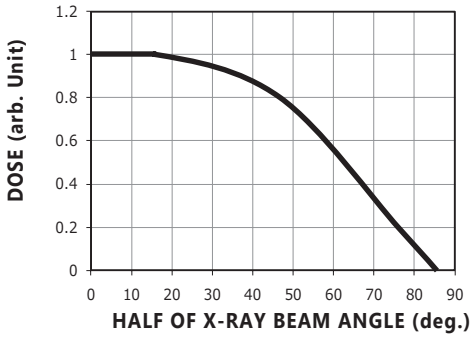


(260x)

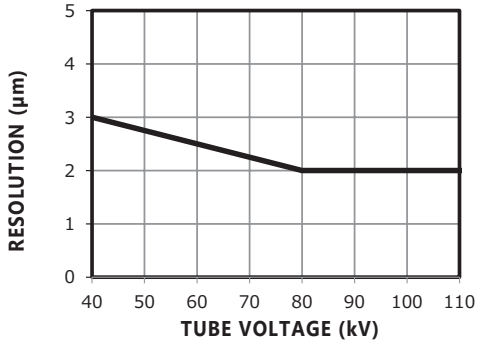
● TUBE CURRENT OPERATIONAL RANGE

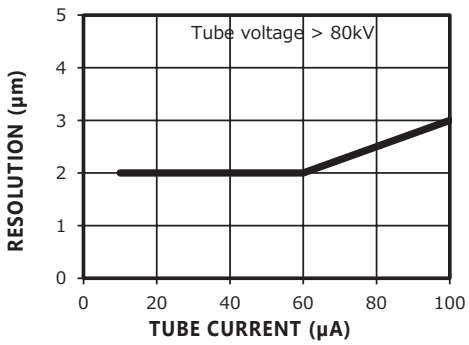


● X-RAY DOSE UNIFORMITY



● FOCUS CHARACTERISTICS

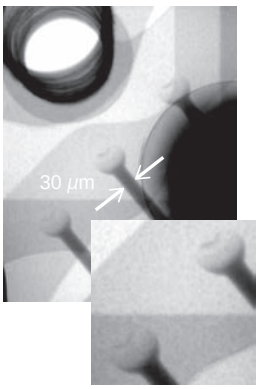




※ The figures showed in each graph are typical values.

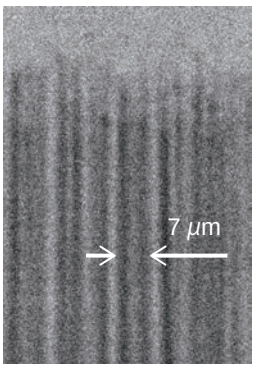
■ IMAGE EXAMPLES

Bonding wire



Multilayer Ceramic Capacitor

Carbon fiver



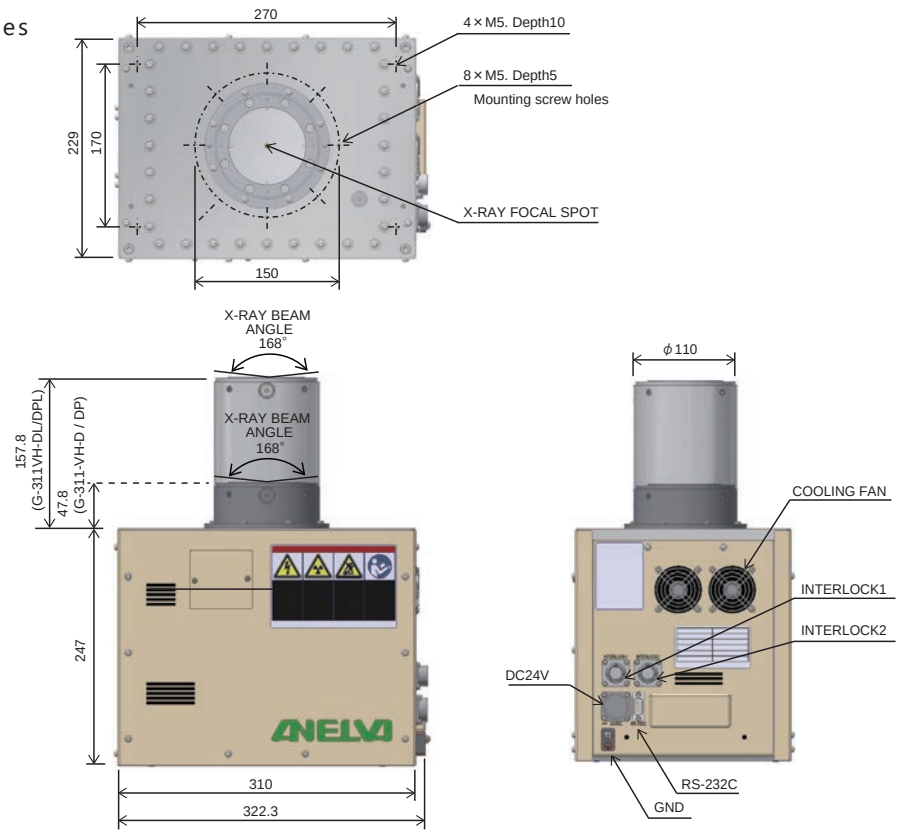
Ant

■ Ordering infomation

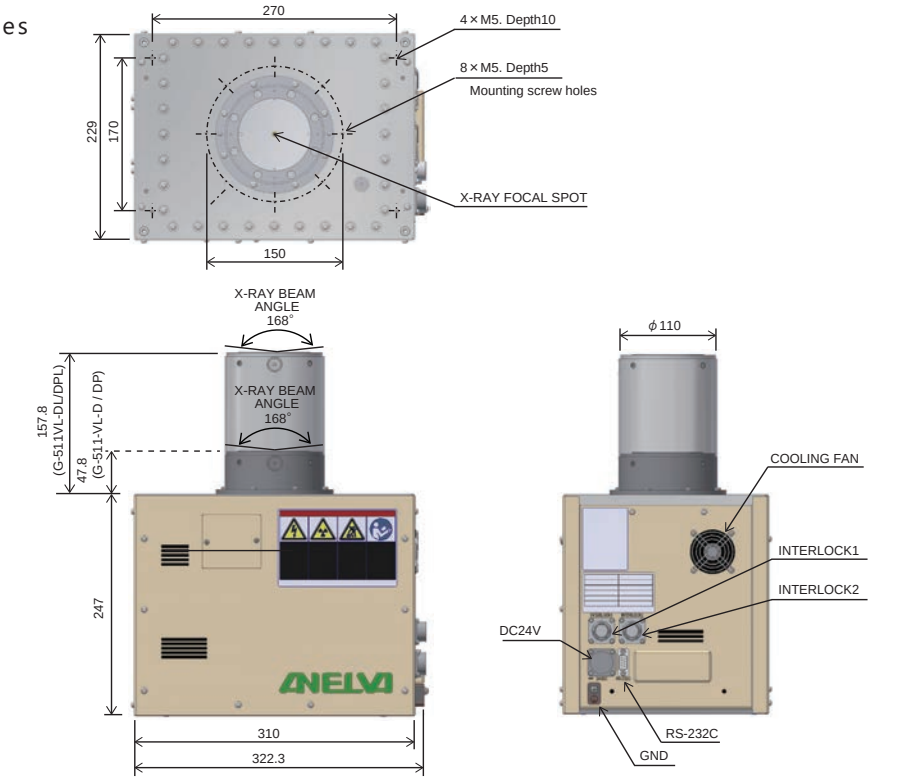
Code	Parts Number	Model	Description	Remarks
49912	8B1-0037-378	G-511VL-D	Sealed Transmissive Microfocus X-Ray Source	Standard Holder Type
49913	8B1-0038-288	G-511VL-DP	Sealed Transmissive Microfocus X-Ray Source	Standard Holder Type With Pulse Irradiation Function
49914	8B1-103Z-000	G-511VL-DL	Sealed Transmissive Microfocus X-Ray Source	Long Holder Type
49915	8B1-102Z-000	G-511VL-DPL	Sealed Transmissive Microfocus X-Ray Source	Long Holder Type With Pulse Irradiation Function

DIMENSIONAL OUTLINE (Unit:mm)

G-311 Series



G-511 Series



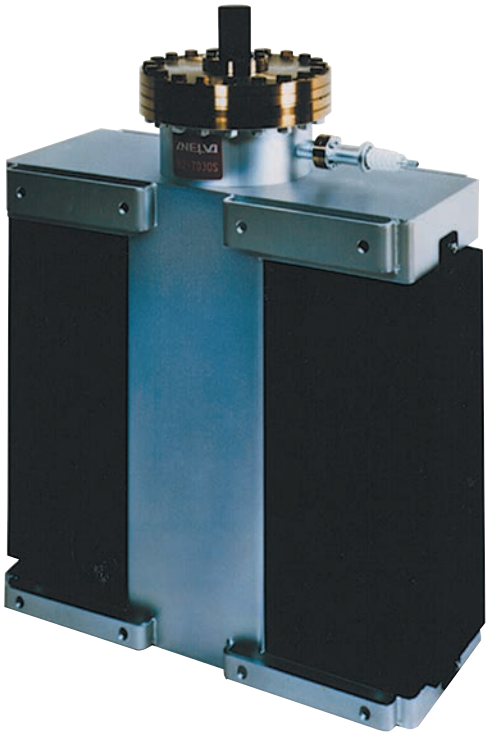
Installation side :Top(exposure port side) and Bottom

CAUTION The X-ray sources introduced in this material generate X-rays. To be used by qualified personnel only. Safe use is the responsibility of the operator.

The X-ray sources introduced in this material were developed specifically for industrial use and can not be used for food and drinks or medical applications. Since the X-ray sources introduced in this material are subject to local laws and regulations, what you are required to use may vary from region to region. Please consult with our sales representative.

Vacuum Pumps

Ion Pump/Noble Pump



P-500 Series Controller

■ Summary

The ion and noble 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.

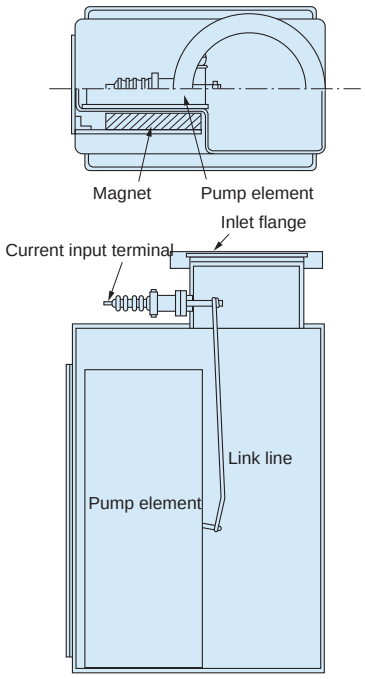
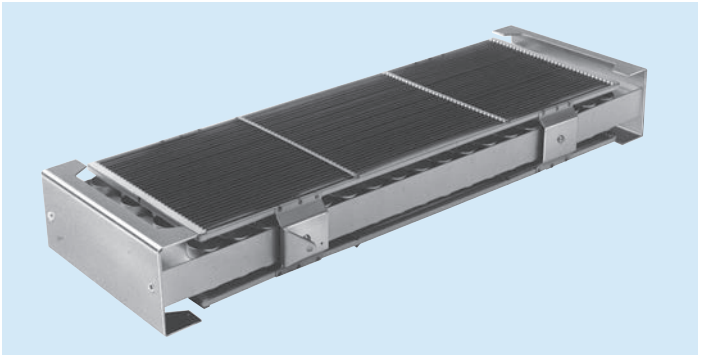
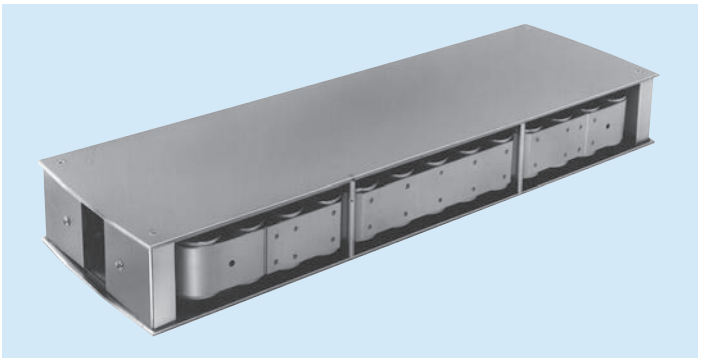


Fig. 1 Ion Pump/Noble pump external
(Example: 140 L/s Ion Pump, 110 L/s Noble Pump)



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.

2. Ultra-high vacuum

The ion pump/noble pump is best suited for creating ultra-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.

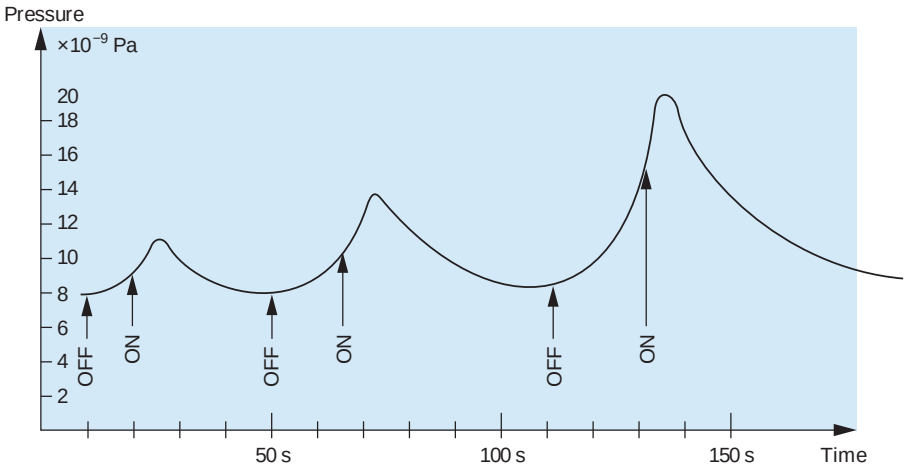


Fig. 3 Pressure change when ion pump is turned ON-OFF at 10^{-9} Pa
(The pressure rises immediately when the pump is turned OFF and drops within a few seconds after it is turned ON again. You can see that the ion pump is operating normally at 10^{-9} Pa.)

3. Quiet operation

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

4. Energy saving

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

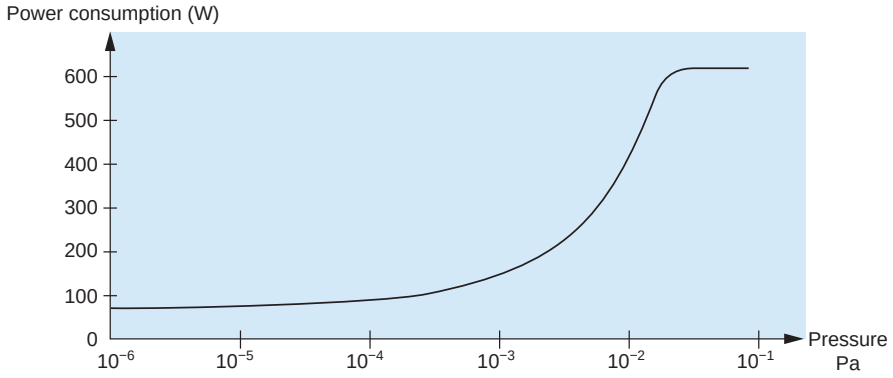


Fig. 4 Power consumption example (60 L/s ion pump)

5. Vacuum Gauge Function

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.

6. Inert gas pumping

(Noble 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 pumps for each gas.

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

	Ion pump	Noble pump
Hydrogen [10^{-4} Pa or less]	200 to 270 ※	200 to 270 ※
Nitrogen	100	100
Vapor	100	100
Carbon monoxide	100	100
Carbon dioxide [10^{-3} Pa or less]	100	100
Various hydrocarbon	90 to 160	90 to 160
Oxygen	57	57
Helium	10	30
Argon	1	21

※ 1100 to 110 for ion, noble, and excel pumps at pressures equal to or more than 10^{-3} Pa.

7. Free mounting direction

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

8. Low leakage magnetic field

A ferrite magnet is used for 20 L/s or more pumps.
The leakage magnetic field decays close to geomagnetism at 30 cm from the flange.
(Refer Fig. 9 for details)

Principle

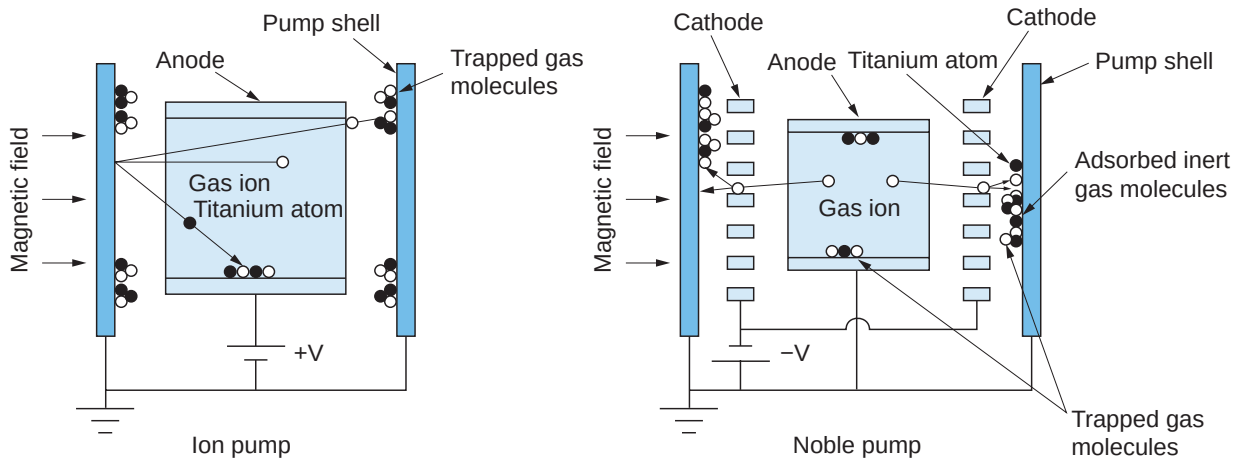


Fig. 5 Ion Pump / Noble Pump Pump pumping mechanism

Applications

- Completely oil free ultra-high vacuum pumping systems
- Ultra-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.

■ 20 L/s Ion Pump / Noble Pump

●Specifications

	Name	20 L/s Ion Pump	20 L/s Noble Pump
Pump	Type	912-7125	912-7120
	Pumping speed (N_2 gas)	20 L/s	
	Operating range(Note 1)	$10^{-2} \sim 10^{-9}$ Pa	
	Ready to start pressure(Note 1)	2×10^{-2} Pa or less	
	Capacity	1.4 L	
	Maximum heating temperature	250°C	
	Inlet	ϕ 70 ICF	
	Current input terminal	Non-replaceable	
	Element (replaceable)	Non-replaceable	
	Magnet	912-7121 (×1) included	
	Weight	10.5 kg	

Note 1 Values when using P-521IP/NP control device.

●Standard configuration

	Name and Type / Components	20 L/s Ion Pump 912-7125	20 L/s Noble Pump 912-7120
Pump	Pump body	×1	
	Attachment gasket for ϕ 70 ICF	×2	

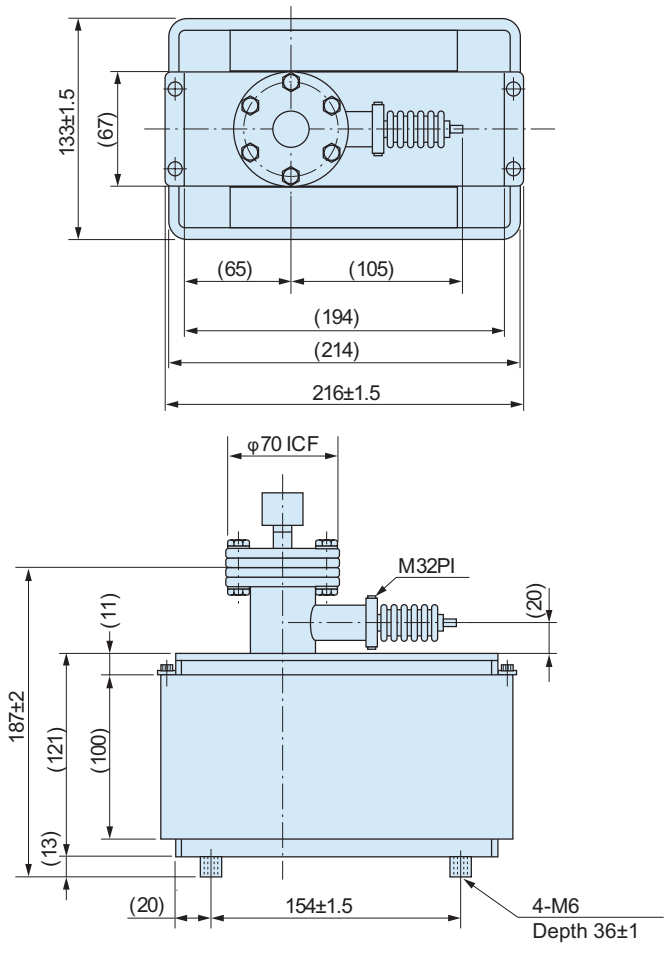


Fig. 6 (a) 20 L/s Ion Pump (912-7120)
20 L/s Noble Pump (912-7120)

■ 30 L/s Ion Pump / Noble Pump

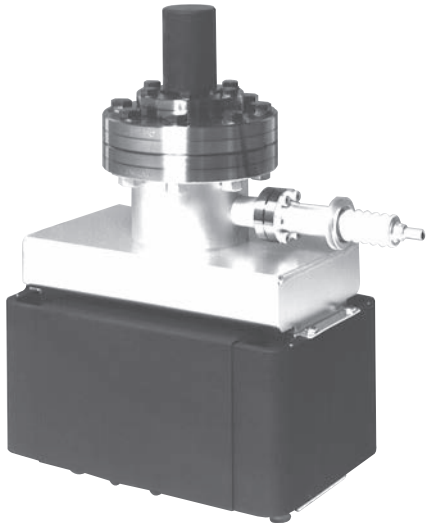
●Specifications

	Name	30 L/s Ion Pump	30 L/s Noble Pump
Pump	Type	912-7135	912-7130
	Pumping speed (N_2 gas)	30 L/s	
	Operating range(Note 1)	$10^{-2} \sim 10^{-9}$ Pa	
	Ready to start pressure(Note 1)	2×10^{-2} Pa or less	
	Capacity	2.2 L	
	Maximum heating temperature	250°C	
	Inlet	ϕ 114 ICF	
	Current input terminal	954-7281	
	Element (replaceable)	Non-replaceable	
	Magnet	912-7121 (×1) included	
	Weight	12.5 kg	

Note 1 Values when using P-521IP/NP control device.

●Standard configuration

	Components \ Name and Type	30 L/s Ion Pump 912-7135	30 L/s Noble Pump 912-7130
Pump	Pump body	×1	
	Attachment gasket for ϕ 114 ICF	×2	



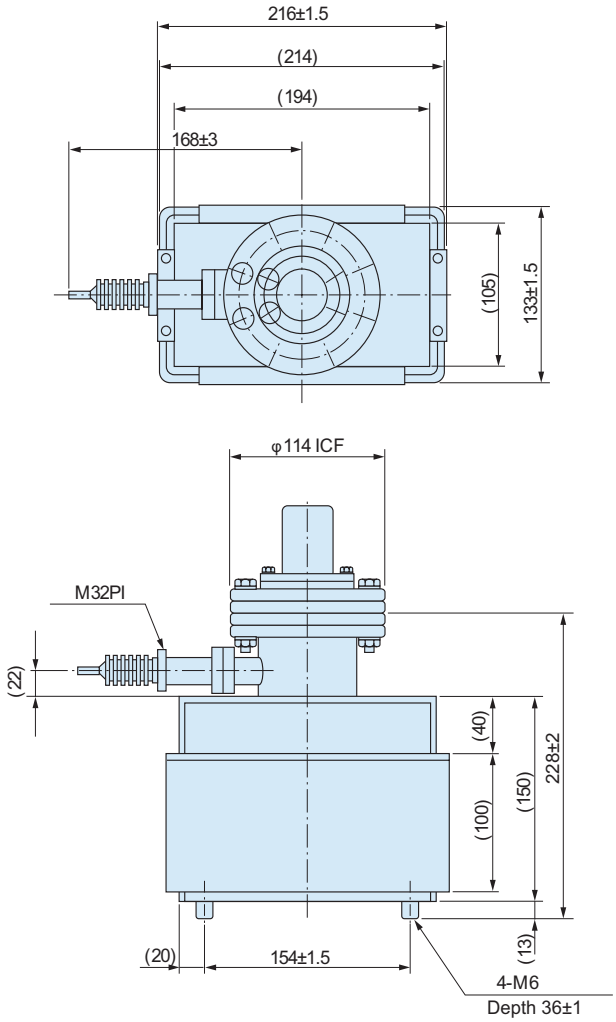


Fig. 6 (b) 30 L/s Ion Pump (912-7135)
30 L/s Noble Pump (912-7130)

■ 60 L/s Ion Pump / Noble Pump

●Specifications

	Name	60 L/s Ion Pump	60 L/s Noble Pump
Pump	Type	912-7165	912-7160
	Pumping speed (N_2 gas)	60 L/s	
	Operating range(Note 1)	$10^{-2} \sim 10^{-9}$ Pa	
	Ready to start pressure(Note 1)	2×10^{-2} Pa or less	
	Capacity	6.2 L	
	Maximum heating temperature	250°C	
	Inlet	ϕ 152 ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-7027 (1 set)	915-9527 (1 set)
	Magnet	912-7121 (×2) included	
	Weight	25.6 kg	

Note 1 Values when using P-521IP/NP control device

●Standard configuration

	Name and Type / Components	60 L/s Ion Pump 912-7165	60 L/s Noble Pump 912-7160
Pump	Pump body	×1	
	Attachment gasket for ϕ 152 ICF	×2	

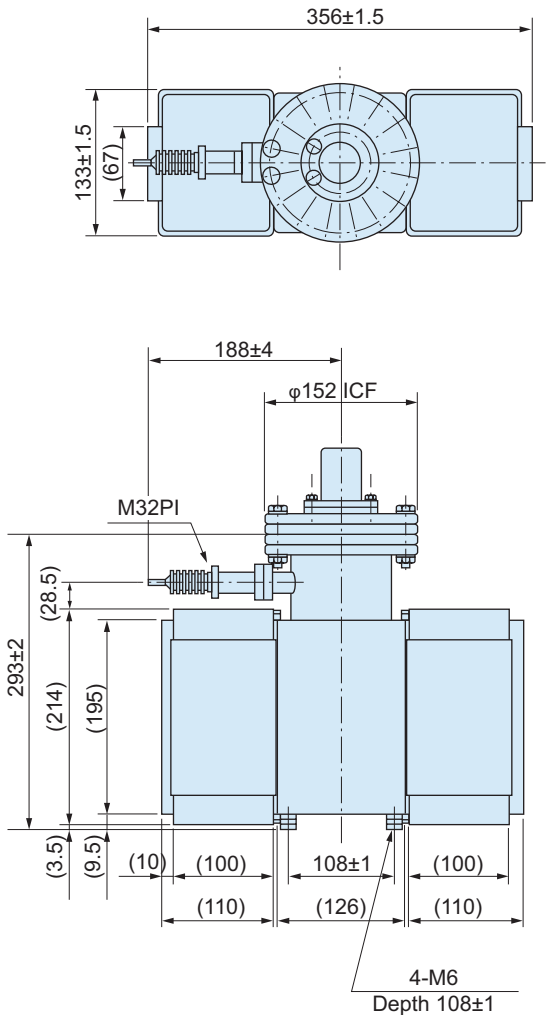


Fig. 6 (c) 60 L/s Ion Pump (912-7165)
60 L/s Noble Pump (912-7160)

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

●Specifications

	Name	110 L/s Noble Pump	140 L/s Ion Pump
Pump	Type	912-7020	912-7010
	Pumping speed (N_2 gas)	110 L/s	140 L/s
	Operating range(Note 1)	$10^{-2} \sim 10^{-9}$ Pa	
	Ready to start pressure(Note 1)	1×10^{-2} Pa or less	
	Capacity	18 L	
	Maximum heating temperature	250°C	
	Inlet	ϕ 203 ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-9520 (1 set)	915-9510 (1 set)
	Magnet	912-7001 (×1) included	
	Weight	48 kg	

Note 1 Values when using P-521IP/NP control device

●Standard configuration

	Name and Type / Components	110 L/s Noble Pump 912-7020	140 L/s Ion Pump 912-7010
Pump	Pump body	×1	
	Attachment gasket for ϕ 203 ICF	×2	

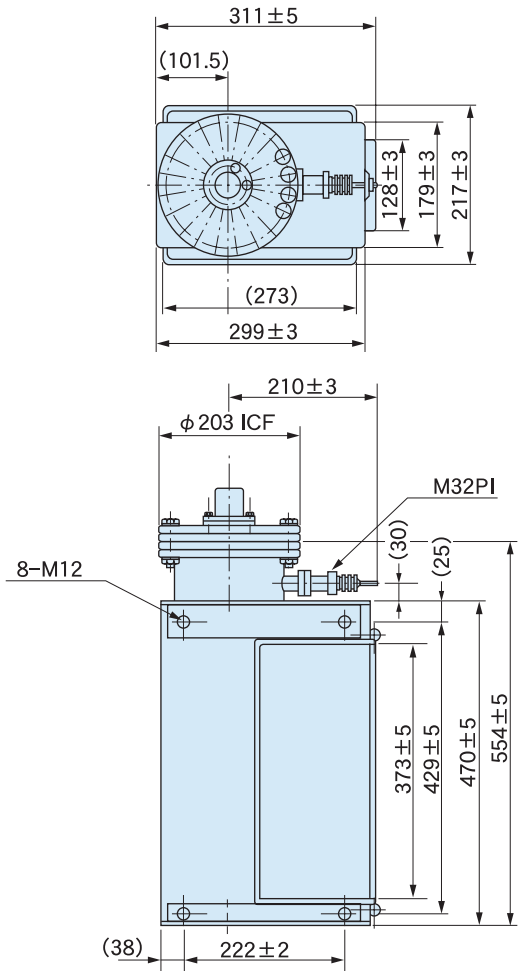


Fig. 6 (d) 110 L/s Noble Pump (912-7020)
140 L/s Ion Pump (912-7010)

■ 220 L/s Noble Pump

•Specifications

	Name	220 L/s Noble Pump	
Pump	Type	912-7040	912-7041
	Pumping speed (N_2 gas)	220 L/s	
	Operating range(Note 1)	$10^{-3} \sim 10^{-9}$ Pa	
	Ready to start pressure(Note 1)	6×10^{-3} Pa or less	
	Capacity	26 L	28 L
	Maximum heating temperature	250°C	
	Inlet	ϕ 203 ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-9510 (×2)	
	Magnet	912-7002 (×1) included	912-7001 (×2) included
	Weight	85 kg	90 kg

Note 1 Values when using P-521IP/NP control device

•Standard configuration

	Name and Type / Components	220 L/s Noble Pump 912-7040	220 L/s Noble Pump 912-7041
Pump	Pump body	×1	
	Attachment gasket for ϕ 203 ICF	×2	

■ 270 L/s Ion Pump

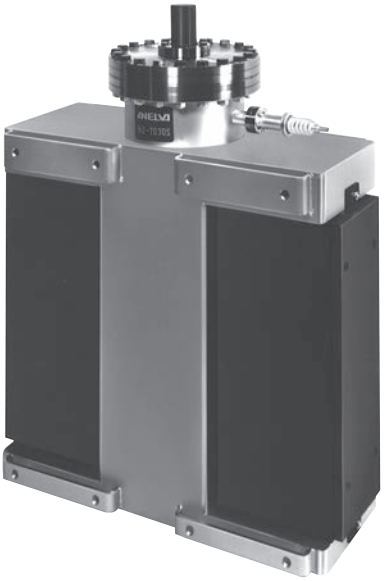
•Specifications

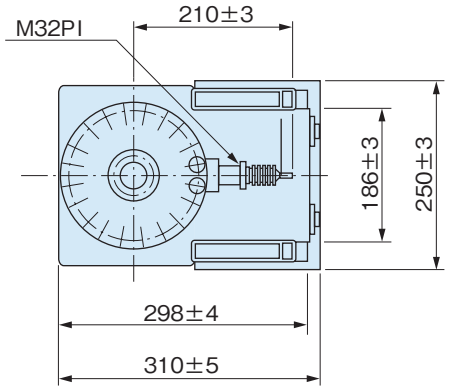
	Name	270 L/s Ion Pump	
Pump	Type	912-7030	912-7031
	Pumping speed (N_2 gas)	270 L/s	
	Operating range(Note 1)	$10^{-3} \sim 10^{-9}$ Pa	
	Ready to start pressure(Note 1)	6×10^{-3} Pa or less	
	Capacity	26 L	28 L
	Maximum heating temperature	250°C	
	Inlet	ϕ 203 ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-9510 (×2)	
	Magnet	912-7002 (×1) included	912-7001 (×2) included
	Weight	85 kg	90 kg

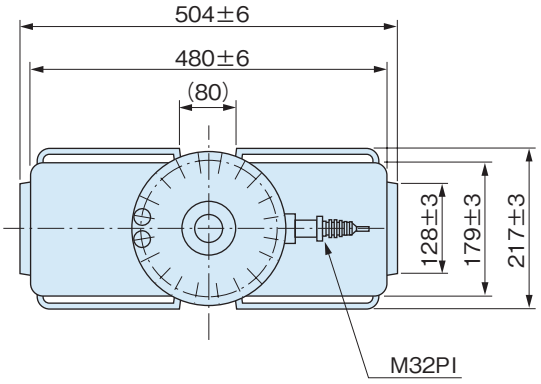
Note 1 Values when using P-521IP/NP control device

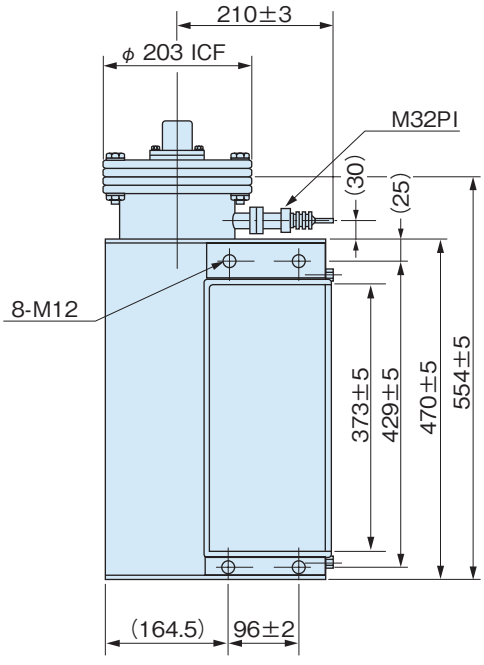
•Standard configuration

	Name and Type / Components	270 L/s Ion Pump 912-7030	270 L/s Ion Pump 912-7031
Pump	Pump body	×1	
	Attachment gasket for ϕ 203 ICF	×2	









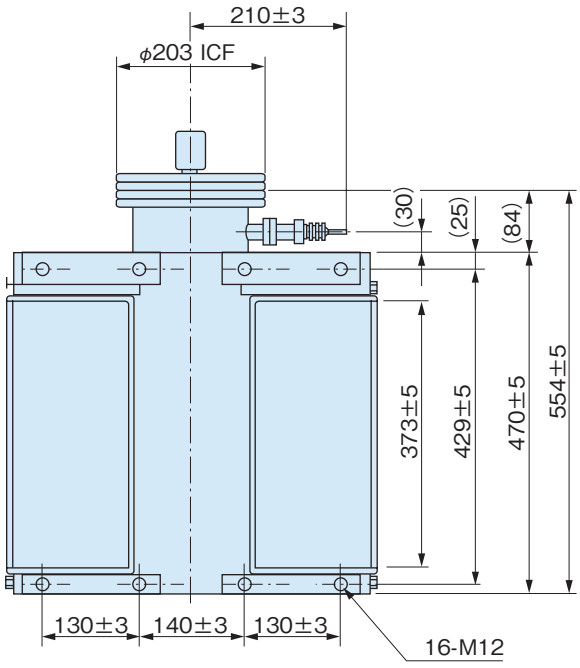


Fig. 6 (e) 220 L/s Noble Pump (912-7040)
270 L/s Ion Pump (912-7030)

Fig. 6 (f) 220 L/s Noble Pump (912-7041)
270 L/s Ion Pump (912-7031)

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

•Specifications

	Name	400 L/s Noble Pump	500 L/s Ion Pump
Pump	Type	912-7060	912-7050
	Pumping speed (N_2 gas)	400 L/s	500 L/s
	Operating range(Note 1)	$10^{-3} \sim 10^{-9}$ Pa	
	Ready to start pressure(Note 1)	3×10^{-3} Pa or less	
	Capacity	38 L	
	Maximum heating temperature	250℃	
	Inlet	ϕ 203 ICF	
	Current input terminal	954-7281	
	Element (replaceable)	915-9520 (×4)	915-9510 (×4)
	Magnet	912-7002 (×2) included	
	Weight	120 kg	

Note 1 Values when using P-521IP/NP control device

•Standard configuration

	Name and Type / Components	400 L/s Noble Pump 912-7060	500 L/s Ion Pump 912-7050
Pump	Pump body	×1	
	Attachment gasket forφ203 ICF	×2	

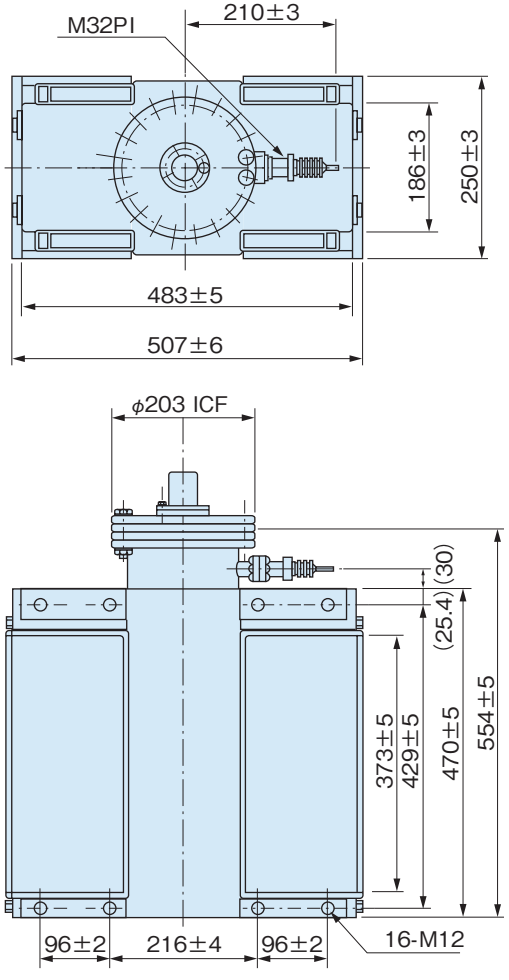


Fig. 6 (g) 400 L/s Noble Pump (912-7060)
500 L/s Ion Pump (912-7050)

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

•Specifications

	Name	800 L/s Noble Pump		1000 L/s Ion Pump	
Pump	Type	912-9110	912-7190	912-9100	912-7195
	Pumping speed (N_2 gas)	800 L/s		1000 L/s	
	Operating range(Note 1)	$10^{-3} \sim 10^{-9}$ Pa			
	Ready to start pressure(Note 1)	2×10^{-3} Pa or less			
	Capacity	106 L			
	Maximum heating temperature	250°C			
	Inlet	ϕ 326CS flange	ϕ 356 ICF	ϕ 326CS flange	ϕ 356 ICF
	Current input terminal	954-7281			
	Element (replaceable)	912-9520 (×8)		915-9510 (×8)	
	Magnet	912-7003 (×2) included			
	Weight	257 kg			

Note 1 Values when using P-521IP/NP control device

•Standard configuration

	Name and Type / Components	800 L/s Noble Pump 912-9110	800 L/s Noble Pump 912-7190	1000 L/s Ion Pump 912-9100	1000 L/s Ion Pump 912-7195
Pump	Pump body	×1			
	Attachment gasket forφ203 ICF	×3 (gasket for ϕ 326 CS flange)	×3 (gasket for ϕ 356 ICF flange)	×2 (gasket for ϕ 326 CS flange)	×2 (gasket for ϕ 356 ICF flange)

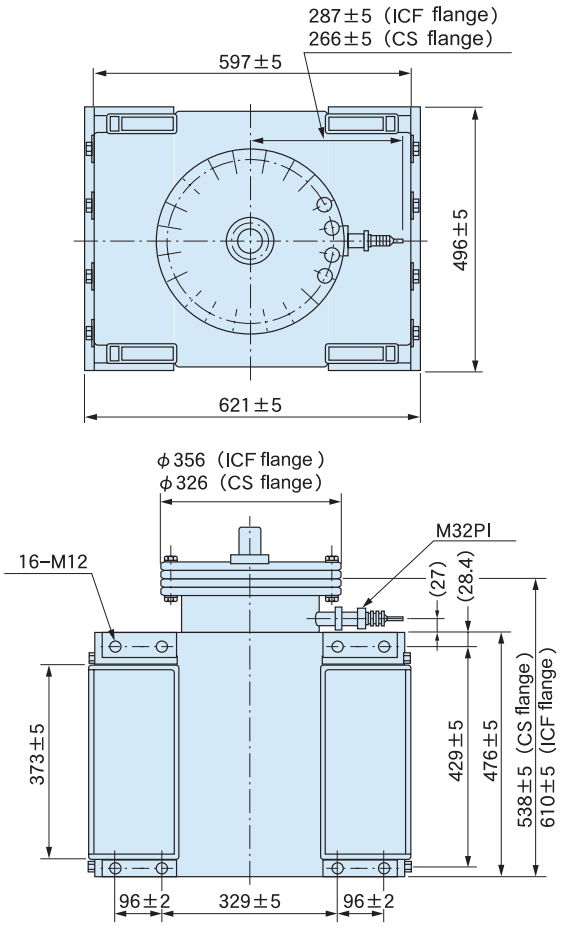
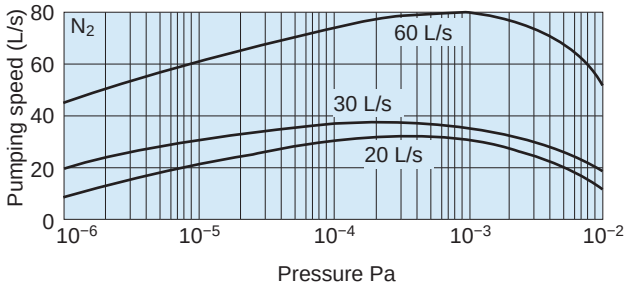
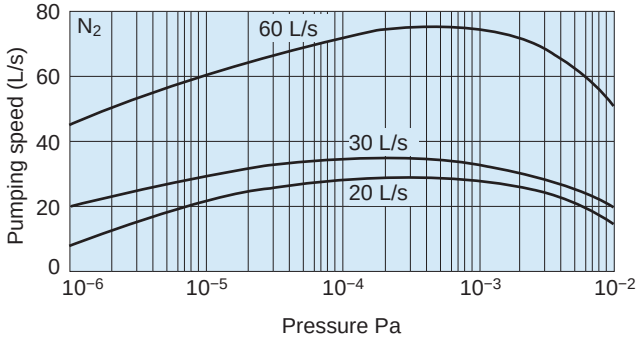


Fig. 6 (h) 800 L/s Noble Pump (912-9110)
800 L/s Noble Pump (912-7190)
1000 L/s Ion Pump (912-9100)
1000 L/s Ion Pump (912-7195)

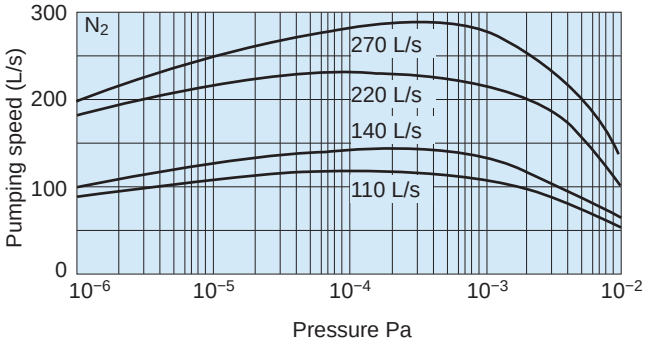
Pumping speed - pressure characteristics (Fig. 8)



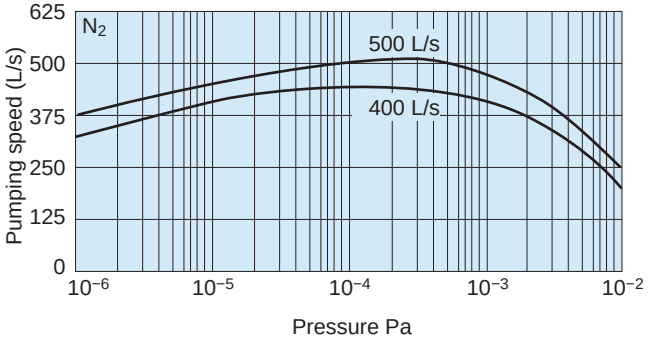
20 L/s • 30 L/s • 60 L/s Ion Pump



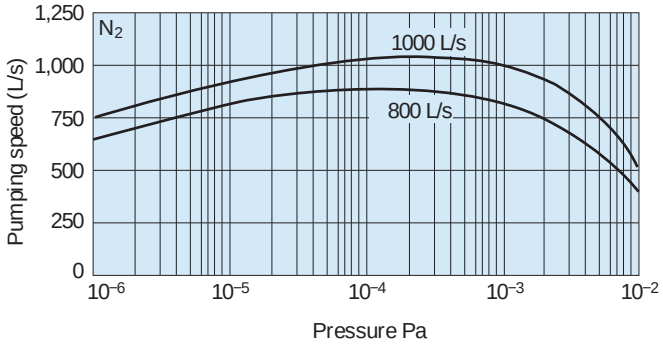
20 L/s • 30 L/s • 60 L/s Noble Pump



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

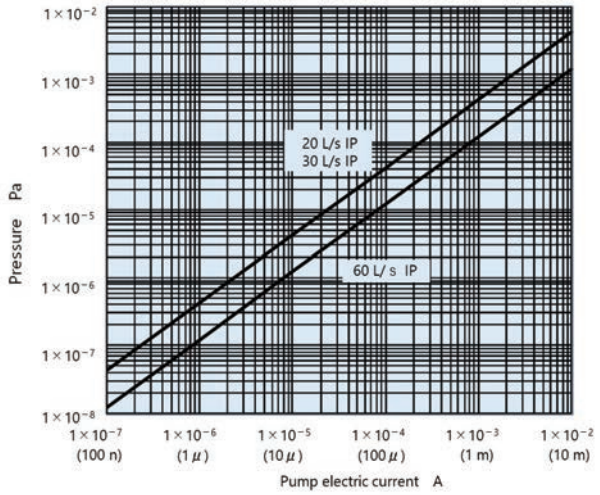


400 L/s Noble Pump • 500 L/s Ion Pump

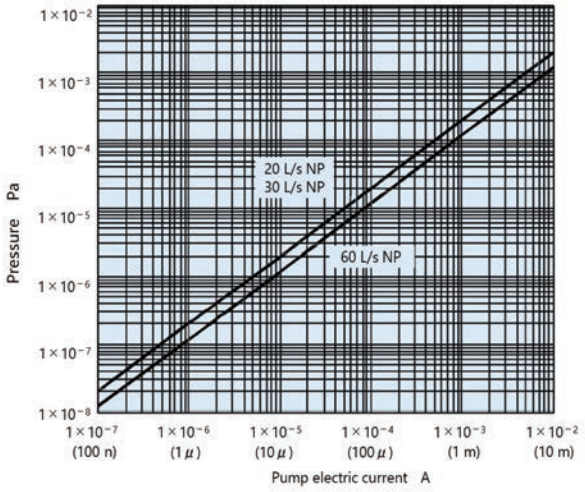


800 L/s Noble Pump • 1000L/s Ion Pump

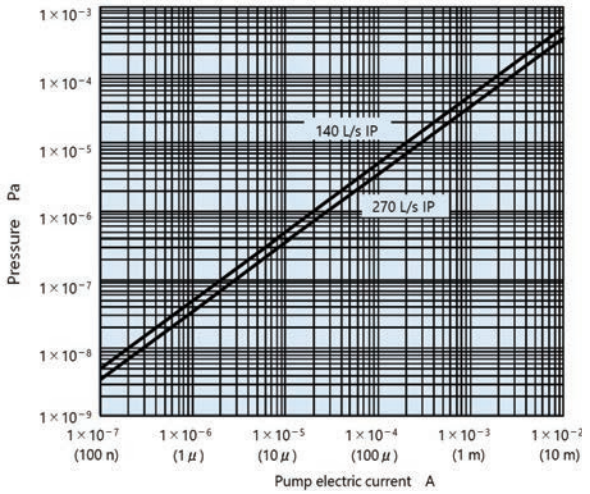
Pressure - pump current characteristics (Fig. 9)



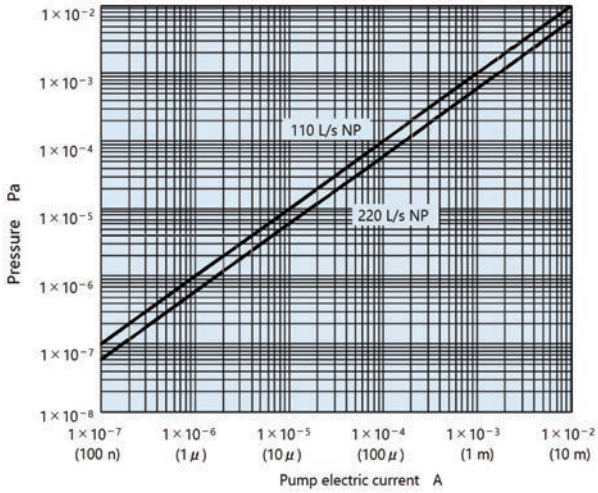
20 L/s • 30 L/s • 60 L/s Ion Pump



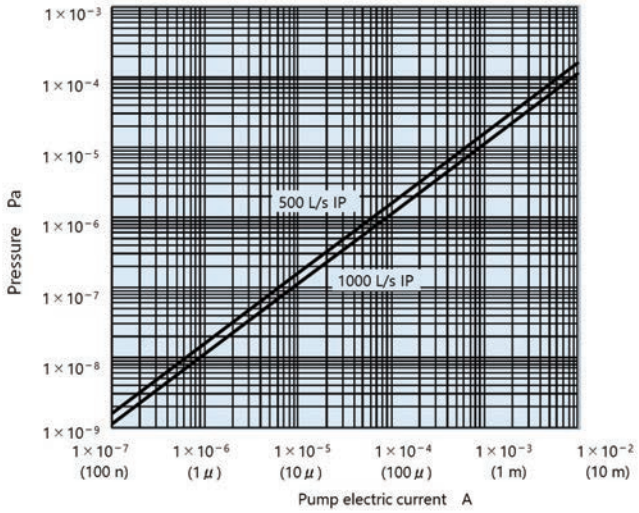
20 L/s • 30 L/s • 60 L/s Noble Pump

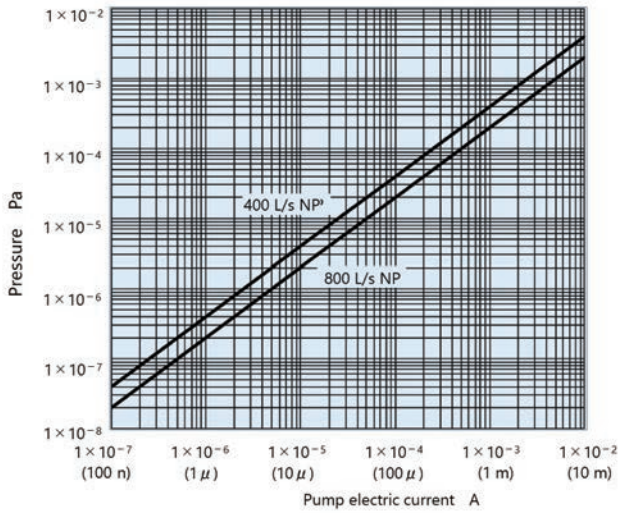


140 L/s • 270 L/s Ion Pump



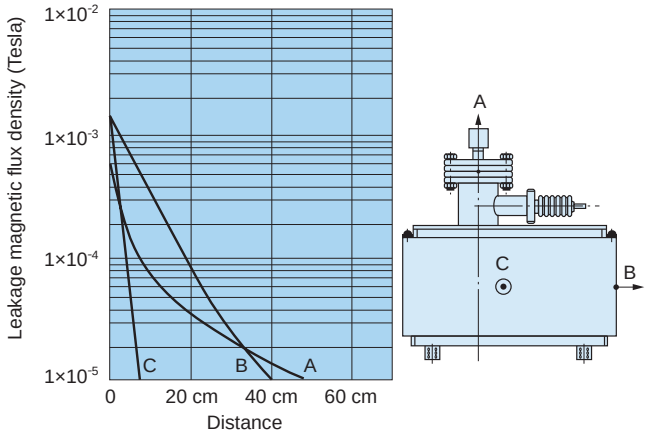
110 L/s • 220 L/s Noble Pump



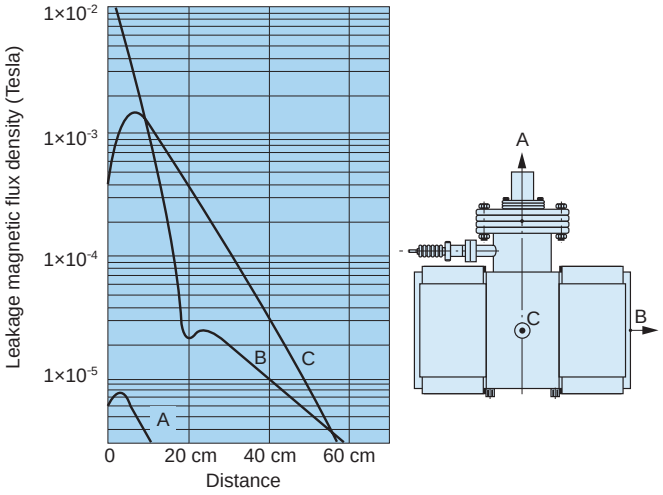


110 L/s • 220 L/s Noble Pump

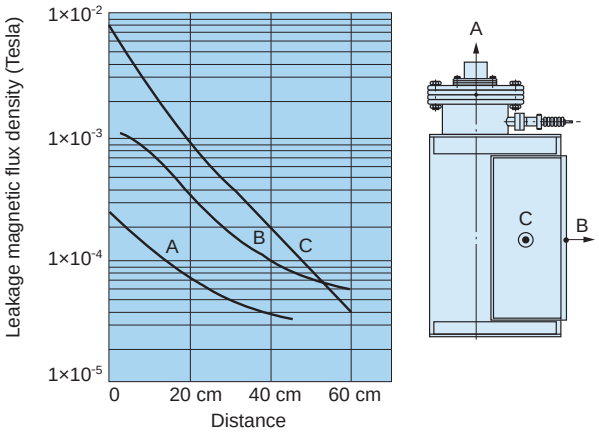
Leakage magnetic flux characteristics (Fig. 9)



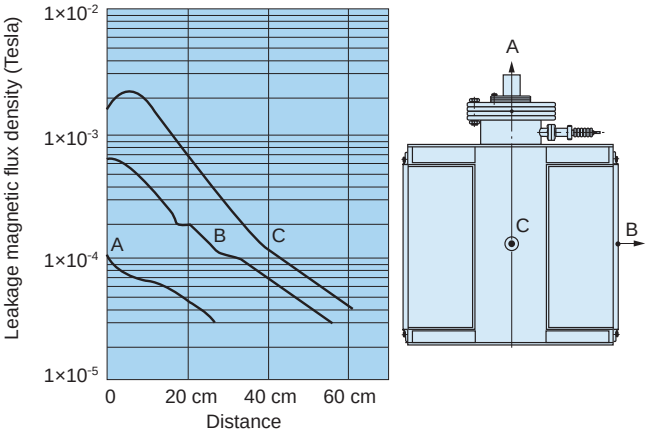
20 L/s Noble Pump
20 L/s Ion Pump



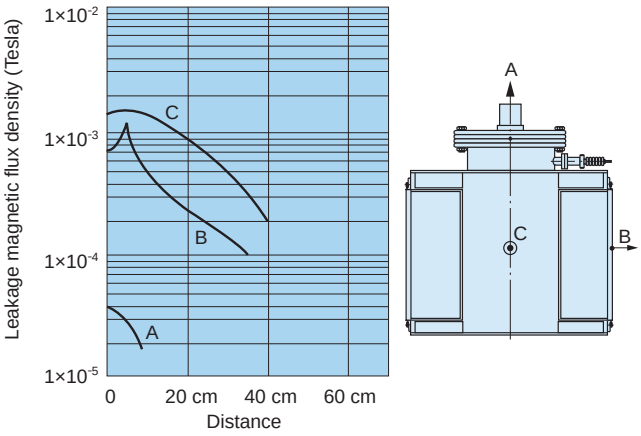
60 L/s Noble Pump
60 L/s Ion Pump



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



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



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

■ Options

● Output cable assembly

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

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

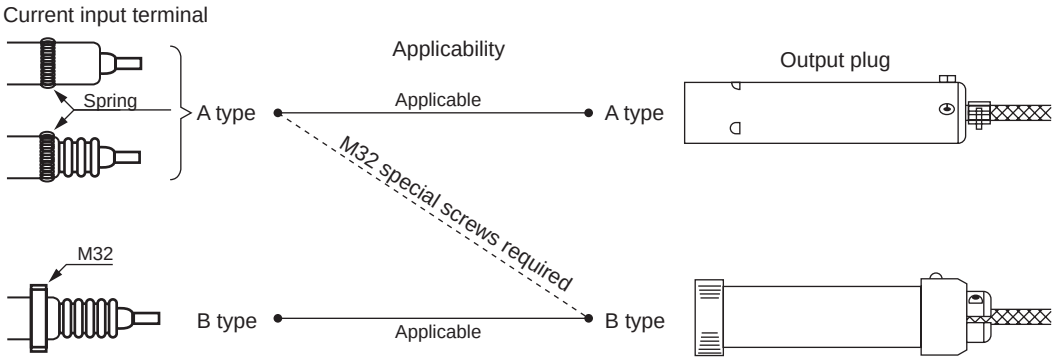
For pumps of 30L/s or less, the entire pump unit excluding the magnet must be replaced because it cannot be renewed.

Current input terminal

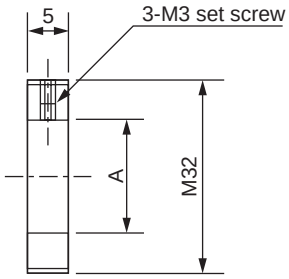
The current input terminal can be replaced for 30L/s or more pumps. Refer to the section on current input terminal.

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
954-7020	M32special screw(1)	110 L/s、140 L/s、220 L/s、270 L/s、400 L/s、500 L/s、800 L/s、1000 L/s pump	ϕ 20.2
954-7019	M32special screw(2)	1 L/s、8 L/s、20 L/s、60 L/s pump	ϕ 19.3

■ Application

When using an ion pump to create an ultra-high vacuum, the selection of the components of the vacuumsystem 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.
In general, the exhaust system configuration shown in Figure 10 is recommended.

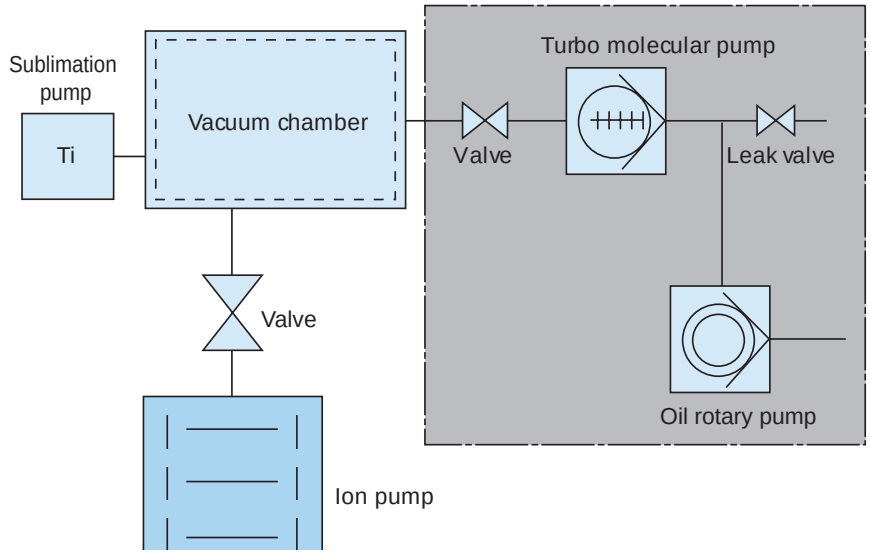


Fig. 10 Combining the roughing system with turbo molecular pump and oil rotary pump

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 10^{-2} Pa or at 3×10^{-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. 10)**

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.

● To obtain ultra-high vacuum

Oil-free rough pumping and baking of the vacuum chamber and pump body is essential.
We recommend using our titanium sublimation pump (956-7015) or tie-vac pump (956-7040) in combination as an auxiliary pump, when exhausting with the ion pump after baking.

● 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 1×10^{-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 abovementioned 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.

■ Ordering information

Parts Number	Model	Description	Remarks	Code
8B1-0002-132	912-7125	20 L/s Ion Pump	With ϕ 70 ICF	10020
8G1-0501-425	912-7127	20 L/s Ion Pump	With ϕ 70 ICF without magnet	10021
8B1-0002-074	912-7135	30 L/s Ion Pump	With ϕ 114 ICF	10022
8B1-0005-011	912-7137	30 L/s Ion Pump	With ϕ 114 ICF without magnet	10023
8B1-0002-189	912-7165	60 L/s Ion Pump	With ϕ 152 ICF	10030
8B1-0002-349	912-7010	140 L/s Ion Pump	With ϕ 203 ICF	10040
8B1-0002-383	912-7030	270 L/s Ion Pump	With ϕ 203 ICF	10042
8B1-0002-073	912-7031	270 L/s Ion Pump	With ϕ 203 ICF, left-right symmetric	10043
8B1-0002-373	912-7050	500 L/s Ion Pump	With ϕ 203 ICF	10050
8B1-0005-089	912-9100	1000 L/s Ion Pump	With ϕ 326 CS flange	10060
8B1-0008-225	912-7195	1000 L/s Ion Pump	With ϕ 356 ICF	10062
8B1-0002-194	912-7120	20 L/s Noble Pump	With ϕ 70 ICF	10120
8B1-0001-989	912-7122	20 L/s Noble Pump	With ϕ 70 ICF without magnet	10121
8B1-0001-832	912-7130	30 L/s Noble Pump	With ϕ 114 ICF	10122
8B1-0004-018	912-7132	30 L/s Noble Pump	With ϕ 114 ICF without magnet	10123
8B1-0002-146	912-7160	60 L/s Noble Pump	With ϕ 152 ICF	10130
8B1-0002-343	912-7020	110 L/s Noble Pump	With ϕ 203 ICF	10140
8B1-0002-360	912-7040	220 L/s Noble Pump	With ϕ 203 ICF	10142
8B1-0002-379	912-7041	220 L/s Noble Pump	With ϕ 203 ICF, left-right symmetric	10143
8B1-0002-368	912-7060	400 L/s Noble Pump	With ϕ 203 ICF	10150
8B1-0010-097	912-9110	800 L/s Noble Pump	With ϕ 326 CS flange	10160
8B1-0010-100	912-7190	800 L/s Noble Pump	With ϕ 356 ICF	10162
8B1-0001-727	954-7403	Output Cable assembly	For 20 L/s-1000 L/s IP/NP (3 m)	10548
8B1-0001-728	954-7405	Output Cable assembly	For 20 L/s-1000 L/s IP/NP (5 m)	10549
8B1-0001-729	954-7407	Output Cable assembly	For 20 L/s-1000 L/s IP/NP (7 m)	10550
8B1-0001-730	954-7409	Output Cable assembly	For 20 L/s-1000 L/s IP/NP (9 m)	10551

Memorandum

Improved visibility and function!

Ion Pump/Noble Pump Controller

P-500 series

■ Summary

These controllers control the ion pump or noble pump from high vacuum of 10^{-2} Pa to 10^{-4} Pa or less. A large green LED display is used for improved visibility from a distance.
The controllers provide enhanced functions and CE, RoHS compatibility while maintaining compatibility with conventional models.
Supporting RS232C communications with the addition of an option board as well as abundant I/O functions, the controllers are ideal for automated equipment/remote operation equipment.
An ultra-high vacuum type and a high-power type are available for both the ion and noble pumps with the operable pressure range and ready to start pressure depending on the connected pump.

■ Features

1. High performance

Achieves basic functions necessary for high voltage power supply with improved minimum displayable values when monitoring current/voltage, addition of pressure display, and various protective functions

2. Rich functions

- Supports external control with various standard equipped I/Os such as two set points
- Auto recovery from power failure (selectable)
- Small current output (optional) allows to monitor the pump current at ultra-high vacuum.

3. High compatibility

Maintains remote connector, input cable, and output cable compatibility with conventional models

4. Communication support

RS232C (Option〔Assembled at the factory〕)

5. Applicable standards

CE marking, RoHS directive compliance

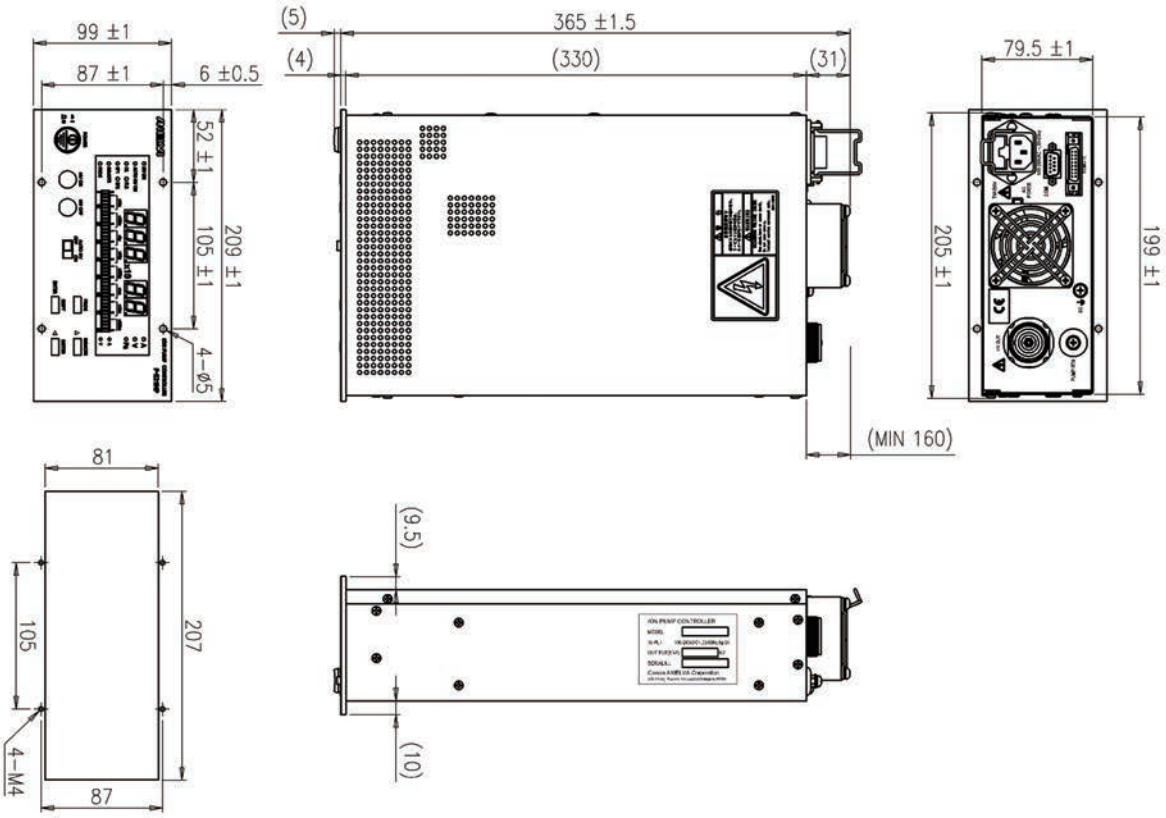
■ Applications

- Electron microscopes, electron beam lithography equipment
- Ion beam equipment, mask repair equipment
- Accelerator-related systems such as storage rings, beam lines, etc.
- Ultra-high vacuum equipment and various analyzers such as MBE, surface analysis equipment, etc.

■ Specifi cations

Type		P-511 IP	P-521 IP	P-511 NP	P-521 NP
Name		Ion Pump Controller		Noble Pump Controller	
Compatible pump		All ion pumps		All noble pumps, excel pumps, combination pumps	
Maximum output voltage		DC+5.2 kV±10% / DC+7.5 kV±10% / DC+3.5 kV±10% Switched in program mode		DC-5.2 kV±10% / DC-7.0 kV±10% Switched in program mode	
Maximum output current		43 mA or more	170 mA or more	43 mA or more	170 mA or more
		Limited to approx. 20 mA in the case of 8 L/s and 1 L/s			
Input voltage		AC100 ～ 240 V 50/60 Hz 1 ϕ (multi-voltage input)			
Power consumption		Approx. 500 VA maximum			
Dimensions		W209×H99×D370 mm (1/2 rack size)			
Weight		Approx. 6 kg (without option board)			
Operating temperature/ humidity		0 ～ 40°C / 85% RH or less (no condensation)			
Usage environment		Indoor use / altitude 2000 m or less / pollution level: 2 / Installation category: II			
Display range	Output voltage	0.1×10^{3} V (0.1 kV) ～ 8.0×10^{3} V (8.0 kV)			
	Output current	0.1×10^{-7} A (10 nA) ～ 5.0×10^{-1} A (500 mA)			
	Pressure	1.1×10^{-9}～ 1.0×10^{-3} Pa (The display range varies depending on the connected pump) No display function in the case of 8 L/s and 1 L/s		1.1×10^{-9}～ 1.0×10^{-3} Pa (The display range varies depending on the connected pump)	
Protection function		Various protective functions available Errors and error numbers are displayed on the display unit when the protective function is activated			
Pressure contact		Two points can be set between 1µA ～ 99 mA			
REMOTE mode		REMOTE/LOCAL switchable with the REMOTE switch on the front panel			
Conformity		CE、RoHS			

■ Dimensions diagram



■ Selection guide

An ultra-high vacuum type and high-power type are available for both the P-500 series ion pump controller and noble pump controller with different ready to start pressures when operating the same pump.
Use the following table to select the controller that meets your requirements.

Applicable Pump Type / Name	Ready to Start Pressure		Remarks
＜ Ion Pump ＞	P-511 IP Ion Pump controller (ultra-high vacuum type)	P-521 IP Ion Pump controller (high-power type)	Set to +5.2 kV output voltage at shipment
912-7125 20 L/s Ion Pump	1×10^{-2} Pa or less	2×10^{-2} Pa or less	
912-7135 30 L/s Ion Pump	1×10^{-2} Pa or less	2×10^{-2} Pa or less	
912-7165 60 L/s Ion Pump	5×10^{-3} Pa or less	2×10^{-2} Pa or less	
912-7010 140 L/s Ion Pump	2×10^{-3} Pa or less	1×10^{-2} Pa or less	Output voltage must be changed to +7.5kV
912-7030 270 L/s Ion Pump 912-7031 270 L/s Ion Pump	1×10^{-3} Pa or less	6×10^{-3} Pa or less	
912-7050 500 L/s Ion Pump	5×10^{-4} Pa or less	3×10^{-3} Pa or less	
912-9100 1000 L/s Ion Pump 912-7195 1000 L/s Ion Pump	3×10^{-4} Pa or less	2×10^{-3} Pa or less	
913-0007 1 L/s Ion Pump 913-0008 1 L/s Ion Pump	1×10^{-2} Pa or less	—	Output voltage must be changed to +3.5kV
911-7000 8 L/s Ion Pump	1×10^{-2} Pa or less	—	
＜ Noble pump ＞	P-511NP Noble Pump controller (ultra-high acuum type)	P-521NP Noble Pump controller (high-power type)	Set to -5.2 kVoutput voltage at shipment
912-7120 20 L/s noble pump	1×10^{-2} Pa or less	2×10^{-2} Pa or less	
912-7130 30 L/s noble pump	1×10^{-2} Pa or less	2×10^{-2} Pa or less	
912-7160 60 L/s noble pump	5×10^{-3} Pa or less	2×10^{-2} Pa or less	
912-7020 110 L/s noble pump	2×10^{-3} Pa or less	1×10^{-2} Pa or less	
912-7040 220 L/s noble pump 912-7041 220 L/s noble pump	1×10^{-3} Pa or less	6×10^{-3} Pa or less	
912-7060 400 L/s noble pump	5×10^{-4} Pa or less	3×10^{-3} Pa or less	
912-9110 800 L/s noble pump 912-7190 800 L/s noble pump	3×10^{-4} Pa or less	2×10^{-3} Pa or less	
913-7000 400 L/s combination pump	1×10^{-2} Pa or less	2×10^{-2} Pa or less	
913-7001 800 L/s combination pump	1×10^{-2} Pa or less	2×10^{-2} Pa or less	
913-7002 1600 L/s combination pump	5×10^{-3} Pa or less	2×10^{-2} Pa or less	

Note) Note that the values depend on conditions such as the pumping history, pumping system configuration, and capacity.

■ Output cable

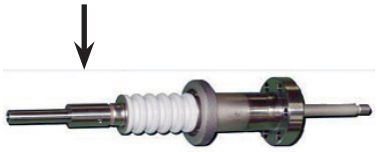
The main unit of the P-500 series ion pump/noble pump controller is CE compliant.
Therefore, CE compliant output cables are newly included.
Conventional type cables (CE non-compliant) can also be used.

Output cable assembly
L=139 mm

CE-compliant output cable assembly L=185 mm

A current terminal adapter is necessary to connect the CE-compliant output cable to the ion pump/noble pump.

Current terminal adapter



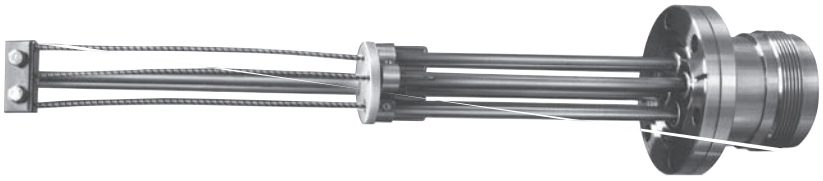
Current terminal equipped with adapter

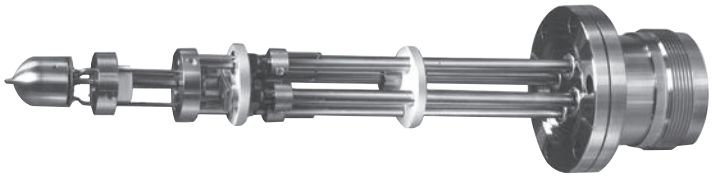
◆ The current terminal adapter is included with the CE-compliant output cable.

■ Ordering information

Parts Number	Model	Description	Remarks	Code
8B1-0000-756	P-511IP	Ion Pump Control Unit	For ultra-high vacuum	10261
8B1-0000-757	P-521IP	Ion Pump Control Unit	High output type	10262
8B1-0000-758	P-511NP	Noble pump Control Unit	For ultra-high vacuum	10361
8B1-0000-759	P-521NP	Noble pump Control Unit	High output type	10362
8B1-0007-418	P-511IP-RS	Ion Pump Control Unit with RS232C	For ultra-high vacuum, RS232C built-in	10263
8B1-0007-419	P-521IP-RS	Ion Pump Control Unit with RS232C	High output, RS232C built-in	10264
8B1-0007-420	P-511NP-RS	Noble pump Control Unit with RS232C	For ultra-high vacuum, RS232C built-in	10363
8B1-0007-421	P-521NP-RS	Noble pump Control Unit with RS232C	High output, RS232C built-in	10364
8B1-0000-761	501-003	CE- Output Cable assembly (3 m)	For both 20 L/s-1000 L/s IP/NP	10561
8B1-0000-762	501-005	CE- Output Cable assembly (5 m)	For both 20 L/s-1000 L/s IP/NP	10562
8B1-0000-763	501-007	CE- Output Cable assembly (7 m)	For both 20 L/s-1000 L/s IP/NP	10563
8B1-0000-764	501-009	CE- Output Cable assembly (9 m)	For both 20 L/s-1000 L/s IP/NP	10564
8B1-0001-727	954-7403	Output Cable assembly (3 m)	For both 20 L/s-1000 L/s IP/NP	10548
8B1-0001-728	954-7405	Output Cable assembly (5 m)	For both 20 L/s-1000 L/s IP/NP	10549
8B1-0001-729	954-7407	Output Cable assembly (7 m)	For both 20 L/s-1000 L/s IP/NP	10550
8B1-0001-730	954-7409	Output Cable assembly (9 m)	For both 20 L/s-1000 L/s IP/NP	10551

Titanium Sublimation Pump/Ti-Vac Pump





■ Summary

The titanium sublimation pump and Ti-Vac pump are getter pumps that heat and sublimate 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 signifi cantly 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.

■ Specifi cations

● 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 45 A power	Average 0.35g/h at 48 A power
Used fl ange	ϕ 70 ICF flange	
Weight	Approx. 580g	Approx. 680g
Dimensions	See Fig. 1	See Fig. 2

● Controller

Name	Sublimation controller
Type	922-9119
Input	AC200 V±20 V 1 ϕ 2 A 50 / 60 Hz
Output	Voltage: 2.8 to 10.8 V 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. 3.8 V 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. 20.5 kg
Input cable	Length outside equipment Approx. 2 m
Output Cable	Length 2 m
Dimensions	See figure

● Standard configuration

Titanium sublimation pump (TSP)

Name		Configuration
956-7015 TSP cartridge (Titanium filament not attached)		×1
Attachiments	956-0010 titanium filament	×12 (1 pack)
	953-5014 gasket for ϕ 70 ICF flange	×5 (1 pack)
	10×10 combination wrench	×1
	7×8 both opening spanner	×1
	Dimension 2 hexagonal wrench	×1
	Moly paste (lubricant)	×1 (tube)
	M4x4 set screws (spare)	×4

Controller (for both TSP and Ti-Vac pump)

Name		Configuration
Controller body		×1
4P plug with output cable (2 m)		×1
Attachiments	Receptacle for 200 V input	×1
	5A fuse	×2
	50A fuse with tab	×1

Note) Cable connector heat-resistant temperature 125°C

Ti-Vac Pump

Name		Configuration
956-7030 Ti-Vac holder		×1
956-7035 Ti-Vac head		×1
Attachiments	Support fitting (included with Ti-Vac holder)	×1
	Insulation spacer (included with Ti-Vac head)	×1
	953-5014 gasket for ϕ 70 ICF flange	×5 (1 pack)
	10x10 combination wrench	×1
	Dimension 2 hexagonal wrench	×2
	Moly paste (lubricant)	×1 (tube)
	M4x4 set screws (spare)	×1

Sublimation pump controller

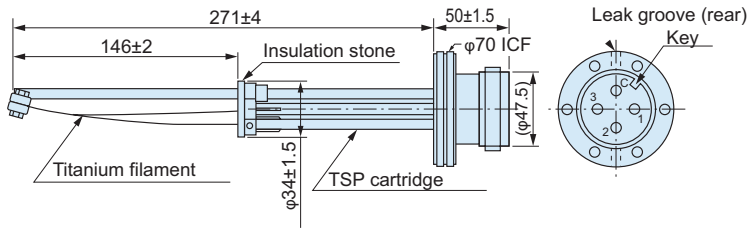


Fig. 1 Titanium sublimation pump

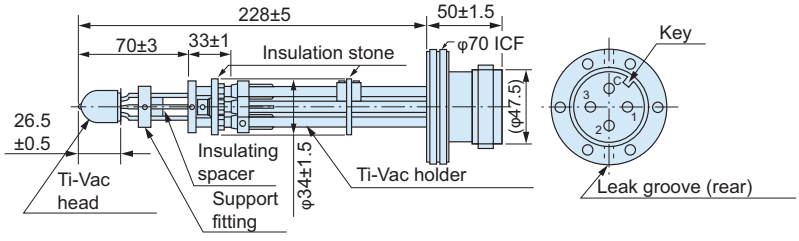


Fig. 2 Ti-Vac pump

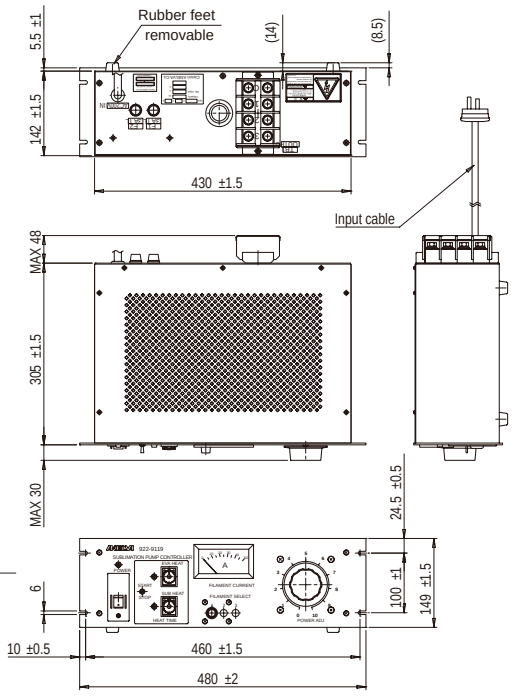
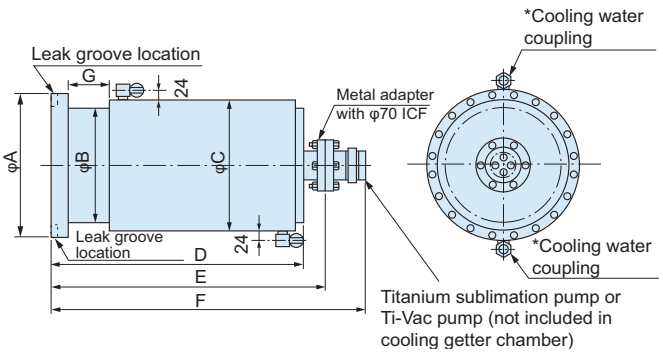


Fig. 3 Sublimation pump controller

■ Options

● Water-cooled getter chamber

Description	400 L/s Getter chamber	800 L/s Getter chamber	1600 L/s Getter chamber
ϕ A	ϕ 152 ICF	ϕ 203 ICF	ϕ 253 ICF
ϕ B	ϕ 101.6	ϕ 160	ϕ 203
ϕ C	ϕ 120	ϕ 180	ϕ 221
D	300	350	400
E	330	380	430
F	380	430	480
G	60	58	65
Weight	Approx. 5.5 kg	Approx. 10 kg	Approx. 15 kg



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

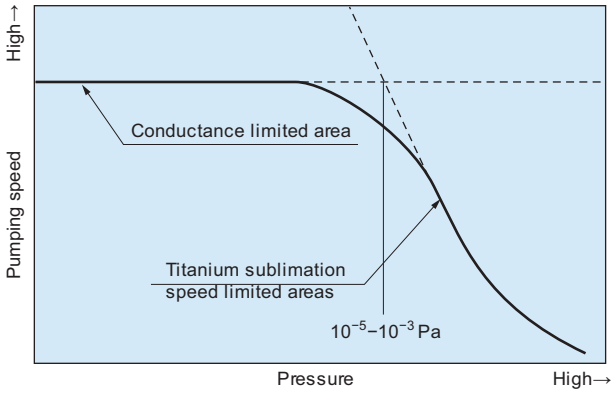
■ Application

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

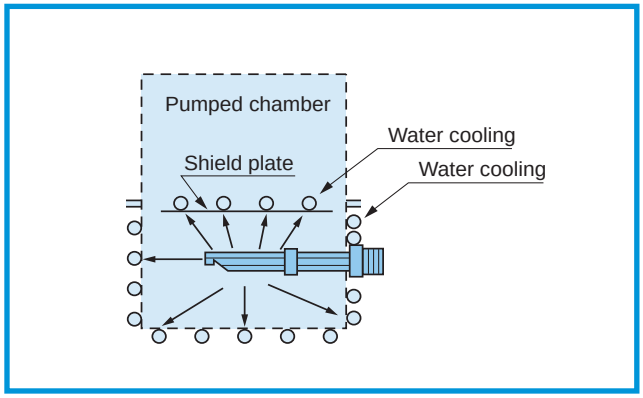
(Unit：L/s,cm²)

Type of gas / Getter surface temperature	H_2	N_2	O_2	CO	CO_2	H_2O	Inert gas	Methane
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

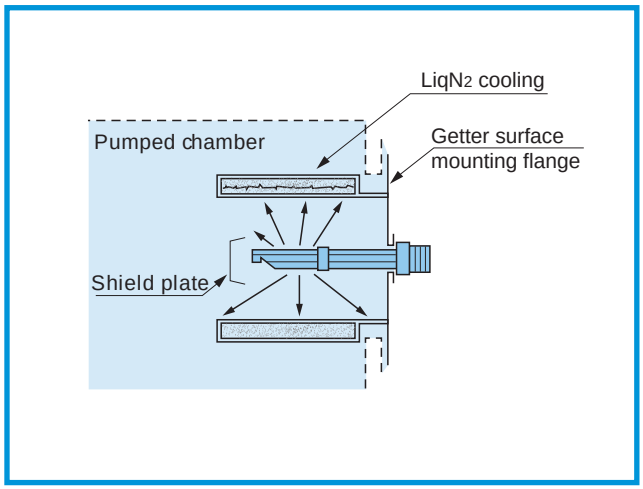
As shown above, the pumping speed of the getter pump varies significantly according to the pressure at the conductance limited area and titanium sublimation speed limited area.
The pumping speed at the conductance limited area is as shown above when the supply of titanium to the getter surface is sufficient 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.

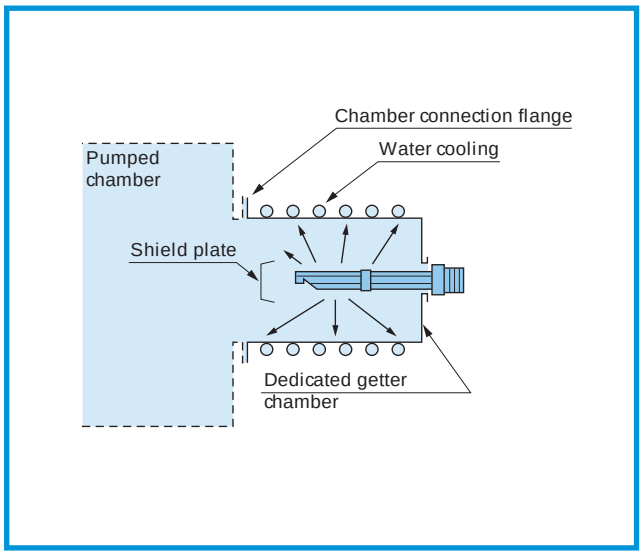
1. Using the inside wall of the pumped chamber as the getter surface
   (In order to obtain high pumping speed)



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



3. 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
8B1-0001-982	956-7040	Ti-Vac Pump	With ϕ 70 ICF, Ti-Vac head x1	10720
8B1-0008-563	956-7035	Ti-Vac Head	TI Head	10730
8B1-0008-568	956-7015	TSP Cartridge	With ϕ 70 ICF, with filament/gasket/attachment tool	10700
8B1-0006-590	956-0010	TSP Filament	×12	10711
8G1-0527-966	956-7030	Ti-Vac Holder		10731
8B1-0006-399	922-9119	Sublimation Pump Control Unit	200V AC /1 ϕ , for both TSP and Ti-Vac pump	10771
8B1-0008-571		TSP Output Cable (2 m)	2 m	10780
8B1-0004-847		TSP Output Cable (3 m)	3 m	10781
8B1-0008-572		TSP Output Cable (5 m)	5 m	10782
8G1-0526-884		TSP Output Cable (7 m)	7 m	10783
8B1-0008-500	941-7104	400 L/s Getter Chamber	With ϕ 152 ICF	10752
8B1-0008-502	941-7108	800 L/s Getter Chamber	With ϕ 203 ICF	10753
8B1-0008-504	941-7116	1600 L/s Getter Chamber	With ϕ 253 ICF	10754

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.

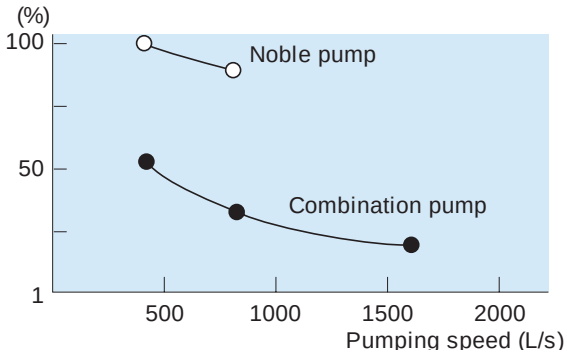


Fig. 1 Price to pumping speed ratio
(Assuming 400 L/s noble pump is 100%)

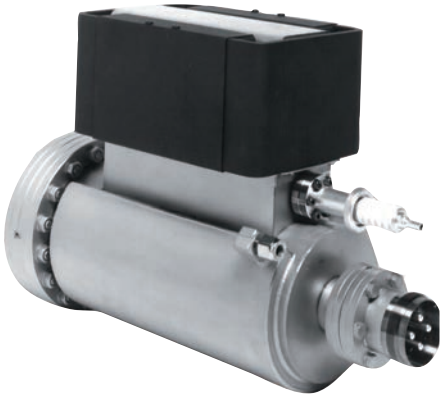
■ Features

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.

■ 400 L/s Combination Pump



● Specifications

Pumping rate/ Pumping flow	See Fig. 2
Operating pressure range	10^{-1} Pa ～ 10^{-9} Pa
Baking temperature	MAX 250°C
Weight	Approx. 15 kg
Intake flange	ϕ 152 ICF flange
Capacity	Approx. 4.5 L
Dimensions	See Fig. 3
Applicable controller	922-9119 Sublimation Pump Controller and P-511NP or P-521NP Noble Pump Controller

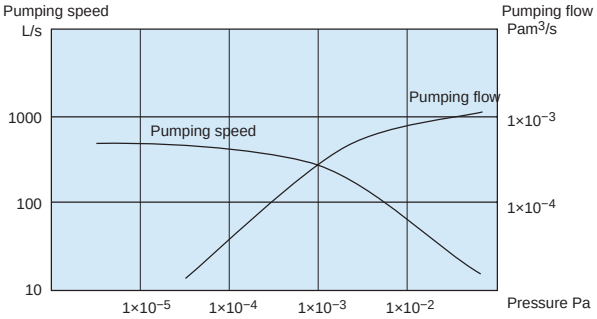
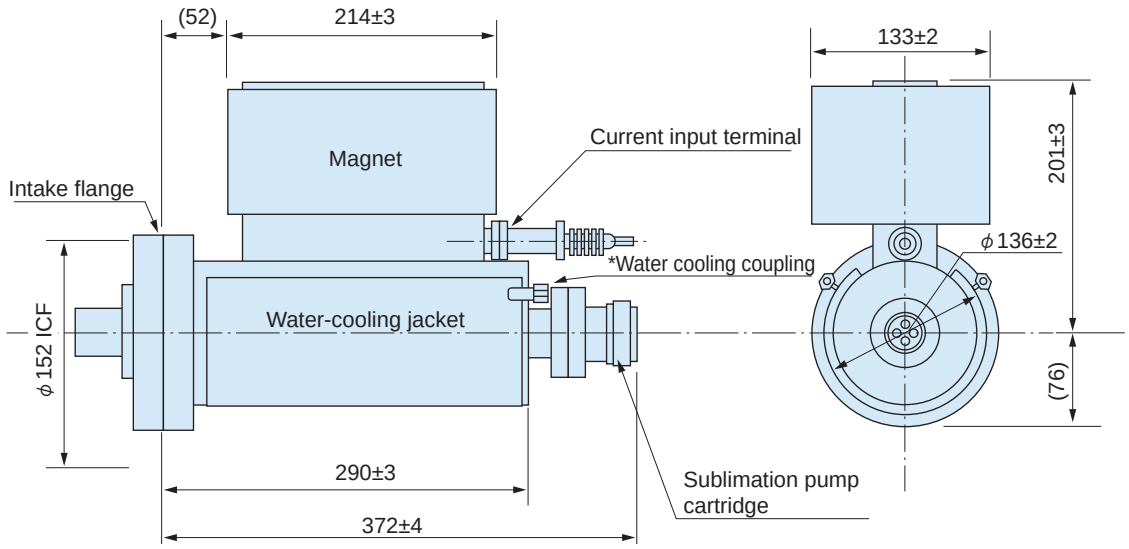


Fig. 2 Pumping speed/pumping flow - pressure characteristics



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

Fig. 3 400 L/s Combination Pump Dimensions diagram

■ 800 L/s Combination Pump

● Specifications

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

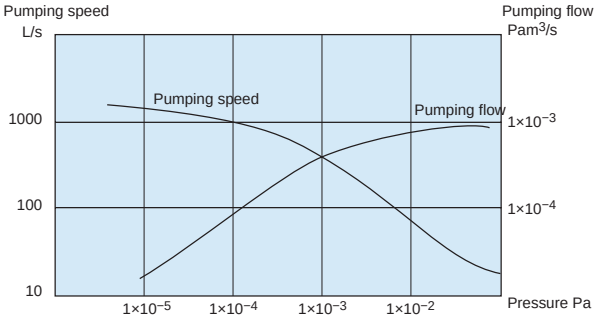
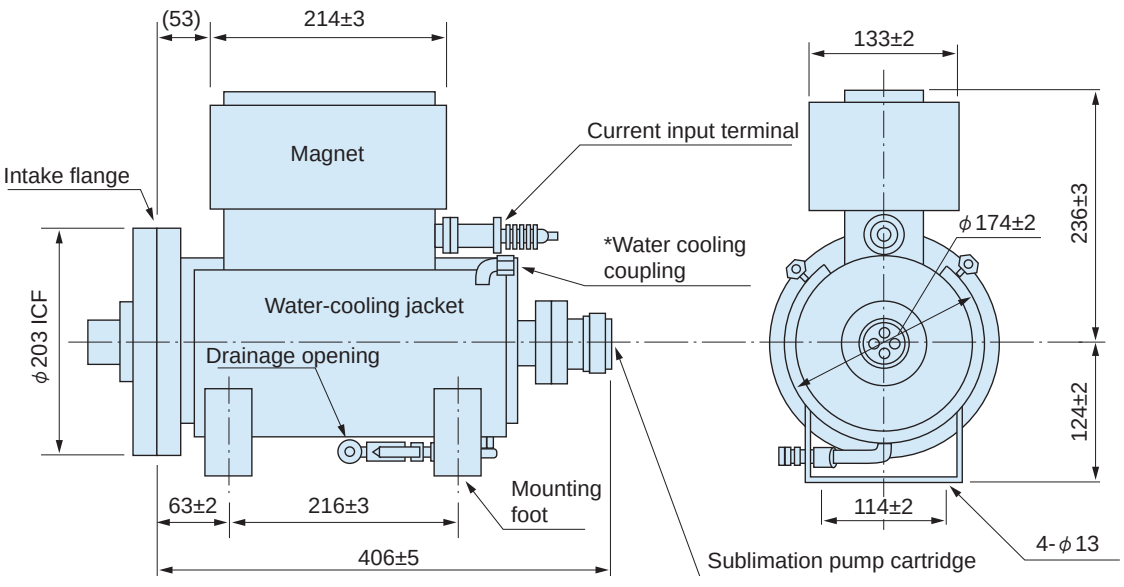


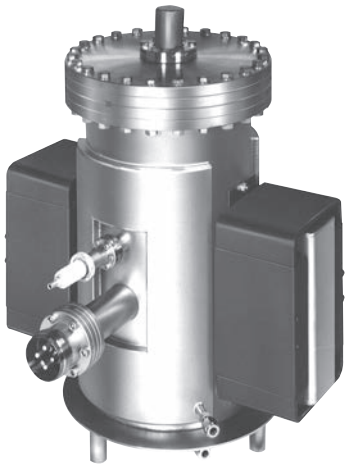
Fig. 4 Pumping speed/pumping flow - pressure characteristics



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

Fig. 5 800 L/s Combination Pump Dimensions diagram

■ 1600 L/s Combination Pump



● Specifications

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

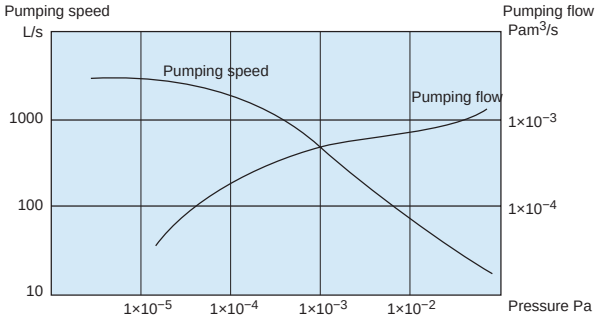
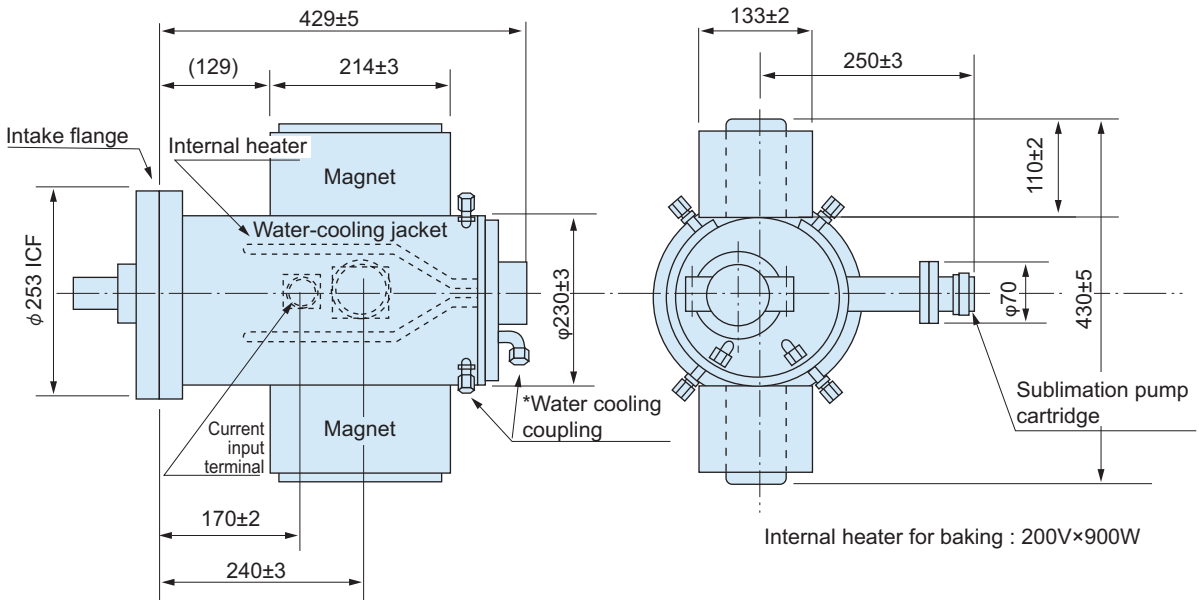


Fig. 6 Pumping speed/pumping flow - pressure characteristics



※his coupling is for 8mm outer diameter SUS pipe (bright annealed austenitic stainless steel) or copper pipe.

Fig. 7 1600 L/s Combination Pump 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	400 L/s 800 L/s 1600 L/s	913-7000 913-7001 913-7002	1 set 1 set 1 set	Connecting lines included
Current input terminal		954-7281	×1	With ϕ 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

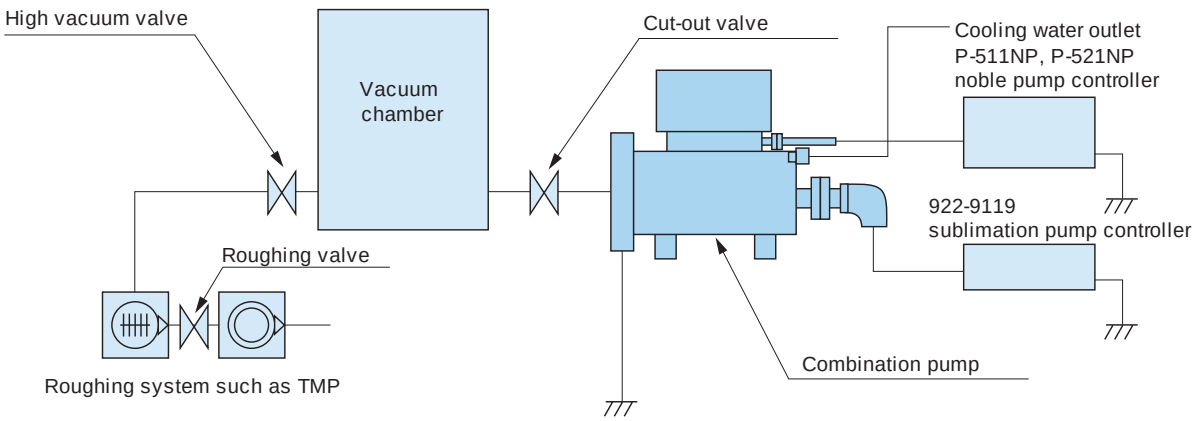


Fig. 8 Pumping system

● Pumping system and connection method

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 ϕ 8mm 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
8B1-0002-163	913-7000	400 L/s Combination Pump	With ϕ 152 ICF, with TSP・NP	10600
8B1-0001-975	913-7001	800 L/s Combination Pump	With ϕ 203 ICF, with TSP・NP	10610
8B1-0002-454	913-7002	1600 L/s Combination Pump	With ϕ 253 ICF, with TSP・NP	10620
8B1-0008-568	956-7015	TSP Cartridge	With ϕ 70 ICF, with filament/gasket/attachment tool	10700
8B1-0006-590	956-0010	TSP Filament	×12	10711
8B1-0001-892	956-7040	Ti-Vac Pump	With ϕ 70 ICF, Ti-Vac head x1	10720

High-Performance Cryopump Backed by Long-Standing Trust and Proven Performance

POWER/POWER^{ECO} Series Cryopump System

Intake diameter 8 to 22 inches

Summary

The POWER/POWERECO series cryogenic pump systems can be combined with a variety of units to accommodate a wide range of applications, from equipment for research and development to equipment for mass production.

The standard system is a simple and easy-to-use configuration with a temperature monitor. It can be used in combination with the CRYONAVI controller for automatic regeneration.

The Eco system has a unique control system that reduces maintenance costs through reduced power consumption and longer maintenance intervals, which contributes to the achievement of SDGs.

Applications

- Semiconductor manufacturing equipment (Sputtering equipment,Ion implanter)
- Electronic component manufacturing equipment
- Vacuum evaporation systems
- Vacuum furnace,space chambers
- Accelerators
- Various high vacuum equipment

About the POWER/POWER^{ECO} series cryopump model

An example is shown below for reference.

P — 080CL — AHN

- 080: Pump intake diameter (08 ～ 22 inch)
- CL: C ：Cryopump (vertical) / CL：Cryopump (horizontal)
- AHN: N：Without heater / HN：With heater

Specification No.
0, 5：Standard
1, 6：Hydrogen high exhaust performance model
2, 3, 7：Argon gas large exhaust capacity model

Intake flange specifications
J：Form JIS flange
A：ASA flange
S：ISO (new JIS) flange
U：ICF flange specification
X：All metal seal specification

■ Unit Configuration of POWER/POWER^{ECO} Series Cryopumps

There are two different types of POWER/POWER^{ECO} series cryopump systems.

The standard system uses a conventional cryopump (refrigerator) and compressor that operate at a constant speed.

With the Eco system, the operation speed of the cryopump and compressor are adjusted according to the output required at any given time.

Most of the power in a system is consumed by the compressor. However, while the compressor in the standard system operates at a constant power supply frequency (50/60 Hz), the compressor in the Eco system has a built-in inverter that adjusts the operating frequency to reduce power consumption.

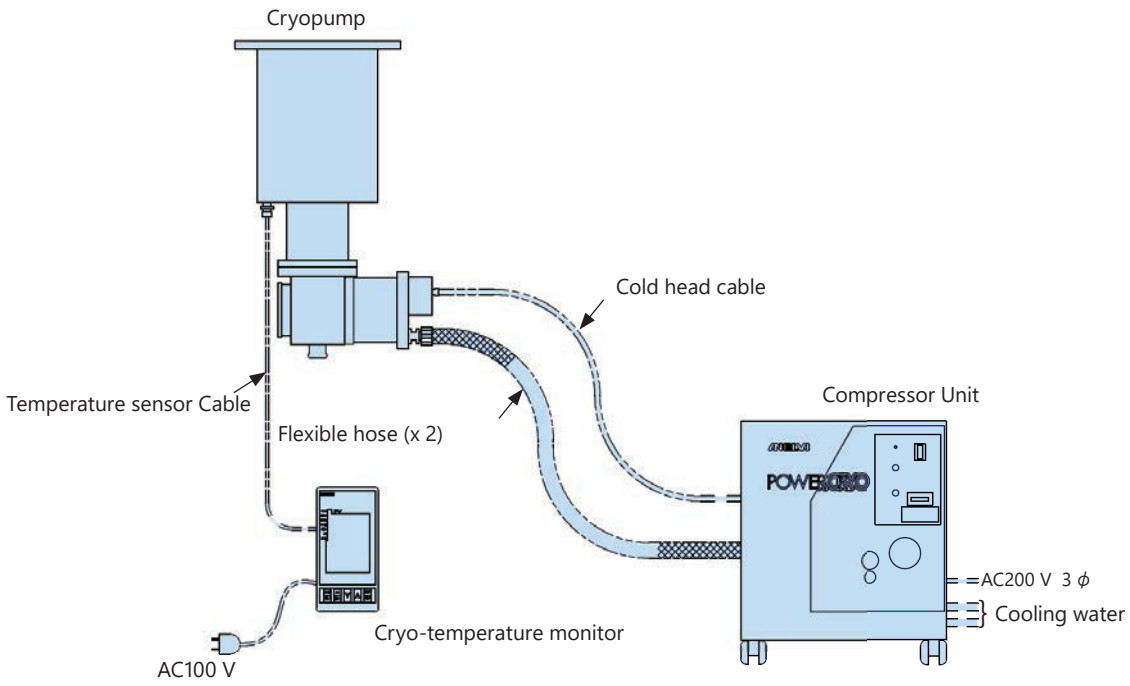
The unit configurations of the standard system and the Eco system are shown below.

<table>
<tr><th>Unit</th><th>Standard system</th><th>Eco system</th></tr>
<tr><td>Cryopump</td><td>POWER Series
POWER^{ECO} Series</td><td>POWER^{ECO} Series</td></tr>
<tr><td>Temperature monitor
Cold head driver
Controller</td><td>DB650 Temperature monitor
P-023CD Cold head driver
P-024CD Cold head driver
P-011CC-R CRYONAVI Controller</td><td>P-031CC Controller</td></tr>
<tr><td>Compressor</td><td>F-50L Compressor</td><td>CSW-61CN2 Compressor</td></tr>
<tr><td rowspan="2">Features</td><td colspan="2">High-speed cooling operation
Heating operation (Self-heating function)
High exhaust performance (practical exhaust capacity)
Low vibration (Low vibration motor)</td></tr>
<tr><td>Temperature stability (multi-wave operation)
Supercooling prevention structure (POWER series)
Reduced power consumption (multi-unit effect)</td><td>Reduced power consumption (output control)
Multi-operation of different models (minimum configuration)
Temperature stability (temperature control)
Exhaust performance stability (optimal temperature)
Longer maintenance intervals (reduced wear)</td></tr>
</table>

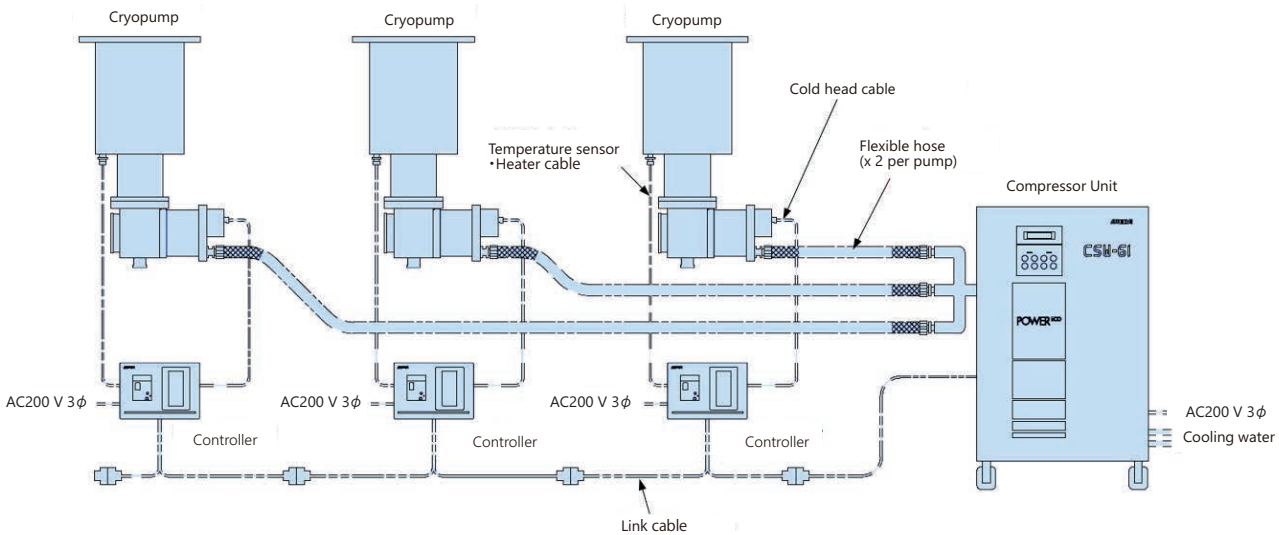
※ POWER^{ECO} series cryopumps are equipped with highly efficient refrigerators, so it is necessary to use the controller to adjust the temperature according to the application and system configuration.
The POWER/POWER^{ECO} series use the same cryotrap, but the controller must be used to adjust the temperature.

■ POWER/POWER^{ECO} series cryo pump system configration

Standard system configuration example. (Temperature monitor×1)



Eco system configuration example. (Multi-system)



High-Performance Cryopump that Contributes to the Operating Efficiency of Vacuum Equipment

POWER series cryopump

High performance cryopump

Intake diameter 8 to 12 inches (with small built-in refrigerator)

Summary

The high-performance, compact cryopumps in the POWER series, which prioritize practical performance, feature the world's first self-heating function, temperature stability during multi-operation, and our unique exhaust panel structure.

Features

1 .High-speed cooling operation

The refrigerator uses high-speed cooling operation for cooling (down to 20K).

2 .Heating operation

The refrigerator's self-heating function allows rapid heating operation.
The exhaust panel is heated directly, allowing efficient regeneration.

3 .High exhaust performance

Our unique panel structure provides a large practical exhaust capacity.
In addition to its high cooling capacity, it is also resistant to mixed gas exhaust.

4 .Low vibration

A low-vibration motor is used.
In addition, vibration-proof structures are also available.

5 .Temperature stability

The temperature is stable during multi-operation. (multi-wave operation)

6 .Supercooling prevention structure

The 1st stage has a supercooling prevention structure to prevent Argon hang-up.

■ POWER series cryopump performance specifications (with small built-in refrigerator)

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	
	Water	4,500	4,500	4,500	4,500	4,500	7,100	7,100	
Maximum pumping flow ($Pa \cdot m^3/s$)		1.5	1.2	1.2	1.5	1.5	1.0	1.0	Argon
Maximum gas instantaneous tolerance ($Pa \cdot m^3$)		18.0	18.0	18.0	18.0	18.0	18.0	18.0	
Cool-down time (min)		45	50	65	45	50	70	80	＊1
Heat-up time (min)		30	30	30	30	35	35	40	＊1
Regeneration time (min)		75 + α	80 + α	95 + α	75 + α	85 + α	105 + α	120 + α	＊1
Pumping capacity ($Pa \cdot m^3$)	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^{-7}							
Maximum heating temperature (°C)		70							
Ambient temperature range (°C)		10 ～ 35							
Recommended maintenance hour (h)		Within 16,000							
Weight (kg)		20	21	22	23	24	25	27	
Operating units	F-50L	3	3	3	3	3	3	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	
	Water	7,100	7,100	9,800	9,800	9,800	9,800	9,800	
Maximum pumping flow ($Pa \cdot m^3/s$)		1.0	1.0	1.0	1.0	1.0	1.0	1.0	Argon
Maximum gas instantaneous tolerance ($Pa \cdot m^3$)		18.0	18.0	18.0	18.0	18.0	18.0	18.0	
Cool-down time (min)		70	80	60	90	70	100	60	＊1
Heat-up time (min)		35	45	35	40	40	50	35	＊1
Regeneration time (min)		105 + α	125 + α	95 + α	130 + α	110 + α	150 + α	95 + α	＊1
Pumping capacity ($Pa \cdot m^3$)	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^{-7}							
Maximum heating temperature (°C)		70							
Ambient temperature range (°C)		10 ～ 35							
Recommended maintenance hour (h)		Within 16,000							
Weight (kg)		25	27	29	30	29	30	30	
Operating units	F-50L	3	3	3	3	3	3	3	＊3

＊ 1) Cool-down time (to 20K) is achieved by high-speed cooling operation, and heat-up time is the value when purge gas is introduced without storage gas during self-heating.
The "+α" for regeneration time indicates the time required for roughing, etc.

＊ 2) Exhaust capacity is based on our own evaluation method. It is a practical value equivalent to when the unit is actually used.

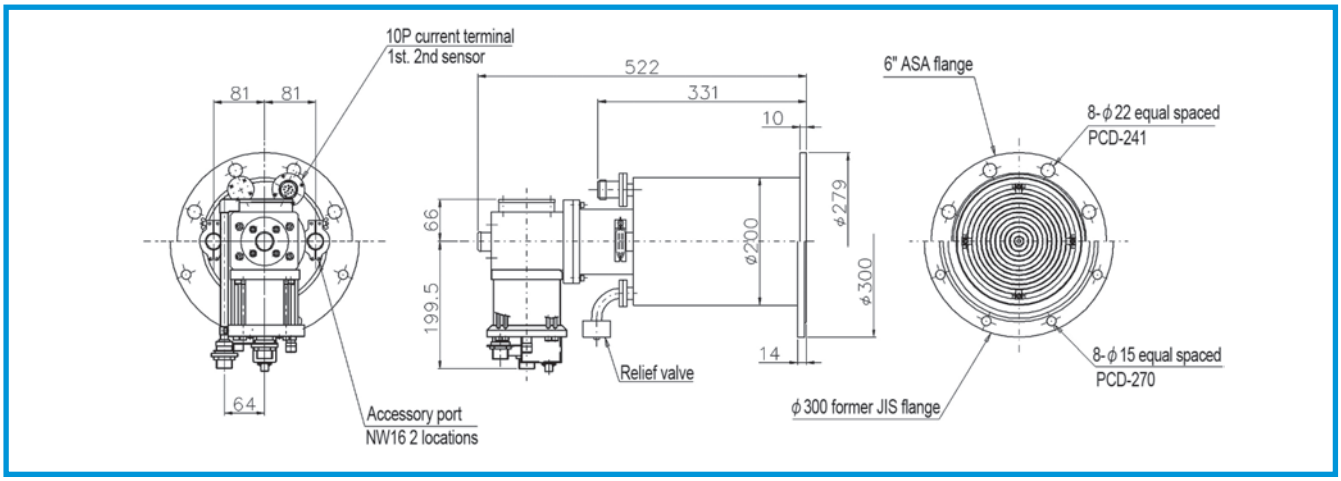
＊ 3) This depends on the heat load on the pump.

※ These specifications are for the pump alone.
The values when vacuum equipment is installed are affected by factors such as gas emissions and heat load in the installation environment.

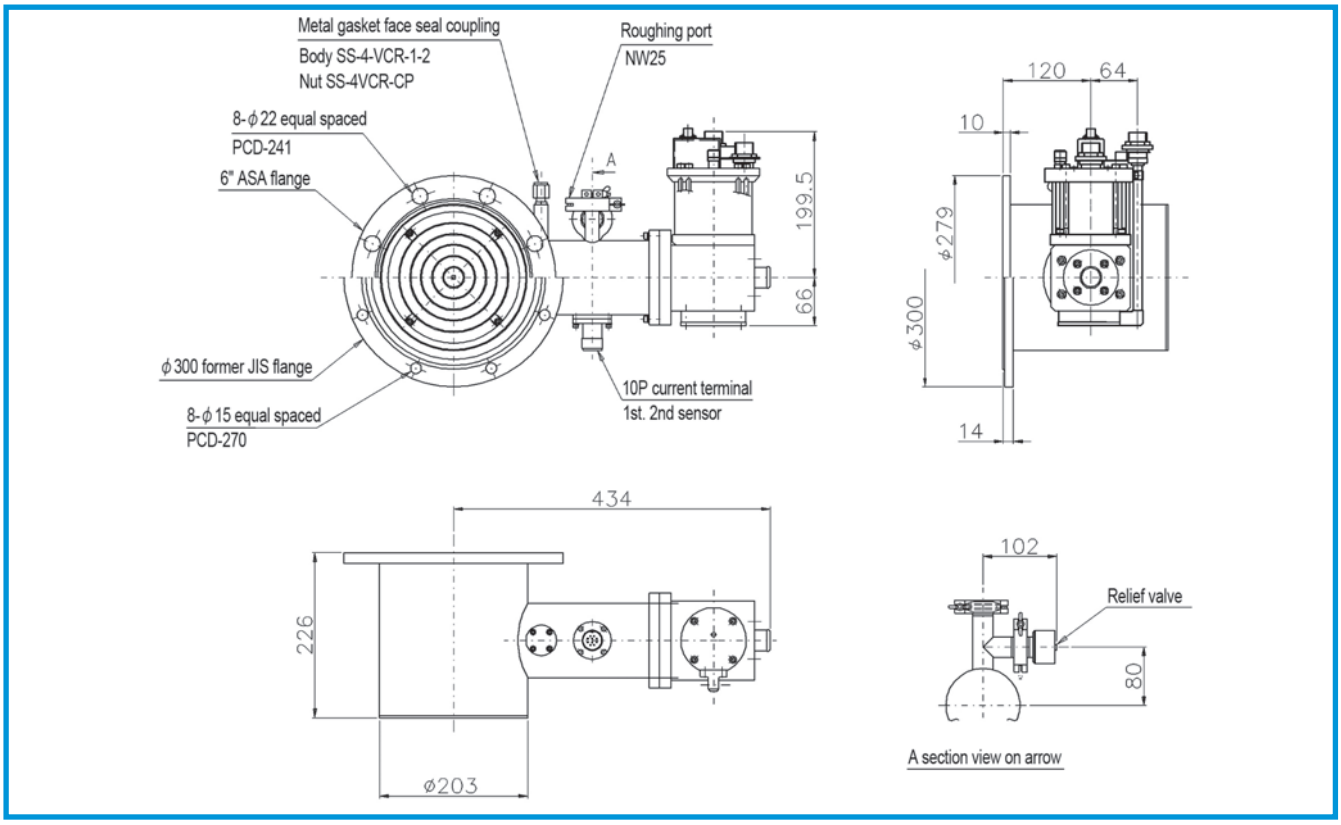
These specifications are subject to change without notice for product improvement or other reasons.

Dimensions diagram

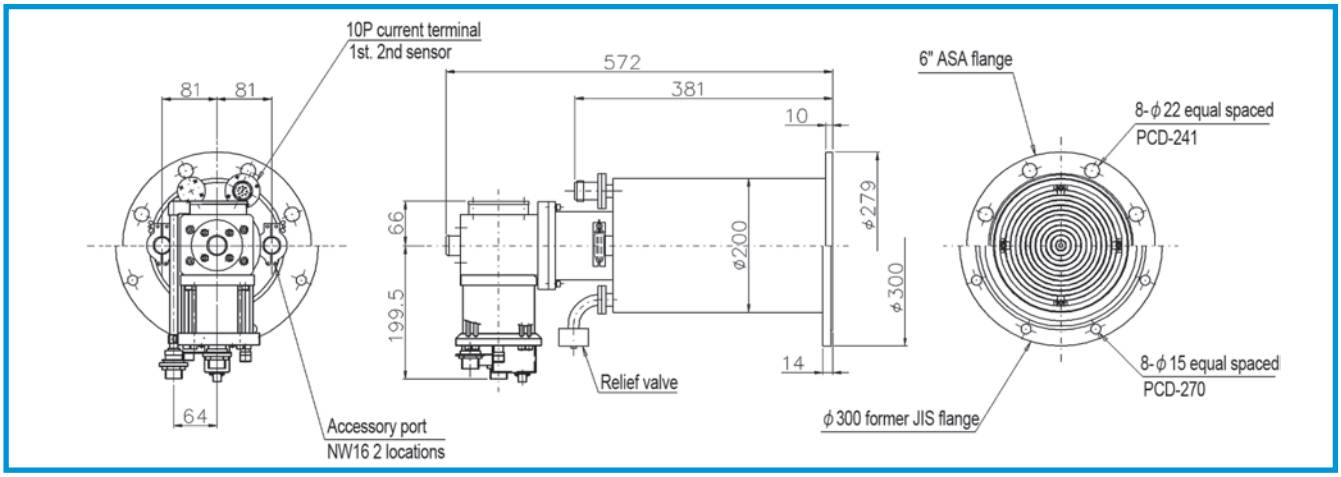
P-080C/P-081C



P-081CL

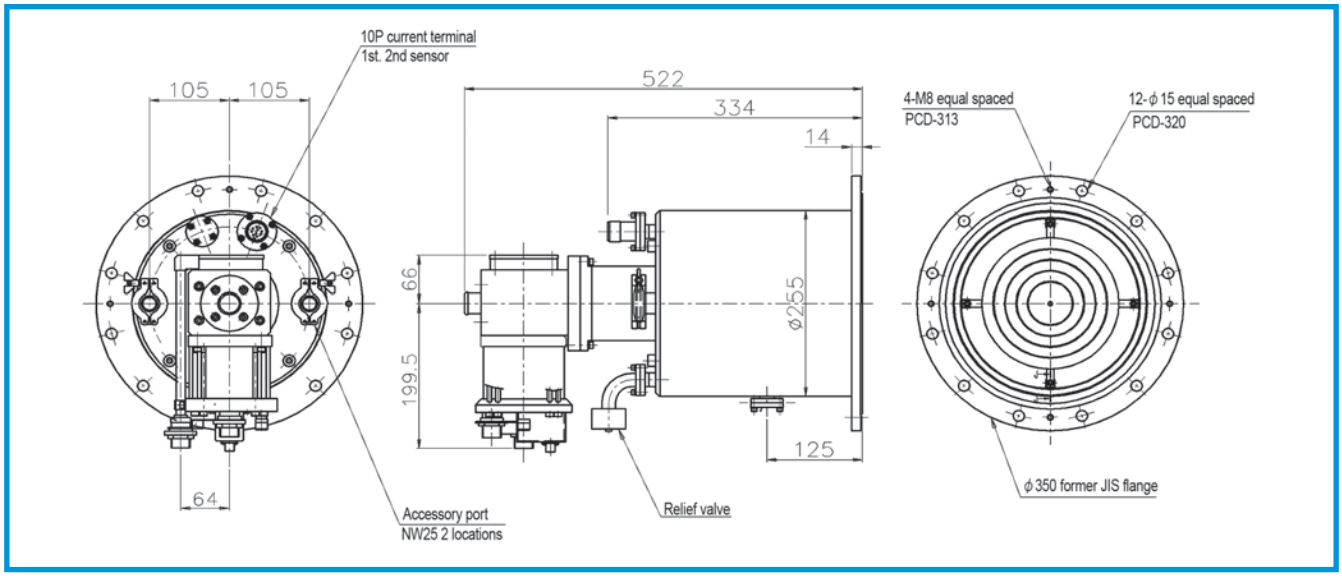


P-082C

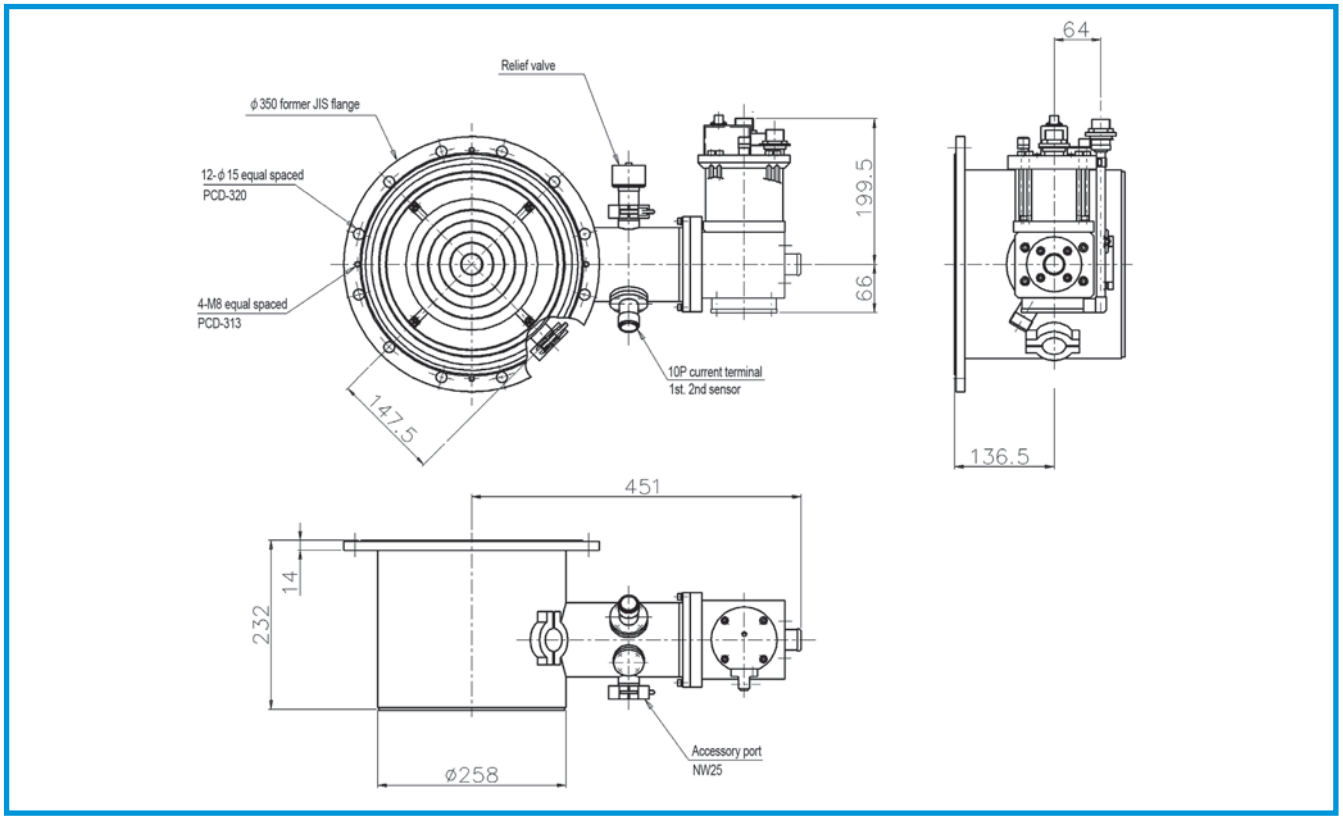


Dimensions diagram

P-101C

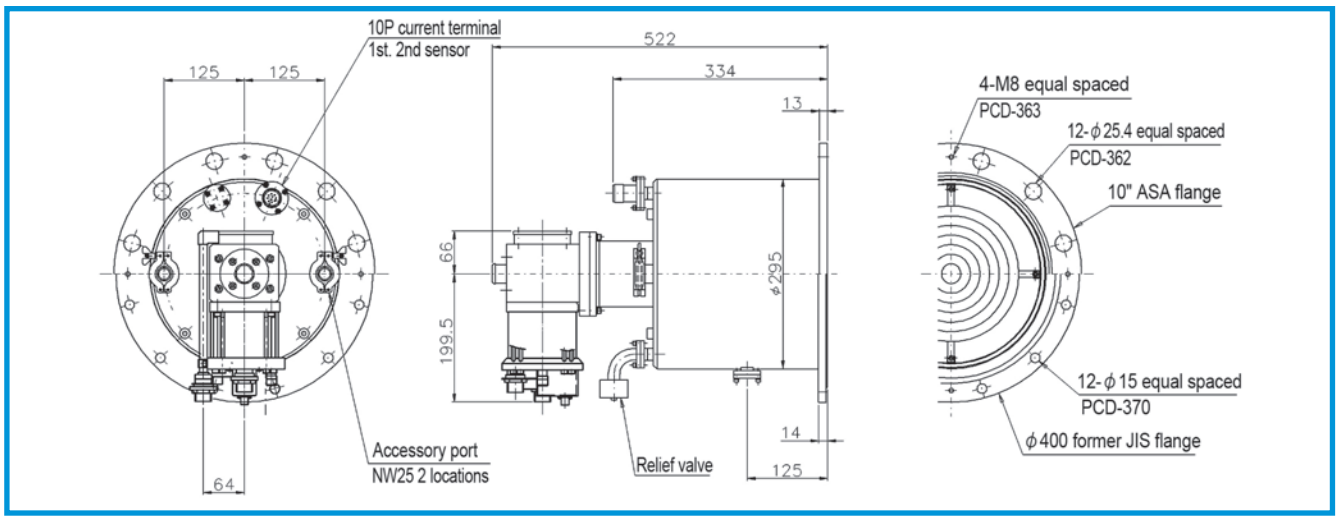


P-100CL/P-101CL

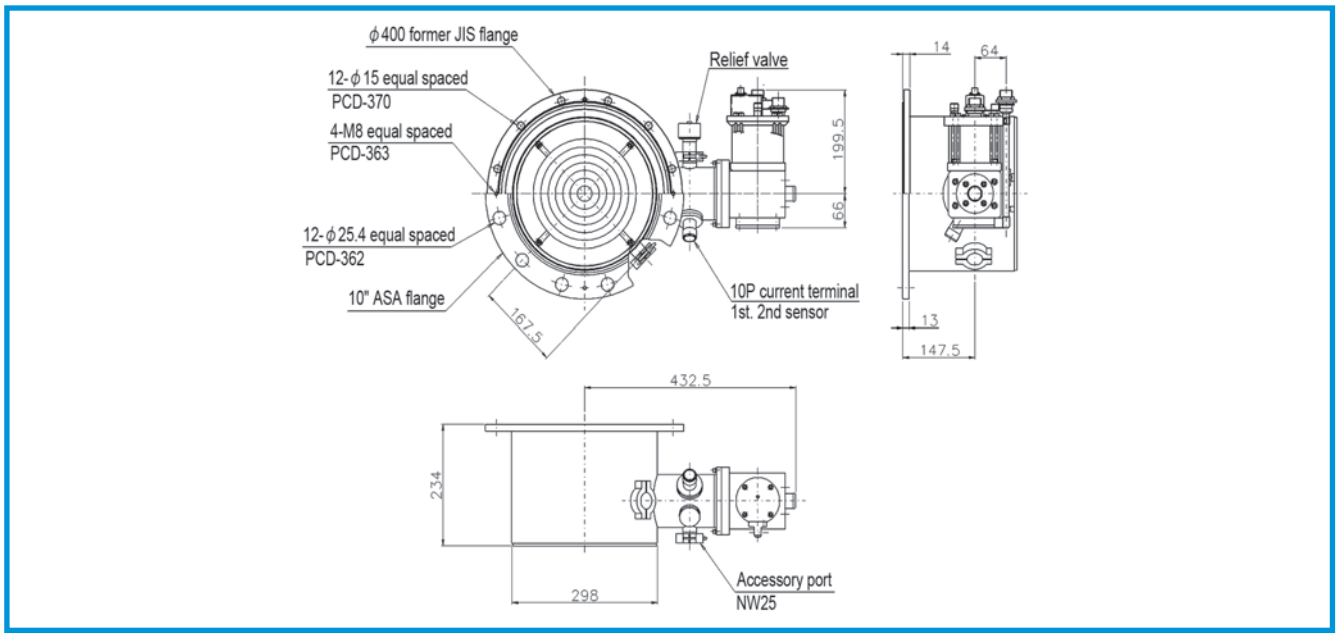


Dimensions diagram

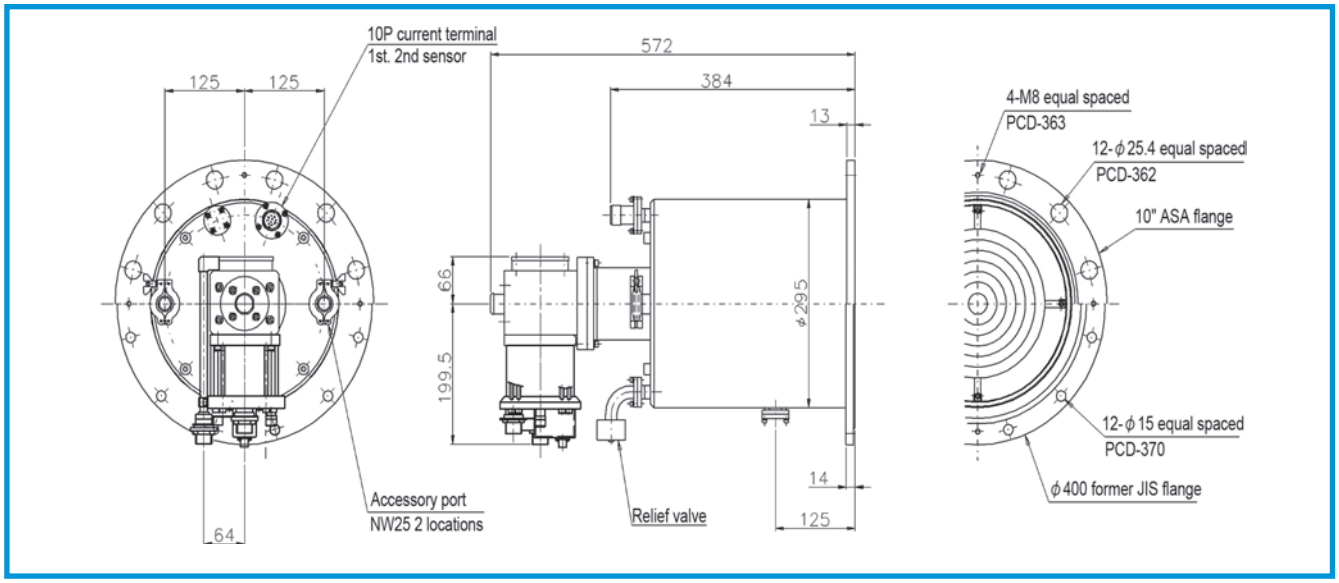
P-120C/P-121C



P-120CL/P-121CL



P-122C



Cryopump System that Contributes to Running Cost and the Operating Efficiency of Vacuum Equipment

POWER^{ECO} series cryopump

High-performance, high-efficiency cryopump
Intake diameter 8 to 22 inches
(with small/medium/large built-in refrigerator)

Summary

POWER^{ECO} series cryopumps achieve high efficiency while retaining the features of the POWER series.

The standard system can operate five 8-inch cryopumps.

The combination of a dedicated controller and compressor in the Eco system provides stable temperature and exhaust performance. Output is kept to a minimum according to the number of cryopump units in operation and the amount of heat input to the cryopumps, thereby reducing power consumption.

Power consumption can also be reduced by stopping cryopumps that are not in use or closing the main valve to reduce the amount of heat entering the cryopumps. By optimizing the operation of the vacuum system in this way, you can achieve further improvements in efficiency.

In addition, since the operating speed of the refrigerator is kept to a minimum, wear on internal parts is reduced, which extends the time until maintenance is required.

In addition to reduced power consumption, you can expect an overall reduction in running cost.

Features (in addition to the features of the POWER series)

1. Reduced power consumption (standard system)

Capable of multi-unit operation with up to five 8-inch cryopumps and four 10/12-inch cryopumps. Through the use of multiple units, power consumption is reduced per cryopump.

2. Reduced power consumption (Eco system)

Output is suppressed to the minimum necessary within the range of 50 to 100%, reducing power consumption.

3. Multi-operation of different models (Eco system)

Small/medium cryopumps and cryotraps can be operated with the same compressor.
Vacuum equipment can be configured with the minimum number of compressors required.

4. Temperature stability (Eco system)

Our unique control system maintains a constant temperature.

5. Exhaust performance stability (Eco system)

An optimal temperature is maintained for stable exhaust performance.

6. Longer maintenance intervals (Eco system)

Wear on the internal parts of the refrigerator is suppressed, which extends the time until maintenance is required.
This is effective in reducing running costs.

■ POWER^{ECO} series cryopump performance specifications (with small built-in refrigerator)

Pump Type		P-085C	P-086C	P-086CL	P-087C	P-105C	P-105CL	P-106C	P-106CL	P-107C	Remarks
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	
	Water	4,500	4,500	4,500	4,500	7,100	7,100	7,100	7,100	7,100	
Maximum pumping flow ($Pa \cdot m^3/s$)		1.2	1.2	1.1	1.2	1.0	1.0	1.0	1.0	1.0	Argon
Maximum gas instantaneous tolerance ($Pa \cdot m^3$)		18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	
Cool-down time (min)		60	65	80	60	75	90	85	100	120	＊1
Heat-up time (min)		40	40	45	40	45	50	45	50	50	
Regeneration time (min)		100 + α	105 + α	125 + α	100 + α	120 + α	140 + α	130 + α	150 + α	170 + α	
Pumping capacity ($Pa \cdot m^3$)	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^{-7}									
Maximum heating temperature (°C)		70									
Ambient temperature range (°C)		10 ～ 35									
Recommended maintenance hour (h)		Within 16,000									
Weight (kg)		22	22	22	23	25	27	24	25	29	
Number of operating units	F-50L	5	5	5	5	5	5	5	5	5	＊3
	CSW-61CN2	6	6	6	6	4	4	4	4	4	

＊1) Cool-down time (to 20K) is achieved by high-speed cooling operation, and heat-up time is the value when purge gas is introduced without storage gas during self-heating.
The "+α" for regeneration time indicates the time required for roughing, etc.

＊2) Exhaust capacity is based on our own evaluation method. It is a practical value equivalent to when the unit is actually used.

＊3) This depends on the heat load on the pump.

※ These specifications are for the pump alone.

The values when vacuum equipment is installed are affected by factors such as gas emissions and heat load in the installation environment.
These specifications are subject to change without notice for product improvement or other reasons.

■ Medium/Large POWER^{ECO} series cryopump performance specifications
(with medium/large built-in refrigerator)

Pump Type		P-128C	P-128CL	P-160C	P-160CL	P-161C	P-161CL	P-206C	P-226C	Remarks
Diameter		12inch	12inch	16inch	16inch	16inch	16inch	20inch	22 inch	
Shape		Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Vertical	
Pumping speed (L/s)	Nitrogen	4,000	4,000	7,500	6,800	7,500	6,800	13,000	17,000	
	Argon	3,200	3,200	6,300	5,700	6,300	5,700	9,000	11,000	
	Hydrogen	6,000	5,000	5,500	5,000	11,000	10,000	17,000	23,000	
	Water	9,800	9,800	19,000	19,000	19,000	19,000	30,000	39,000	
Maximum pumping flow ($Pa \cdot m^3/s$)		2.2	2.2	2.2	2,2	2.0	2.2	3.0	2.7	Argon
Maximum gas instantaneous tolerance ($Pa \cdot m^3$)		40	40	50	50	50	50	80	133	
Cool-down time (min)		110	115	70	95	90	120	100	120	＊1
Heat-up time (min)		70	70	40	60	60	60	80	80	
Regeneration time (min)		180 ＋ α	185 ＋ α	110 ＋ α	155 ＋ α	150 ＋ α	180 ＋ α	180 ＋ α	200 ＋ α	
Pumping capacity ($Pa \cdot m^3$)	Argon	270,000	200,000	400,000	200,000	400,000	200,000	650,000	1,000,000	＊2
	Hydrogen	4,000	3,500	1,600	1,400	3,400	3,000	7,500	7,500	
Ultimate temperature (K)		15 or less							15 or less	
Ultimate pressure (Pa)		Approx. 10^{-7}								
Maximum heating temperature (°C)		70								
Ambient temperature range (°C)		10 ～ 35								
Recommended maintenance hour (h)		Within 16,000 (longer with the Eco system)								
Weight (kg)		37	39	50	62	50	62	67	87	
Number of operating units	F-50L	2	2	2	2	2	2	1	1	＊3
	CSW-61CN2	2	2	2	2	2	2	1	1	

＊1) Cool-down time (to 20K) is achieved by high-speed cooling operation, and heat-up time is the value when purge gas is introduced without storage gas during self-heating.
The "+α" for regeneration time indicates the time required for roughing, etc.

＊2) Exhaust capacity is based on our own evaluation method. It is a practical value equivalent to when the unit is actually used.

＊3) This depends on the heat load on the pump.

※ These specifications are for the pump alone.
The values when vacuum equipment is installed are affected by factors such as gas emissions and heat load in the installation environment.
These specifications are subject to change without notice for product improvement or other reasons.

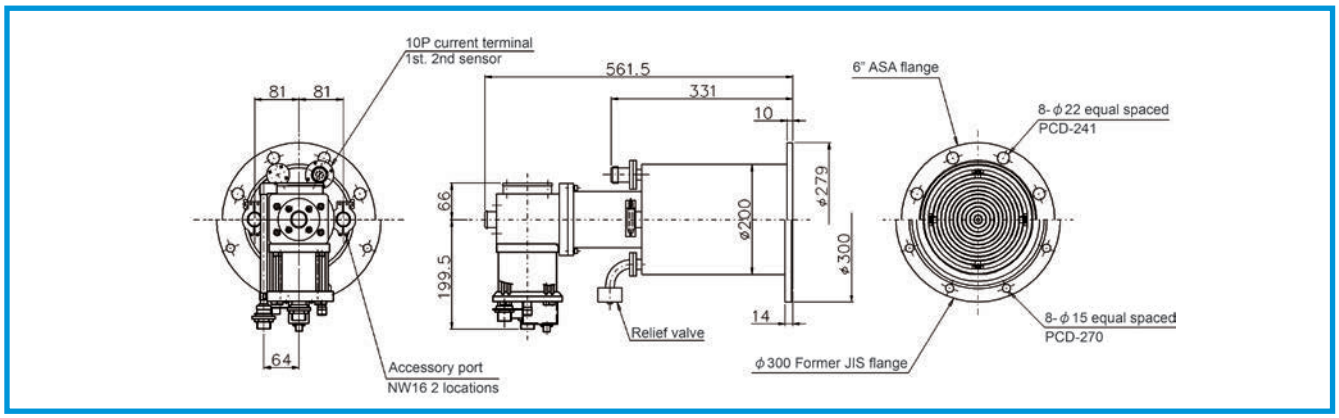
Notes regarding export, transfer, and disposal

When exporting large-diameter cryopumps outside Japan, it might be necessary to conduct classification in accordance with the Foreign Exchange and Foreign Trade Act. Please contact our sales department for more information.

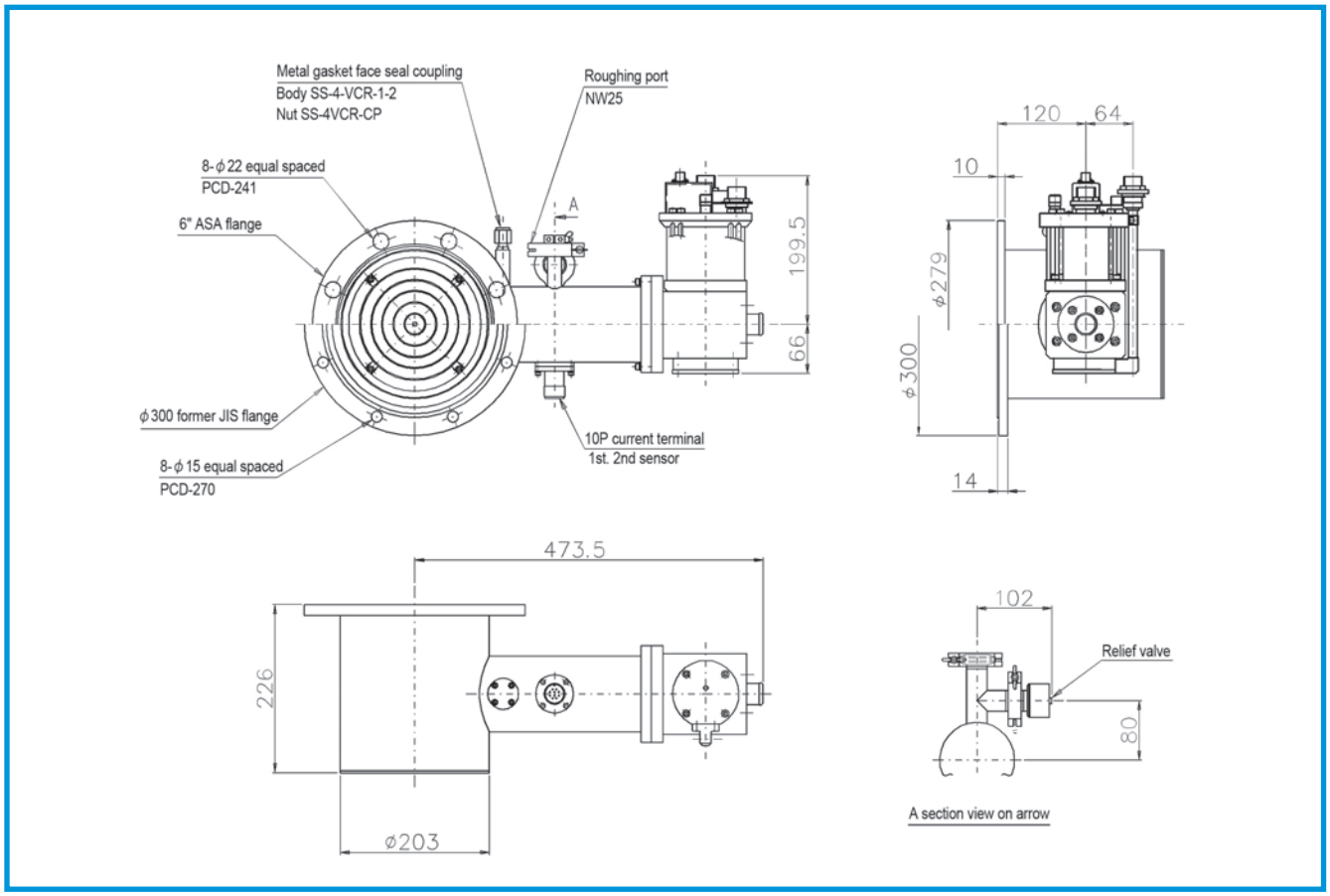
In addition, the same classification is required when transferring or disposing of units within Japan. Please notify the transfer or disposal destination of the results of the classification process.

Dimensions diagram

P-085C/P-086C



P-086CL



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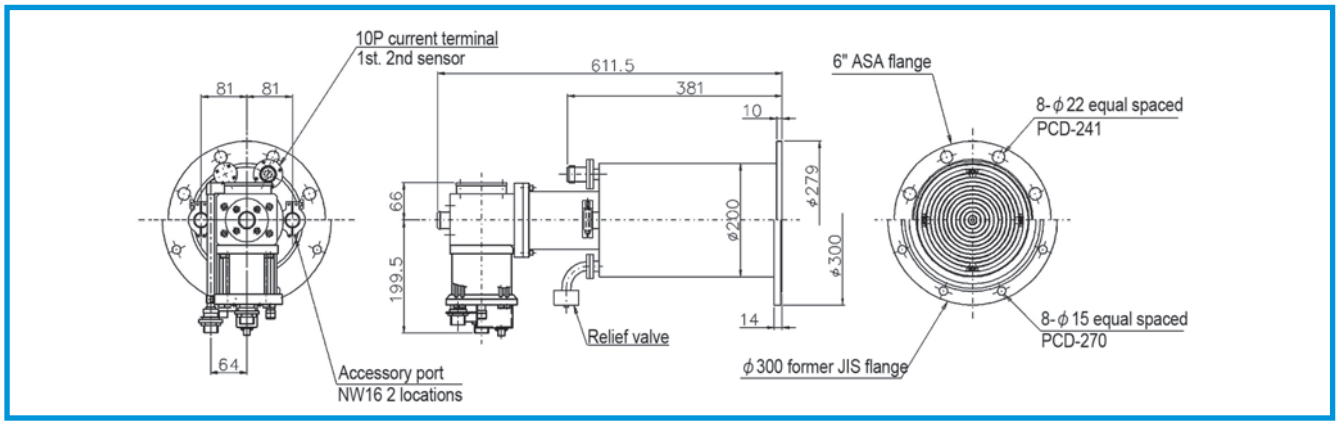
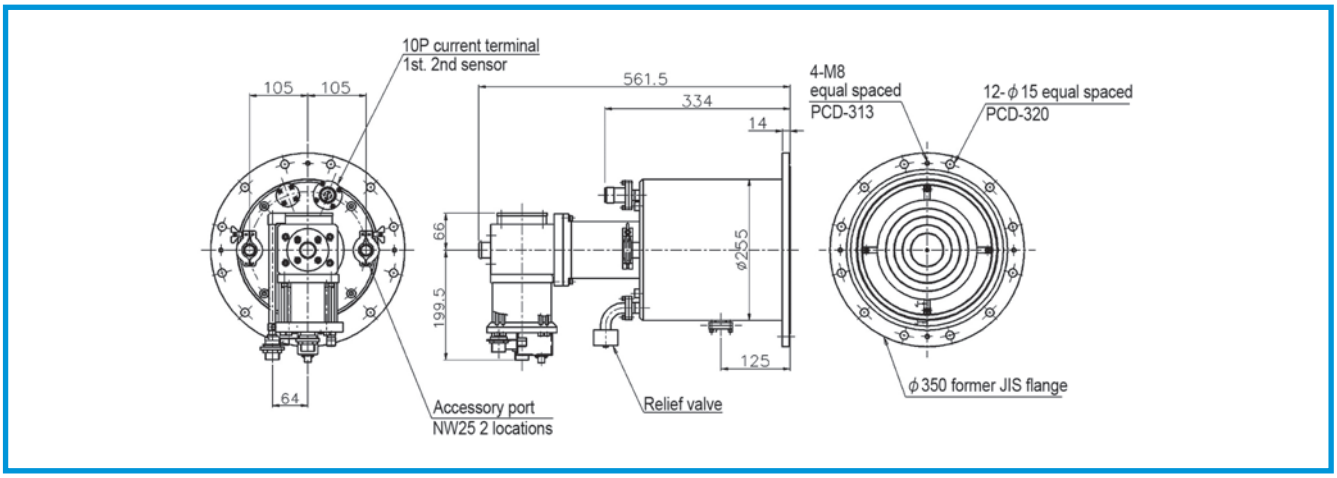
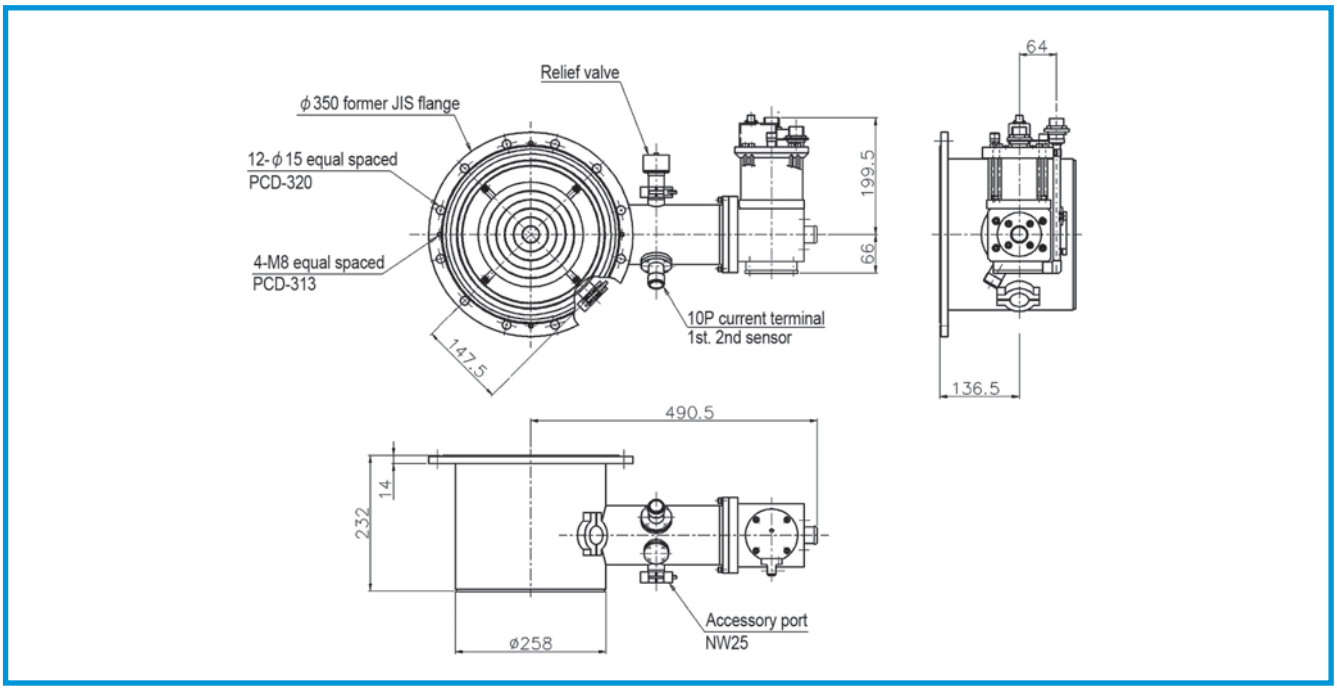


■ Dimensions diagram

P-105C/P-106C

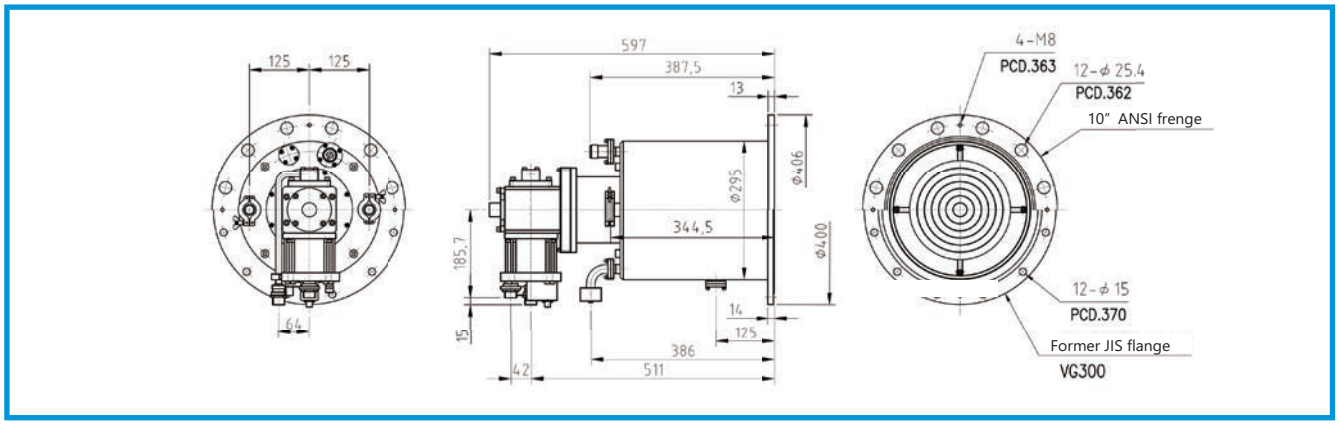


P-105CL/P-106CL



■Dimensions diagram

P-128C



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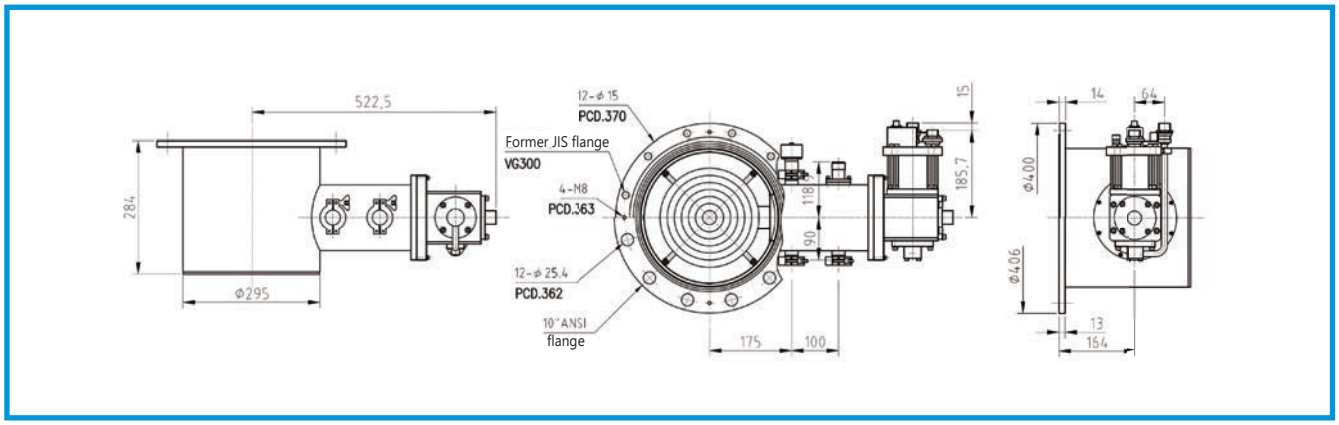
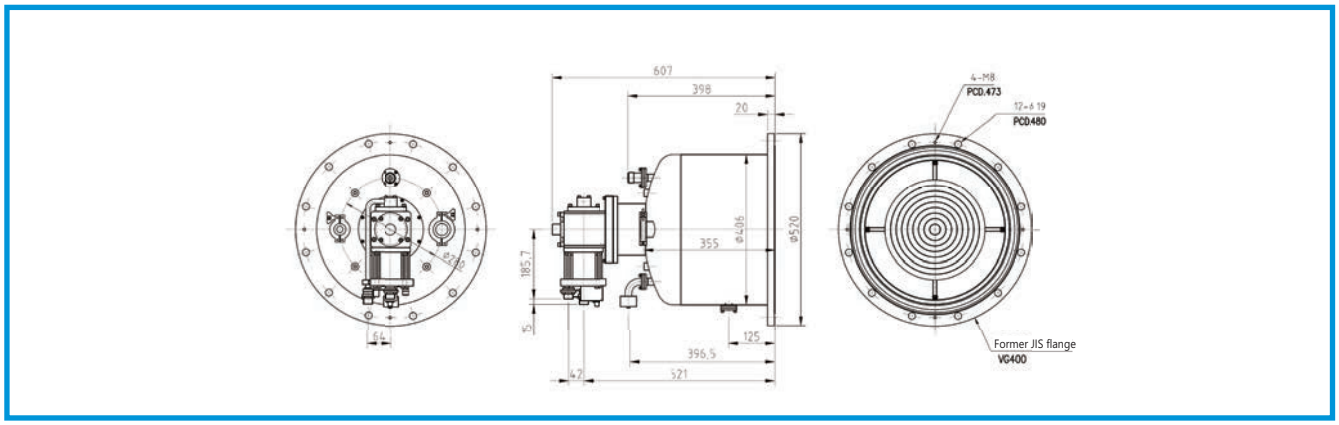
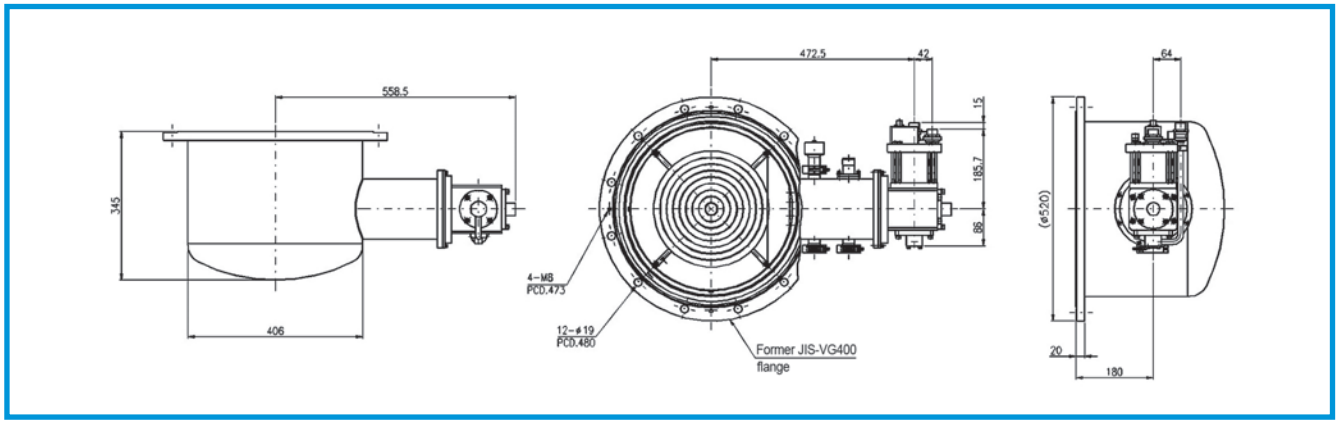


P-161C

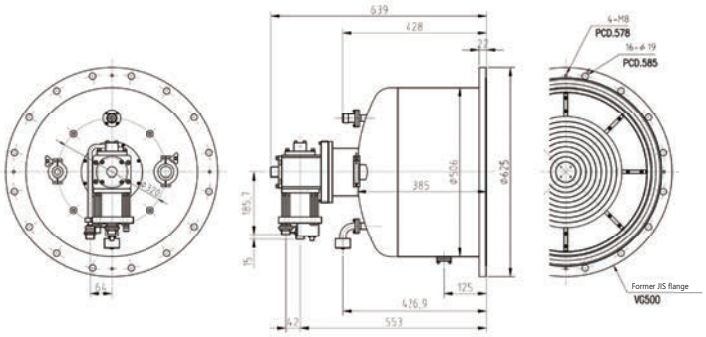


P-161CL

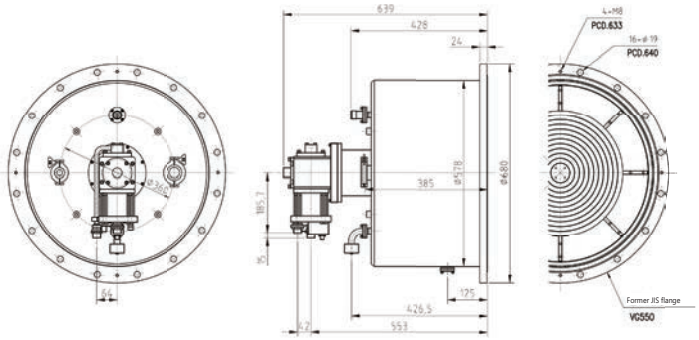


Dimensions diagram

P-206C



P-226C



F-50L Compressor unit

Summary

UL CE

This is a large compressor unit for standard systems.
(Manufactured by Sumitomo Heavy Industries, Ltd.)

A separate cold head driver is required.

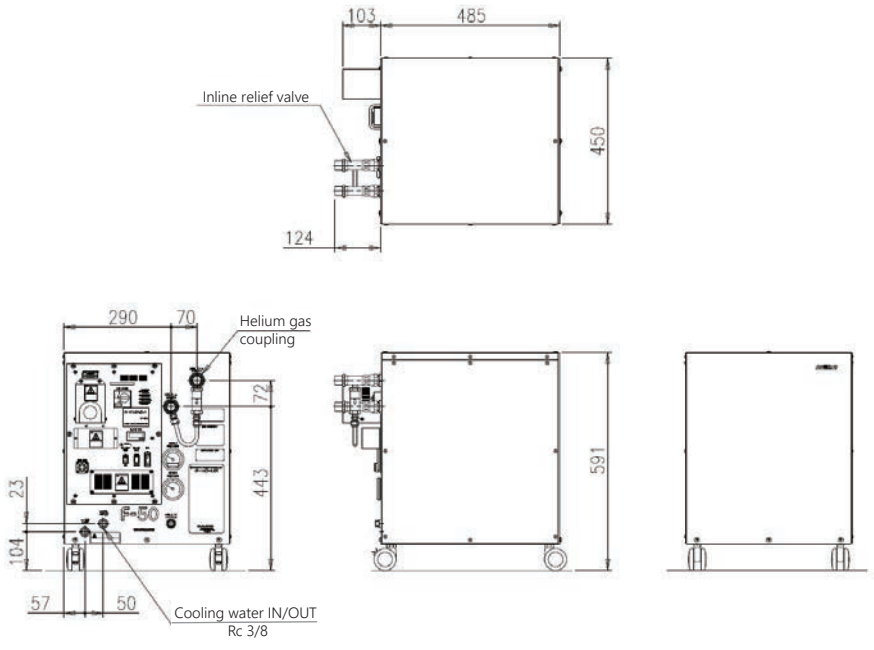
An external inline relief valve is provided for cryopumps/traps.

Specifications

Type		F-50L
Helium gas pressure (MPa)	Not operating	1.50 ～ 1.55
	Operating (High Side)	1.8 ～ 2.3
	Operating (Low Side)	0.3 ～ 0.8
Compressor cooling water	Flow Rate (L/min)	7 or more
	Inlet/outlet pressure difference (MPa)	0.085
	Maximum water pressure (MPa)	0.69
	Input temperature (°C)	4 ～ 28
Input power supply/voltage (50/60Hz)		3 ϕ AC200 V±10%
Power consumption (kW)	Steady-state (50Hz)	5.2
	Steady-state (60Hz)	6.5
Ambient temperature range (°C)		5 ～ 35
Maintenance interval (h) (adsorber replacement)		Every 30,000h
Dimensions (mm) W×D×H		450×485×591
Weight (kg)		120

Dimensions diagram

F-50L



Vacuum Pumps

CSW-61CN2 Compressor unit (for Eco system)

Summary

UL CE

This is a large compressor unit for Eco systems.

It has a built-in pressure sensor and inverter to regulate the compression flow of helium gas to the minimum necessary.

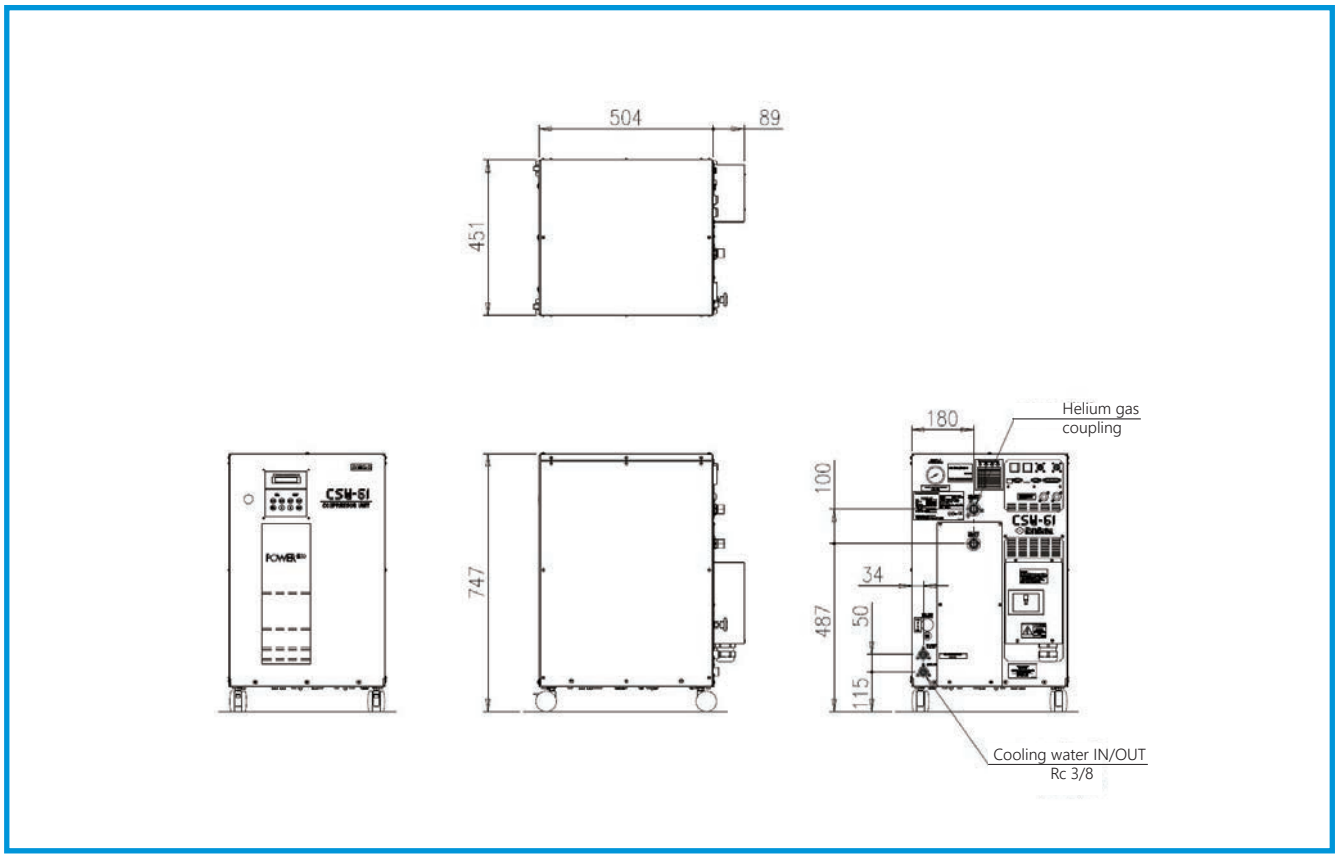
A separate controller is required for the Eco system.

Specifications

Type		CSW-61CN2
Helium gas pressure (MPa)	Not operating	1.65 ～ 1.70
	Operating (High Side)	2.2 ～ 2.5
Compressor cooling water	Flow Rate (L/min) ※ Depends on cooling water temperature	4 ～ 10
	Maximum water pressure (MPa)	0.7
	Input temperature (°C)	4 ～ 28
Input power supply/voltage (50/60Hz)		3 ϕ AC200 ～ 240 V±10%
Power consumption (kW)		3.5 ～ 9.2
Ambient temperature range for installation (°C)		5 ～ 40
Maintenance interval (h) (adsorber replacement)		Every 30,000h
Dimensions (mm) W×D×H		451×594×747
Weight (kg)		130

Dimensions diagram

CSW-61CN2



■ System selection guide

◎：Optimum　○：Applicable

Selection criteria	Pump body	Power series (Intake diameter 8 to 12 inches)			Power ECO series (Intake diameter 8 to 22 inches)			
	System	Standard system			Standard system			Eco system
		Temperature monitor ×1	Temperature monitor ×2	CRYONAVI Contoroller	Temperature monitor ×1	Temperature monitor ×2	CRYONAVI Contoroller	
① High-speed cooling operation		◎	◎	◎	◎	◎	◎	◎
② Heating operation		-	◎	◎	-	◎	◎	◎
③ Auto regeneration (heating → roughing → cooling)		-	-	◎	-	-	◎	-
④ Multi-operation of small pumps (diameter in inches)	1 - 3 pumps	◎	◎	◎	-	-	-	◎
	4 pumps (8 to 12)	-	-	-	◎	◎	◎	◎
	5 pumps (8)	-	-	-	◎	◎	◎	◎
	6 pumps (8)	-	-	-	-	-	-	◎
⑤ Multi-operation of different models	Including medium-sized	-	-	-	-	-	-	◎
	Including traps	-	-	○	-	-	○	◎
⑥ 1st stage temperature control	Heat-up adjustment with heater	-	-	◎	-	-	◎	-
	Cooling output adjustment	-	-	-	-	-	-	◎
⑦ Power consumption reduction	Multi-unit effect	-	-	-	○	○	○	-
	Output adjustment effect	-	-	-	-	-	-	◎
⑧ Maintenance cost		-	-	-	-	-	-	◎

[Standard system]　System in which a cryopump, trap, and compressor operate at a constant speed

[Eco system]　System in which output is adjusted according to the heat load on the cryopump/trap, resulting in minimum power consumption

① Cool-down time is reduced by high-speed cooling operation of the refrigerator.

② Heat-up time is reduced by the self-heating operation of the refrigerator.Two temperature monitors or a dedicated controller are required.

③ Regeneration is performed automatically.(Heating and cooling operation, roughing pressure measurement, purge valve and roughing valve open/close control

④ Multi-operation (multiple operation with the same compressor) of small pumps of the same diameter is possible. Up to four 10/12-inch diameter pumps and up to six 8-inch diameter pumps can be operated.

⑤ Multi-operation is possible by combining cryopumps and cryotraps with different diameters and refrigerator sizes as desired.
Vacuum equipment can be configured with the minimum number of compressors required. Please contact us for more information about combinations, the number of units that can be operated, etc.

⑥ The 1st stage temperature control is effective for the stable exhaust of Kr (krypton) and Xe (xenon) and for preventing Ar (argon) hang-up.
There are two types of temperature control: adjusting the heating amount of the heater and adjusting the cooling output. However, in the case of cryopumps, both methods require a heater to be installed in the 1st stage.
In the Eco system, the 1st stage temperature is controlled by adjusting the cooling output for all cryopumps/traps.

⑦ In the standard system, the more cryopump/trap units that are operating with the same compressor, the lower the power consumption per unit. (Multi-unit effect)
In the Eco system, the compressor's compression flow rate is also adjusted according to the heat load on the cryopump/trap, resulting in minimum power consumption.(Compressor output is adjustable within a range of 50 to 100%.)

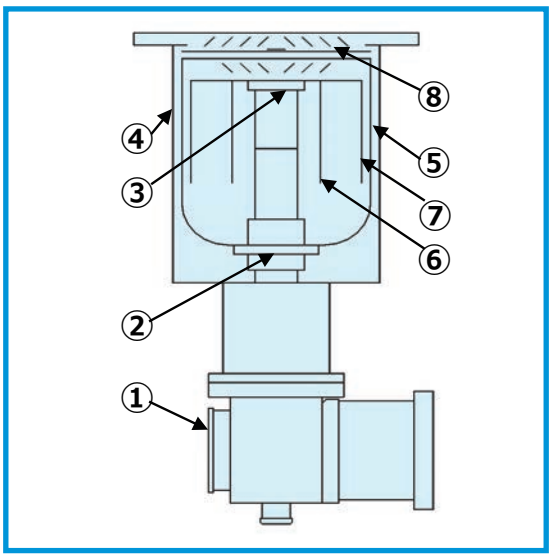
⑧ The Eco system suppresses the operation speed of cryopumps/traps, which reduces wear on the refrigerator and extends the time until maintenance is required.

■ What is a cryopump?

The gas molecules in a vacuum cool and solidify when they collide with an extremely cold surface.This is called sublimation, and it occurs when the temperature and pressure are below the triple point.Cryopumps utilize this phenomenon. The vacuum pump uses the refrigerator to cool the exhaust panel inside the vacuum chamber to extremely low temperatures, causing gas molecules to sublimate and be evacuated under vacuum.However, H_2 (hydrogen), Ne (neon), and He (helium) do not sublimate even at extremely low temperatures, so they are adsorbed by activated carbon on the exhaust panel and then evacuated under vacuum.
Cryopumps have excellent features such as a high exhaust speed and the ability to achieve a clean vacuum.However, since the gas evacuated under vacuum is stored inside, exhaust performance declines when a certain volume of gas molecules is evacuated, and it is necessary to restore the exhaust performance.The exhaust panel, which was at an extremely low temperature, is first heated to room temperature to vaporize the sublimated gas, which is then discharged outside the cryopump. This operation is called regeneration.
Since it is not possible to evacuate gas under vacuum during regeneration, the productivity and operating rate of vacuum equipment are greatly affected by how quickly regeneration can be performed or how much gas can be accumulated to reduce the frequency of regeneration.

■ Cryopump parts and exhaust principle

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



There are two cooling sections in the refrigerator.The 1st cooling stage is cooled to 80K to 100K, and a radiation shield and louvers are installed to block heat from outside and sublimate H_2O.The second cooling stage is cooled to below 20K and consists of a cryogenic panel where N_2 (nitrogen), O_2 (oxygen), Ar (argon) etc. sublimate, and a charcoal panel with activated carbon that adsorbs H_2, Ne, and He, which do not sublimate even at temperatures below 20K.
Cryopumps use sublimation and adsorption at extremely low temperatures to evacuate gas under vacuum, and if the 2nd cooling stage is below 20K, a pressure of 10^{-7} Pa can be achieved with the pump alone.

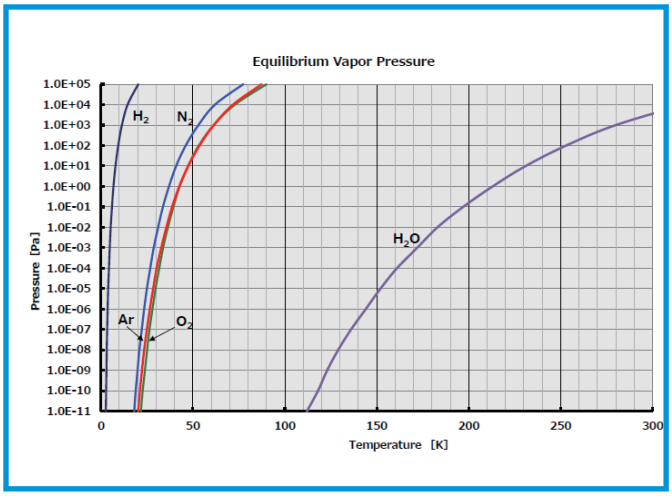
■ Equilibrium vapor pressure

The equilibrium vapor pressure in a cryopump refers to the relationship between temperature and pressure at which the gas around the exhaust panel, which is cooled to an extremely low temperature, reaches phase equilibrium (the point at which the rate of phase change between gas and solid is equal) in a vacuum.
If the equilibrium vapor pressure corresponding to the temperature of the exhaust panel is sufficiently lower than the pressure in the chamber, the gas flowing in from the chamber side will be sublimated to the equilibrium vapor pressure and evacuated under vacuum.

The graph on the right shows the equilibrium vapor pressure of typical gases in a vacuum. If the temperature of the exhaust panel is lower than 20K, the equilibrium vapor pressure of gases other than H_2, Ne, and He will be 1×10^{-9} Pa or less, enabling sufficient vacuum exhaust performance.

Therefore, normally, the cryopump temperature (2nd cooling stage) is maintained at 20K or below as a guideline.

H_2, Ne, and He can be adsorbed by activated carbon cooled to 20K or less, enabling sufficient vacuum exhaust performance for all gases.



■ Operation of cryopump refrigerators

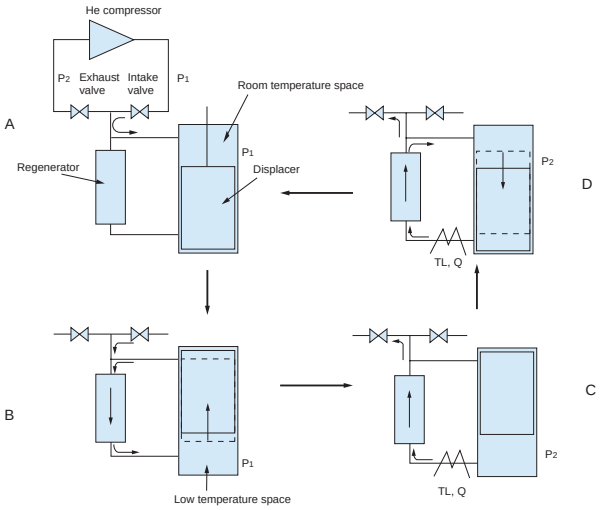
Refrigerators operate using a cooling cycle called the G-M cycle.

A: The intake valve opens and high-pressure helium gas fills the room temperature space at the top of the cylinder.(Gas remaining in the space generates heat due to adiabatic compression.)

B: When the displacer moves upward, the high-pressure gas in the room temperature space is cooled in the cold accumulator and transferred to the low-temperature space at the bottom of the cylinder. Cooling causes a reduction in volume, so more air is supplied from the intake valve.

C: When the intake valve closes and the exhaust valve opens, high-pressure gas in the low-temperature space undergoes adiabatic expansion, causing cooling.This low-temperature, low-pressure gas cools the low-temperature space (cooling stage) and the cold storage unit, and then returns to the compressor.

D: When the displacer moves downward, the low-temperature, low-pressure gas in the low-temperature space further cools the cold storage unit and returns to the room temperature space and compressor.



■ What is a self-heating function?

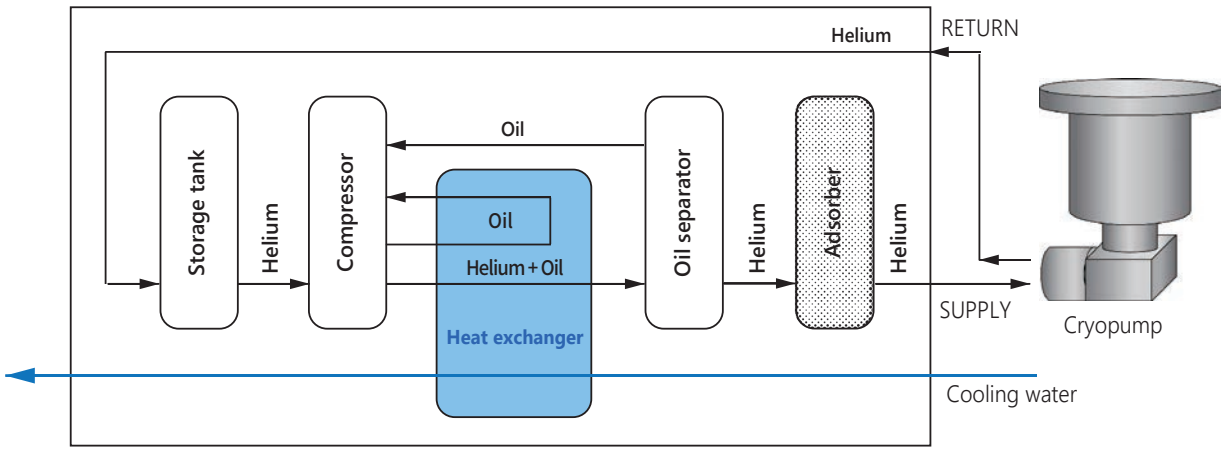
In refrigerators, cold is generated by insulating and expanding low-temperature, high-pressure helium gas in the low-temperature space inside the cooling stage.However, in the cooling cycle performed by the refrigerator, there is a process in which compression heat is generated when low-pressure gas remaining in the room temperature space is compressed into high-pressure gas (Fig. A above).The self-heating function utilizes this compression heat for heating by switching the operation timing of the displacer in response to the gas intake and exhaust timing. This generates compression heat in the low-temperature space and heats the cooling stage.
During self-heating operation, it is necessary to monitor the temperatures of the 1st and 2nd cooling stages, which are the heat-generating areas, and control them to stop at 310K.
Unlike indirect methods that heat cryopump containers with band heaters, this method directly heats the exhaust panel, allowing efficient heating in a short time.

■ Features of multi-operation (standard system)

In vacuum equipment with multiple vacuum chambers, it is common to operate multiple cryopumps with a single compressor in a multi-operation configuration. However, there are features that are unique to a multi-operation configuration.
For example, if all cryopumps in the system are cooled simultaneously, the cool-down time will be as specified in the catalog. However, if only one pump is regenerated during operation, the cool-down time will be longer than the value shown in the catalog (cooling lag).This is because the cryopump being cooled consumes insufficient helium gas due to the consumption of large volumes of helium gas by other cryopumps that are maintaining low temperatures. To minimize this effect in POWER series and POWER^{ECO} series cryopumps, the consumption of helium gas is increased by operating at high speed until 20K during cooling, thereby achieving a cool-down time that is almost the same as when all units are cooled simultaneously.
In addition, multi-systems tend to have large temperature differences between cryopumps.One reason for this is that the timing of helium gas intake and exhaust in refrigerators is arbitrary.During intake, the helium gas supply pressure drops momentarily. However, if there is a pump that intakes at that moment, the supply pressure drops slightly, causing the temperature to gradually rise if operated at that interval for a long time.
On the other hand, since more helium gas fills refrigerators with lower temperatures and thereby decreases the temperature further, the temperature difference between cryopumps tends to increase.
POWER series and POWER^{ECO} series cryopumps operate with a slight difference in operating speed between each cryopump (multi-wave operation).This ensures that the helium gas intake and exhaust times between each cryopump are switched at regular intervals, minimizing any temperature differences between cryopumps due to intake and exhaust timing.
Thanks to the above technologies, POWER series and POWER^{ECO} series cryopumps offer a greater number of cryopumps/traps compared to conventional multi-systems, resulting in a stable system with a smaller temperature difference.

■ Compressors

Helium compressor units for cryopumps have the basic configuration shown in the figure below.
Low-pressure helium gas recovered from the cryopump/trap side via the RETURN line passes through the storage tank and enters the compressor.In the case of large compressors, the compressor unit is a scroll compressor filled with oil.The oil has sealing and compression heat absorption functions. The compressed helium gas and oil are cooled in a heat exchanger before entering the oil separator.The oil circulation line is also cooled, cooling the compressor itself.The oil separator separates oil from the helium gas, returns the oil to the compressor, and sends only the helium gas to the adsorber.The adsorber is filled with adsorbents such as activated carbon, which adsorb and remove minute amounts of oil mist that cannot be removed by the oil separator, in order to supply pure high-pressure helium gas to the cryopump/trap.
Any impurities will freeze in the cryogenic section of the refrigerator, causing problems such as increased temperature and malfunctions. Therefore, the adsorbent must be replaced every 30,000 operating hours to maintain its adsorption capacity.



Basic configuration of a compressor

■ Eco system

Most of the power consumed by cryopump systems is used to compress helium gas in the compressor.
The Eco system minimizes the consumption of helium gas in the cryopump/trap and compresses only the volume of helium gas consumed in the compressor, thereby reducing power consumption.(See the figure below.)
The conventional system is designed to operate at 100% output (constant speed) at all times, assuming maximum load.
On the other hand, the Eco system suppresses output in accordance with the heat load at any given time. So, when replacing conventional systems, a reduction in power consumption of approximately 20 to 40% can typically be expected.
In addition, in conventional systems, medium-sized cryopumps and small cryopumps/traps are operated by separate compressors. However, by replacing them with an Eco system that allows cryopumps/traps to be operated by the same compressor, it is possible to reduce power consumption by approximately 50% in some cases.

In addition, the Eco system offers the following benefits.

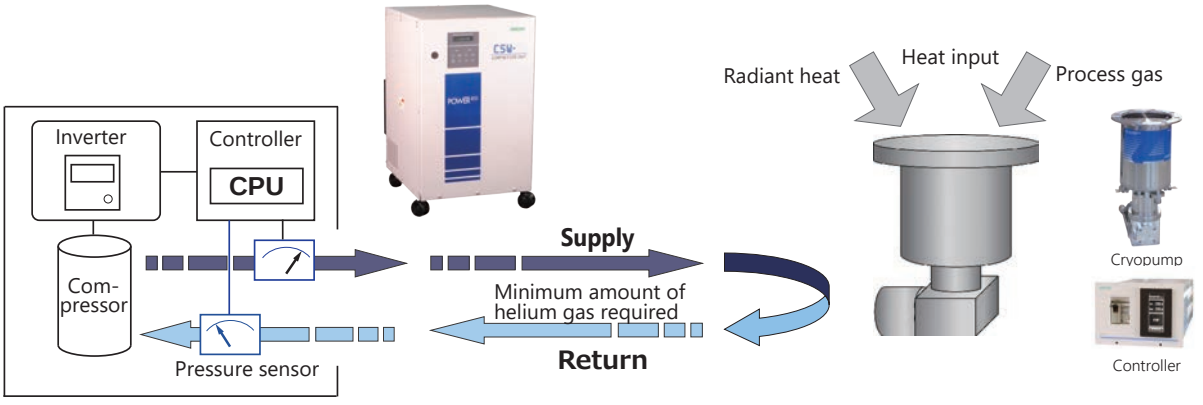
[Temperature and exhaust performance stability]　Temperature is controlled by adjusting the operation speed of the refrigerator in response to fluctuations in heat input, which also achieves stable exhaust performance.

[System stability]　The helium supply pressure is kept constant at all times and is not affected by the regeneration or shutdown of other pumps.

[Extended maintenance intervals]　The operating speed of the refrigerator is reduced, which slows down wear on seal parts and bearings, extending their service life.

[Mixed operation is possible]　Small/medium cryopumps and cryotraps can be operated with the same compressor.

[Reduced power consumption during operation]　Power consumption can be further reduced by shutting down pumps and closing main valves during operation.



Compressor

Controls the rotation speed of the compressor so that the pressure difference between the supply and return sides remains constant.
Only the helium gas consumed by the cryopump is compressed and supplied.

Cryopump

Operates the refrigerator by adjusting its output (operating speed) so that the temperature of the cryopump remains constant.
Consumes helium gas equivalent to the heat load on the cryopump.

Eco system

V

Valves・Other

Valves

- Ultra-High Vacuum Type-L Polyimide Valves
- Ultra-High Vacuum Variable Leak Valves
- Isolate Valves

Other

- Vacuum switch

Ultra-High Vacuum Type-L Polyimide Valves

951-7145

951-7120

Summary

These type-L valves are suitable for use in ultra-high vacuum environments, withstanding pressures as low as 10^{-8} Pa. The valve body is constructed from austenitic stainless steel, and the shaft seals utilize austenitic stainless steel bellows. The vacuum seal is made of polyimide resin, known for its high heat tolerance and low outgassing properties. These valves are ideal for ultra-high vacuum systems that require bake-out temperatures of 150°C or higher.

Features

1. **High heat tolerance**
   The polyimide seal can withstand repeated bake cycles from room temperature up to 300°C, regardless of whether the valve is open or closed.
2. **Seal material with low gas emission**
   Since polyimide resin has lower outgassing than fluororubber, it enables the system to easily achieve ultra-high vacuum levels around 10^{-8} Pa. (See Figs. 1 and 2)
3. **Low tightening torque**
   Polyimide seals require less tightening torque compared to metal seals.

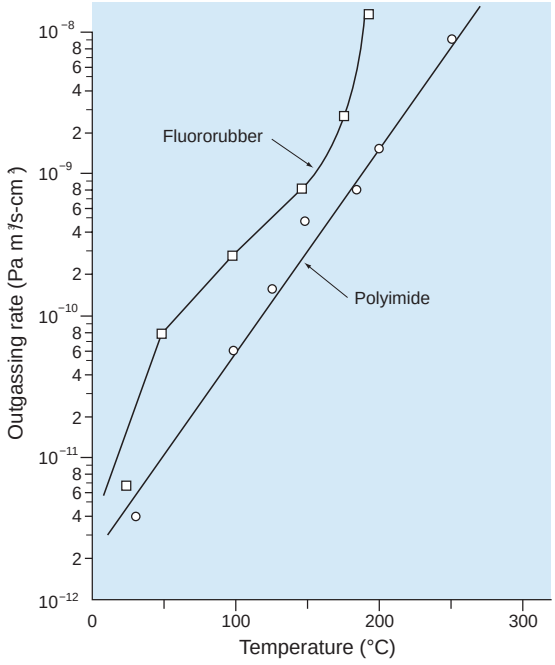


Fig. 1 Gas emissions

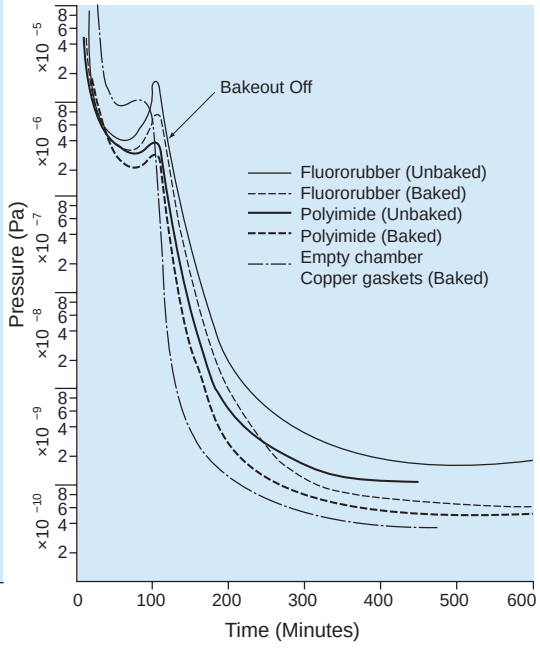


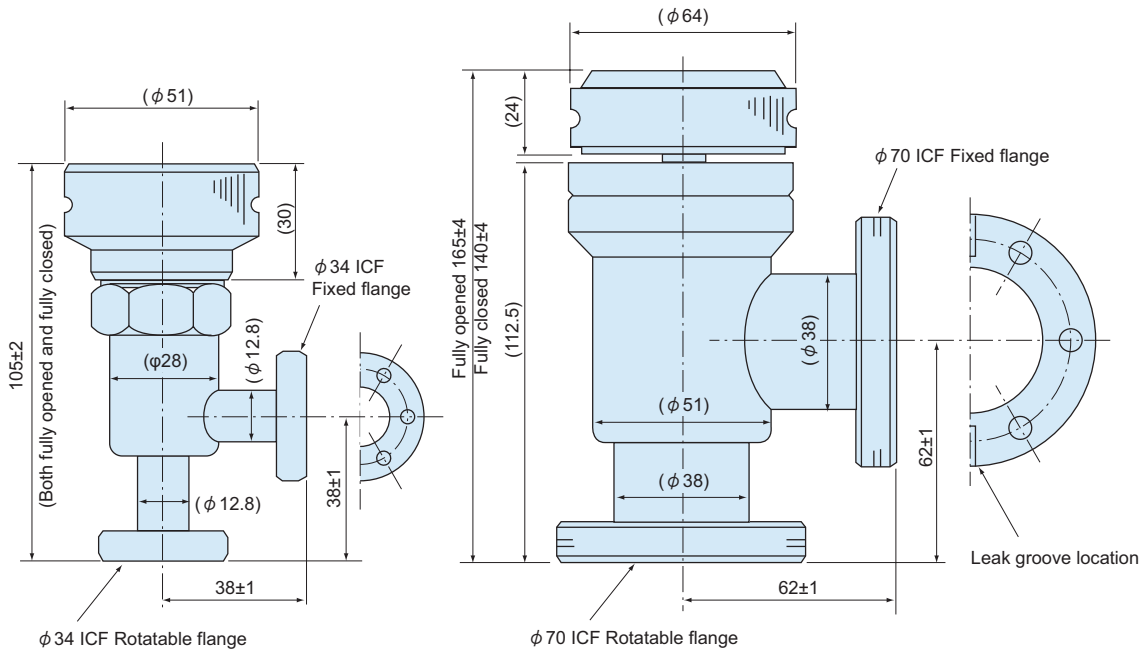
Fig. 2 Seal material comparison (ultimate pressure)

Specifications

Type	951-7145	951-7120
Operating vacuum range	Atmospheric to approx. 10^{-8} Pa	
Allowable heating temperature *1,2	300°C	300°C
Seal material (gasket)	Polyimide resin	Polyimide resin ※4
Recommended sealing force (sample tightening torque*5)	1225 ～ 1921 N (2 ～ 3.4 N・m)	3920 ～ 4900 N (4.9 ～ 5.9 N・m)
Maximum sealing force (sample tightening torque*5)	2626 N (5.9 N・m)	7840 N (14.7 N・m)
Operation	Manual	Manual (If baked several times use adjustable pin wrench)
Conductance	1 L/s	30 L/s
Leak*3	6.7×10^{-11} Pa・m^3/s or less	6.7×10^{-11} Pa・m^3/s or less
Dimensions	Fig. 3	Fig. 3
Material used	Main body: SUS304 Bellows: SUS304L Handle: Al alloy (black alumite)	Main body: SUS304 Bellows: SUS304L Handle: Al alloy (black alumite)
Connection flange	ϕ 34 ICF flange	ϕ 70 ICF flange
Weight	0.41 kg	1.6 kg
Attachments	–	Adjustable pin 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



951-7145 mini polyimide valve　　951-7120 ϕ 38 polyimide valve

Fig. 3

Maintenance and consumable parts

	951-7145 mini polyimide valve	951-7120 ϕ 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
8B1-0020-075	951-7145	Mini Polyimide Valve	With ϕ 34 ICF	30200
8B1-0020-074	951-7120	ϕ 38 Polyimide Valve	With ϕ 70 ICF	30210
8A1-0341-783	951-7145	Bellows Gasket (Polyimide)	For 951-7145 bonnet seal	30806
8A1-0341-786	951-7145	Gasket (Polyimide)	For 951-7145 valve seat seal	30807
8A1-0341-746	951-7120	Gasket (Polyimide)	For 951-7120 valve seat seal	30809
8A1-0341-745	951-7120	Bellows Gasket (Polyimide)	For 951-7120 bonnet seal	30810

Memorandum

Ultra-High Vacuum Variable Leak Valves

951-7172

Summary

This variable leak valve is designed for vacuum systems that require precise control of gas introduction.
By adjusting the gap between the piston equipped with a precision-polished WC (tungsten carbide) seal and the fixed copper alloy gasket, gas can be introduced at extremely low flow rates. Fine adjustments allow for a minimum leak rate of 6.7×10^{-9} Pa·m³/s or less from a fully sealed state.
Additionally, the valve is constructed entirely from metal and can withstand bake-out temperatures up to 450°C, making it ideal for ultra-high vacuum applications.

Features

1. Seal with high resistance to heat and external shock
The sealing mechanism uses WC-type cemented carbide in combination with a copper alloy. Unlike seals made with sapphire and copper alloy, this configuration prevents cracking caused by thermal or mechanical vibrations.

2. Stable control of minute gas flow
Extremely small amounts of gas can be introduced with high precision. The minimum controllable leak rate is less than 6.7×10^{-9} Pa·m³/s when introducing helium gas, with a primary-side gauge pressure of 0.2 MPa.

3. High heat tolerance
Constructed entirely from metal, the valve can withstand bake-out temperatures of up to 450°C.

4. Wide gas flow control range.
The gas flow can be precisely controlled across a wide range.

5. Connectable to ultra-high pressure
Each component material has been carefully selected to ensure compatibility with ultra-high vacuum systems.

Applications

- Vacuum systems requiring precise control of gas flow
- Gas analysis equipment
- Research instrumentation

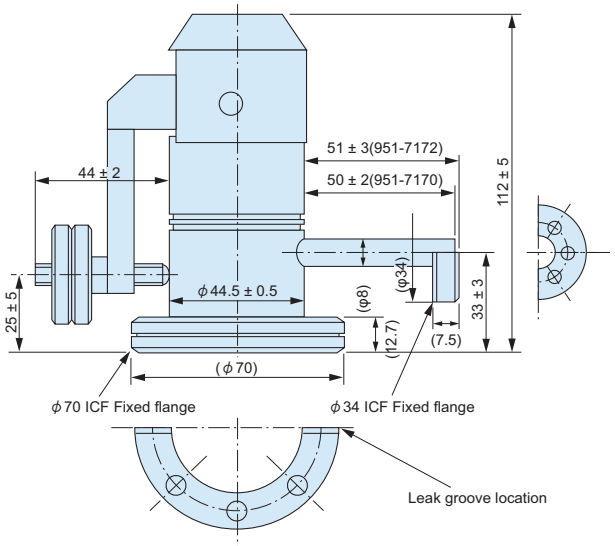
Specifications

Operating vacuum range		Atmospheric to approx. 10^{-8} Pa
Minimum adjustment for gas introduction *1		6.7×10^{-9} Pa • m³/s or less
Leak when valve is closed		6.7×10^{-11} Pa • m³/s or less
Allowable heating temperature*2		450°C (open or closed)
Gasket life*3		Approx. 300 seals (at room temperature) Approx. 30 seals (with baking) (Gasket replaceable)
Component material		Main body: SUS304 Seal: WC type cemented carbide Gasket: Cu alloy
Connection flange	Gas outlet side	ϕ 70 ICF fixed flange
	Gas inlet side	ϕ 8 × ϕ 6 SUS304 tube (951-7170)
		ϕ 34 ICF with fixed flange (951-7172)
Weight		1.3 kg

* 1. Value measured by a He leak detector at the ϕ 70 ICF side with He gas at a pressure of 0.2 MPa connected to the gas inlet side.
* 2. Gas inlet side and ϕ 70ICF side replaced with a vacuum or inert gas such as Ar gas.
* 3. The life of the gasket varies depending on the usage, so it is reference only but non-guaranteed value.

Dimensions diagram

Type
951-7170: With ϕ 8 SUS tube on inlet side
951-7172: with ϕ 34 ICF flange on inlet side



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

Usage notes

1. Precautions for Baking the Variable Leak Valve
   - Depending on the baking temperature and duration, it may be necessary to reapply lubricant to the moving parts on the atmosphere side of the valve.

     If lubricant is not reapplied as needed, its effectiveness may deteriorate, potentially resulting in galling or damage due to metal-to-metal contact.

     Please note that lubricants are not included and must be ordered separately.
   - Do not perform baking with atmosphere or reactive gases present inside the valve, including the gas inlet side. Doing so may cause oxidation of the seal, resulting in irreversible damage.

     Ensure that the gas inlet side and the ϕ 70 ICF flange are purged and filled with vacuum or an inert gas such as argon (Ar) before baking.
2. Ensure that no foreign particles, such as metal dust, are present inside the valve.

   If there is a risk of contamination from the gas introduced from the primary side, a filter should be installed in the piping to prevent particle ingress.
3. Be aware of the thermal effects on the valve.

   These effects become more pronounced when introducing a small gas flow, as the flow rate can fluctuate with temperature changes.

   To ensure precise control of the gas flow, maintain the valve at a constant temperature.
4. This variable leak valve is not suitable for use with corrosive gases.

Ordering information

Parts Number	Model	Description	Remarks	Code
8B1-0020-076	951-7170	Variable Leak Valve	With ϕ 70ICF, inlet side ϕ 8 SUS tube	31000
8B1-0020-077	951-7172	Variable Leak Valve	With ϕ 70ICF, inlet side ϕ 34 ICF tube	31001

Functions as both a shut-off valve and a vent valve.!

Isolate Valves

V–025SV

■ Summary

The V-025SV isolatie valve is primarily used by connecting it to the intake port of an oil rotary vacuum pump. This automatic valve integrates both shut-off and venting functions, and helps prevent backflow of pump oil in the event of a power outage or operational error.

■ Features

1.Prevent backflow of pump oil.

When the oil-sealed rotary vacuum pump is stopped, the valve automatically isolates the pump from the anti-suckback system by vacuum-sealing it, and then vents the pump to the atmosphere. This prevents oil from flowing back from the pump into the anti-suckback system.

2.No compressed air or air piping required

The valve uses the vacuum generated by the oil-sealed rotary vacuum pump as its driving source.
Unlike conventional automatic valves, it does not require compressed air or any associated air piping.
(Note: The valve will not open if the pump is not operating.)

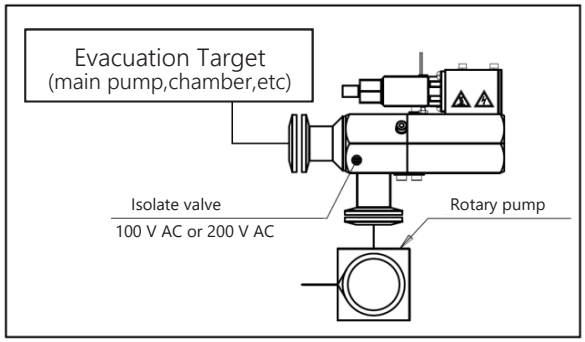
3.No special control circuit required

The valve operates by interlocking the power supply of the solenoid valve with the motor of the oil-sealed rotary vacuum pump.
Therefore, no dedicated control circuit is necessary.

- Please install a fuse or other protective device in the electrical circuit to ensure safety.
- Operate the valve within the specified voltage range (± 10% of the rated voltage).
- Use a connector that is compatible with the rated voltage for wiring the valve.

■ Pumping system configuration example

Since the valve has a fixed flow direction, please ensure that the oil rotary vacuum pump and the exhaust system are connected correctly, referring to the exhaust system configuration diagram below.
If the valve is installed in the wrong orientation, it will not function.
Additionally, if the valve is not properly evacuated, it will not open even when the solenoid valve is energized.



■ Flow of operation

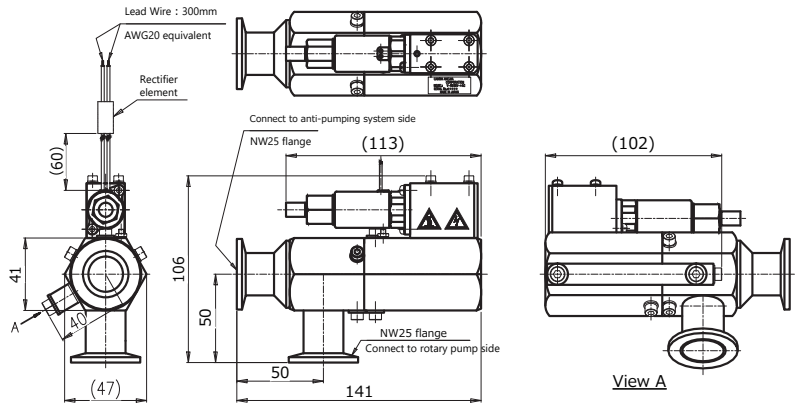
Start rotary pump (Energize the valve solenoid valve)	Stop rotary pump (Turn off power to the valve solenoid valve)
↓	↓
Close vent valve	Close isolate valve (Vacuum seal the pumped system)
↓	↓
Open isolate valve	Open vent valve (Air vent only pump side)
↓	
Vacuum pump the pumped system	

Note 1:The isolate valve incorporates both a shut-off valve and a vent valve.
Note 2:The isolate valve operates using the vacuum generated by an oil-sealed rotary vacuum pump.
Applying power to the solenoid valve alone will not open the valve.

■ Specifications

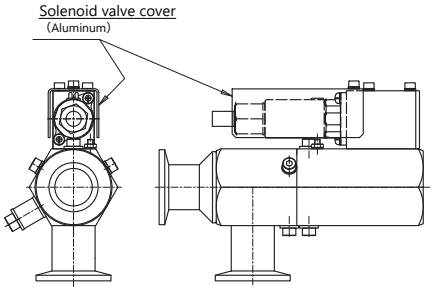
Type		V-025SV-1AC	V-025SV-2AC
Pressure range		Atmospheric to approx. 10^{-2} Pa	
Leak		$< 5 \times 10^{-7}$ Pa·m^3/s	
Conductance		420 L/min	
Maintenance interval		30,000 cycles or 1 year	
Main component material		Fluororubber O-ring: Main seal, bonnet seal, shaft seal Nitryl rubber: Piston and screw seal SUS304: Valve body, spring Al alloy: Base,Piston,air pipe 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)	AC100 V ± 10% (50/60 Hz)	AC200 V ± 10% (50/60 Hz)
	Starting current (A)	0.03 A	0.015 A
	Holding current (A)	0.03 A	0.015 A
	Power consumption	3 W	
	Coil insulation	Type B	
Dimensions		See ■ Dimensions diagram.	
Weight		1 kg	

■ Dimensions diagram



Note : The mounting orientation of the valve is flexible; however, the connection ports to the pump and the exhaust system are fixed.
(The valve will not function if the connection ports are reversed.)

● Option



The solenoid valve may become hot due to continuous energization.
If the ambient temperature exceeds 30 ° C, or if deemed necessary, install a protective cover (optional accessory).

■ Ordering information

Parts Number	Model	Description	Remark	Code
8B1-0020-607	V-025SV-1AC	V-025SV-1AC Isolate Valve	With NW25 flange, 100V AC	31095
8B1-0020-608	V-025SV-2AC	V-025SV-2AC Isolate Valve	With NW25 flange, 200V AC	31096
8B1-0022-410		Isolate valve solenoid valve cover	Option (Separate arrangement required)	31098

■ Dimensions diagram

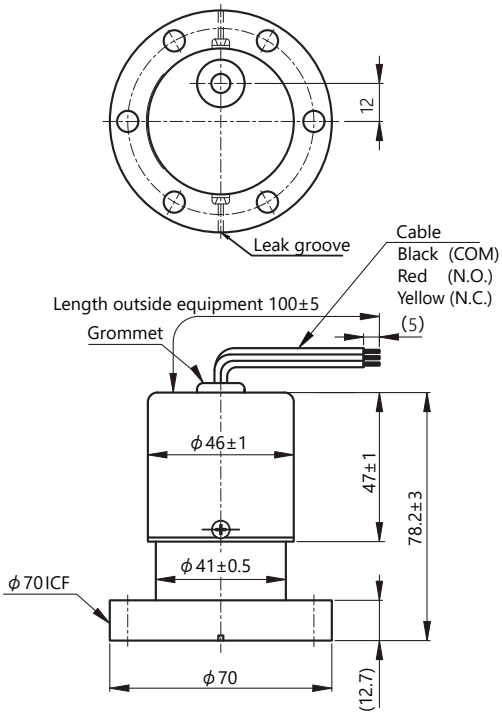


Fig. 1 V-070VS-I dimensions

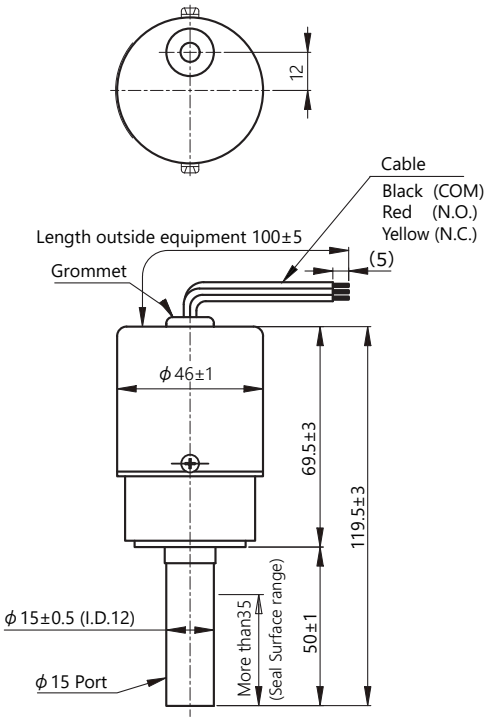
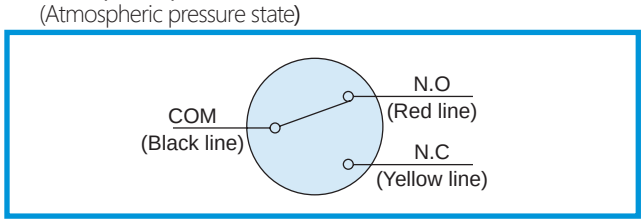


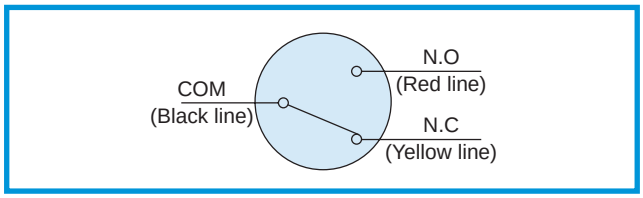
Fig. 2 V-070VS-T dimensions

● Contact structure

Atmospheric pressure minus 5.4 kPa or more
(Atmospheric pressure state)

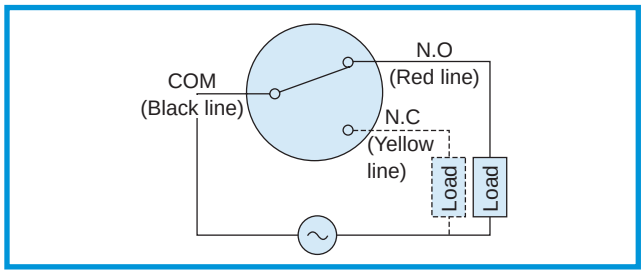


Atmospheric pressure minus 7.0 kPa or less (Vacuum state)

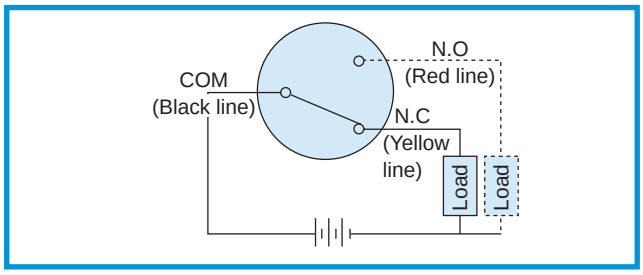


● Wiring method

If AC



If DC



● Usage notes

Be sure to read the included “Usage notes” before using.

■ Ordering information

Parts Number	Model	Description	Remarks	Code
8B1-0018-241	V-070VS-I	Vacuum Switch	With ϕ 70ICF	29210
8B1-0018-242	V-070VS-T	Vacuum Switch	For ϕ 15 gauge port	29211

Vacuum Switches

Summary

These vacuum switches, equipped with a single-pole double-throw (SPDT) contact, allow simultaneous output of ON and OFF control signals at either the maximum or minimum operating pressure, while maintaining minimal variation in switching pressure.
In addition, the entire vacuum-side structure is made of SUS304 stainless steel, and the welded air-tight seal enables connection to high vacuum environments.
These features make the switches suitable for use as protective devices in automated vacuum systems and as components in safety circuits.

Features

1. **Dual signal output with SPDT contact**
   Equipped with a single-pole double-throw (SPDT) contact, the switch can simultaneously output ON and OFF control signals at either the maximum or minimum operating pressure.
2. **High vacuum compatibility**
   The entire vacuum-side structure is made of US304 stainless steel, and the welded air-tight seal enbles reliable connection to high vacuum environments.
3. **Long service life with stable performance**
   Designed for durability, the switch offers a long service life of over 10,000 cycles, while maintaining minimal variation in switching pressure.
4. **Easy installation**
   The V-070VS-T vacuum switch is designed to be inserted into a ϕ 15 gauge adapter, allowing for easy installation and removal.

Applications

Suitable for protecting automated vacuum equipment and for use as a switch in safety circuits.
Enables retrieval of control signals in various vacuum systems.

Specifications

Type	V-070VS-I	V-015VS-T
Operating pressure (At black - yellow lead wire)	OFF : Atmospheric pressure ~ Atmospheric pressure -5.4 kPa (Atmospheric pressure -2.7 kPa±2.7 kPa) ON : Atmospheric pressure -7.0 kPa ~ Atmospheric pressure -18.7 kPa	
Operating degree of vacuum	Approx. 10^{-7} Pa	
Leak	1.33×10^{-11} Pa • m^3/s or less	
Fluid	Air, Gas (excluding corrosive gases affecting SUS304)	
Allowable heating temperature	40°C	
Operating environment temperature	-10°C~ +40°C	
Material	Vacuum side all SUS304	
Life	10,000 times or more	
Connection flange	ϕ 70 ICF flange	ϕ 15 gauge port
Electrical rating	Rated voltage — Resistive load AC250 V — 15 A DC125 V — 0.6 A DC250 V — 0.3 A	• Ambient temperature : 20 ± 2°C • Ambient humidity : 65 ± 5% RH • Operation frequency : 30 times/min
Weight	500 g	260 g

Note: This vacuum switch is designed specifically for use in vacuum systems. If it is subjected to internal pressurization, it may malfunction, such as deviating from its specified operating pressure.
In particular, for the V-015VS-T vacuum switch, internal pressurization is extremely hazardous, as it may cause the unit to be ejected from the ϕ 15 adapter.
Therefore, please implement appropriate safety measures, such as installing a protective cover, to prevent potential ejection and ensure safe operation.

Memorandum

Components Portfolio

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