

# **Vacuum Components Portfolio**

Components Business HQ ULVAC, Inc.

ULVAC CRYOGENICS, Inc.

**Vol.09**

## ■ Pressure unit conversion table

Pa (N·m <sup>-2</sup> )	Torr (mmHg)	Bar	kg·cm <sup>-2</sup>	Psi (lb·in <sup>-2</sup> )	atm	Water Column (15°C) m
1	7.500 62×10 <sup>-3</sup>	10 <sup>-5</sup>	1.019 72×10 <sup>-5</sup>	1.450 38×10 <sup>-4</sup>	9.869 23×10 <sup>-6</sup>	1.020 63×10 <sup>-4</sup>
133.322	1	1.333 22×10 <sup>-3</sup>	1.359 51×10 <sup>-3</sup>	1.933 68×10 <sup>-2</sup>	1.315 79×10 <sup>-3</sup>	1.360 73×10 <sup>-2</sup>
10 <sup>5</sup>	750.062	1	1.019 72	14.503 8	0.986 923	10.206 3
9.806 65×10 <sup>4</sup>	735.559	0.980 665	1	14.223 4	0.967 841	10.009 0
6.894 75×10 <sup>3</sup>	51.714 9	6.894 75×10 <sup>-2</sup>	7.030 69×10 <sup>-2</sup>	1	6.804 59×10 <sup>-2</sup>	0.703 702
1.013 25×10 <sup>5</sup>	760	1.013 25	1.033 23	14.696 0	1	10.341 6
9.797 82×10 <sup>3</sup>	73.489 7	9.797 82×10 <sup>-2</sup>	9.991 0×10 <sup>-2</sup>	1.421 06	9.669 70×10 <sup>-2</sup>	1

1 lb·in<sup>-2</sup> = 144 lb·ft<sup>-2</sup> , 1 short ton·ft<sup>-2</sup> = 0.945 08 atm, psi: pound per square inch

## ■ Flow rate unit conversion table

Pa·m <sup>3</sup> ·s <sup>-1</sup>	Torr·L·s <sup>-1</sup>	atm·cm <sup>3</sup> ·s <sup>-1</sup>	mbar·L·s <sup>-1</sup>	molecule·s <sup>-1</sup>	sccm
1	7.500 62	9.869 23	10	2.651 65×10 <sup>20</sup>	5.921 540×10 <sup>2</sup>
0.133 322	1	1.315 79	1.333 22	3.535 23×10 <sup>19</sup>	78.947 4
0.101 325	0.76	1	1.013 25	2.686 78×10 <sup>19</sup>	60
0.1	0.750 062	0.986 923	1	2.651 65×10 <sup>21</sup>	59.215 40
3.771 24×10 <sup>-21</sup>	2.828 67×10 <sup>-20</sup>	3.721 92×10 <sup>-20</sup>	3.771 24×10 <sup>-20</sup>	1	2.233 15×10 <sup>-18</sup>
1.688 75×10 <sup>-3</sup>	1.266 67×10 <sup>-2</sup>	1.666 67×10 <sup>-2</sup>	1.688 75×10 <sup>-2</sup>	4.477 97×10 <sup>17</sup>	1

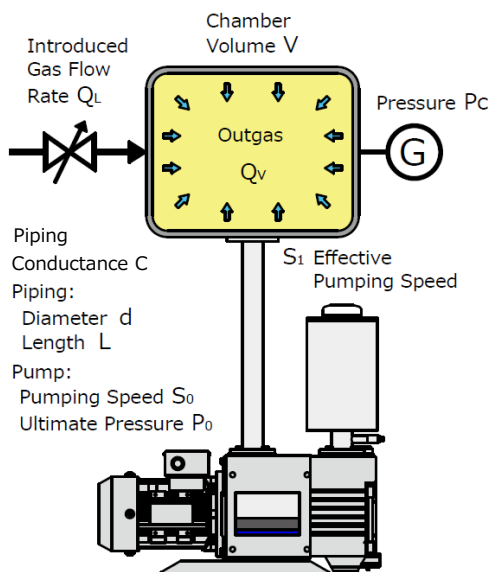
molecule is ideal gas (value of 0°C) , sccm: standard cubic centimeter per minute

## ■ Pumping speed and conductance unit conversion table

m <sup>3</sup> ·s <sup>-1</sup>	L·s <sup>-1</sup>	L·min <sup>-1</sup>	cm <sup>3</sup> ·s <sup>-1</sup>	m <sup>3</sup> ·hr <sup>-1</sup>	ft <sup>3</sup> ·s <sup>-1</sup>
1	10 <sup>3</sup>	6×10 <sup>4</sup>	10 <sup>6</sup>	3600	35.31
10 <sup>-3</sup>	1	60	10 <sup>3</sup>	3.6	3.531×10 <sup>-2</sup>
1.667×10 <sup>-5</sup>	1.667×10 <sup>-2</sup>	1	16.67	0.06	5.885×10 <sup>-4</sup>
10 <sup>-6</sup>	10 <sup>-3</sup>	0.06	1	3.6×10 <sup>-3</sup>	3.531×10 <sup>-5</sup>
2.778×10 <sup>-4</sup>	0.277 8	16.67	2.778×10 <sup>2</sup>	1	9.808×10 <sup>-3</sup>
2.832×10 <sup>-2</sup>	28.32	1.699×10 <sup>3</sup>	2.832×10 <sup>4</sup>	1.019 52×10 <sup>2</sup>	1

## ■ Pumping speed calculation (viscous flow range)

Followings show how to calculate pumping speed in the range of viscous flow when using oil rotation vacuum pumps, dry vacuum pumps, mechanical booster pumps, etc. (Actual result could change from the calculated value depending on vacuum chamber, piping shape, contents in side chamber, leak rate, outgas, etc.)



(1) Pressure inside vacuum chamber "P<sub>C</sub>" being maintained constant while introducing certain amount of gas "Q<sub>L</sub>" is calculated by formula "A" below.

(2) Time "Δt" when pumping down a vacuum chamber with volume "V" from pressure "P<sub>1</sub>" to "P<sub>2</sub>" is calculated by formula "B" below. To get more precise result, totalize all result after calculation by dividing pressure range in scope in narrow scope.

To get conductance "C" of pipe.  
 $C = 1349 \times d^4 / L \times P_{AV}$

To get effective pumping speed "S<sub>1</sub>".  
 $S_1 = 1 / (1/S_0 + 1/C)$

To get pressure "P<sub>C</sub>" of vacuum chamber.  
 $P_C = (Q_L + Q_V) / S_1 + P_0$

To get pumping time "Δt".  
 $\Delta t = 2.3 \times V / S_1 \times \log_{10} (P_1 / P_2)$

V: Vacuum chamber volume (m<sup>3</sup>)  
 L: Piping length (m)  
 d: Piping diameter (m)  
 Q<sub>L</sub>: Introduced gas volume (Pa·m<sup>3</sup>/sec)  
 Q<sub>V</sub>: Outgas inside vacuum chamber (Pa·m<sup>3</sup>/sec)

S<sub>0</sub>: Pumping speed (m<sup>3</sup>/sec)  
 S<sub>1</sub>: Effective pumping speed (m<sup>3</sup>/sec)  
 P<sub>AV</sub>: Average pressure inside piping (Pa)  
 P<sub>0</sub>: Ultimate pressure of vacuum pump itself (Pa)  
 P<sub>1</sub> (Pa) > P<sub>2</sub> (Pa) .

P<sub>C</sub>: Pressure inside vacuum chamber (Pa)  
 C : Piping conductance (m<sup>3</sup>/sec)  
 Δt: Pumping time (sec)

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Vacuum Pump

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Process Gas Monitor  
(Residual Gas Analyzer)

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Power Supply (DC/RF)

**P.66**  
EB Power Supply / EB Source

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Deposition Controller

**P.72**  
Thin Film Measurement

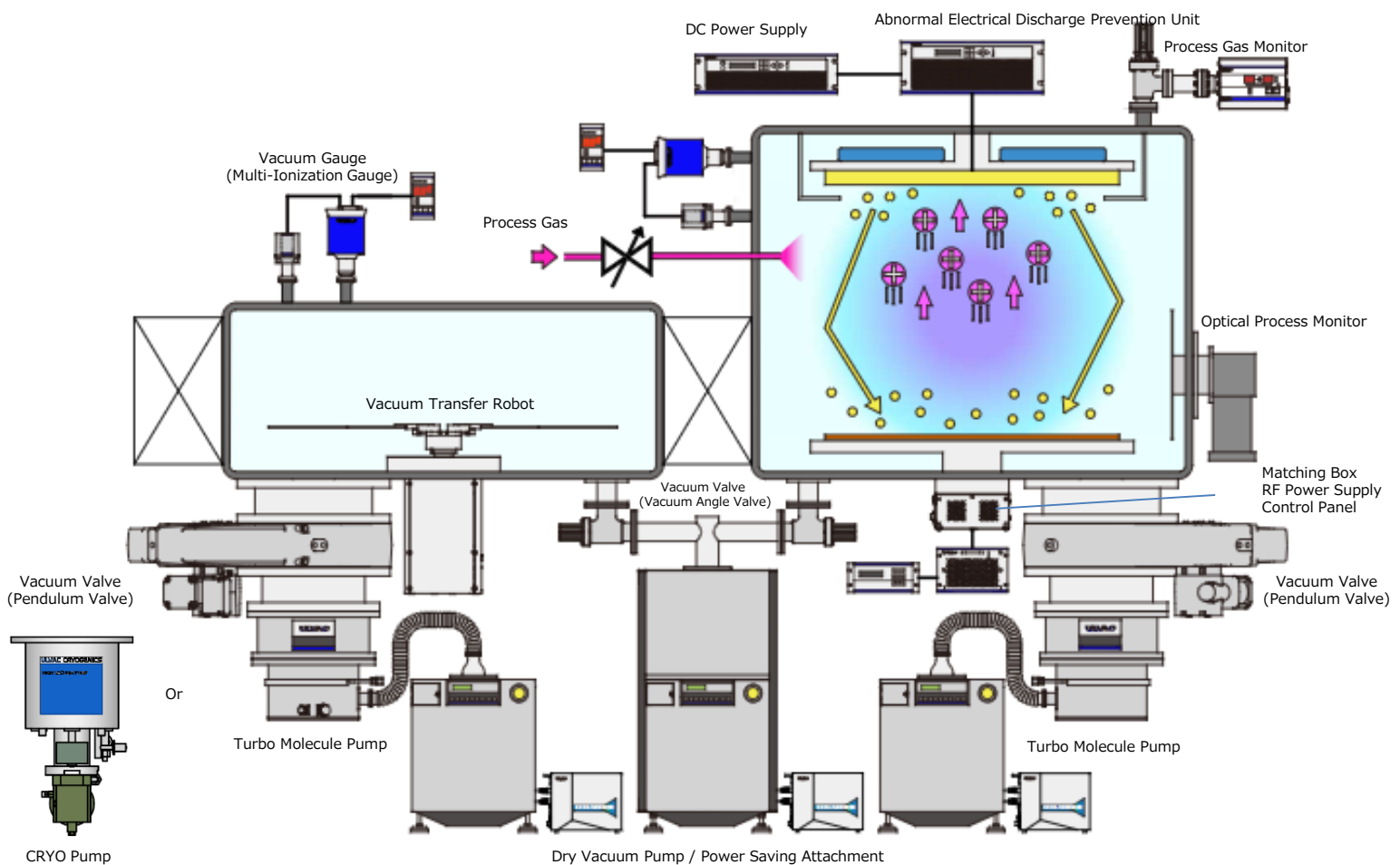
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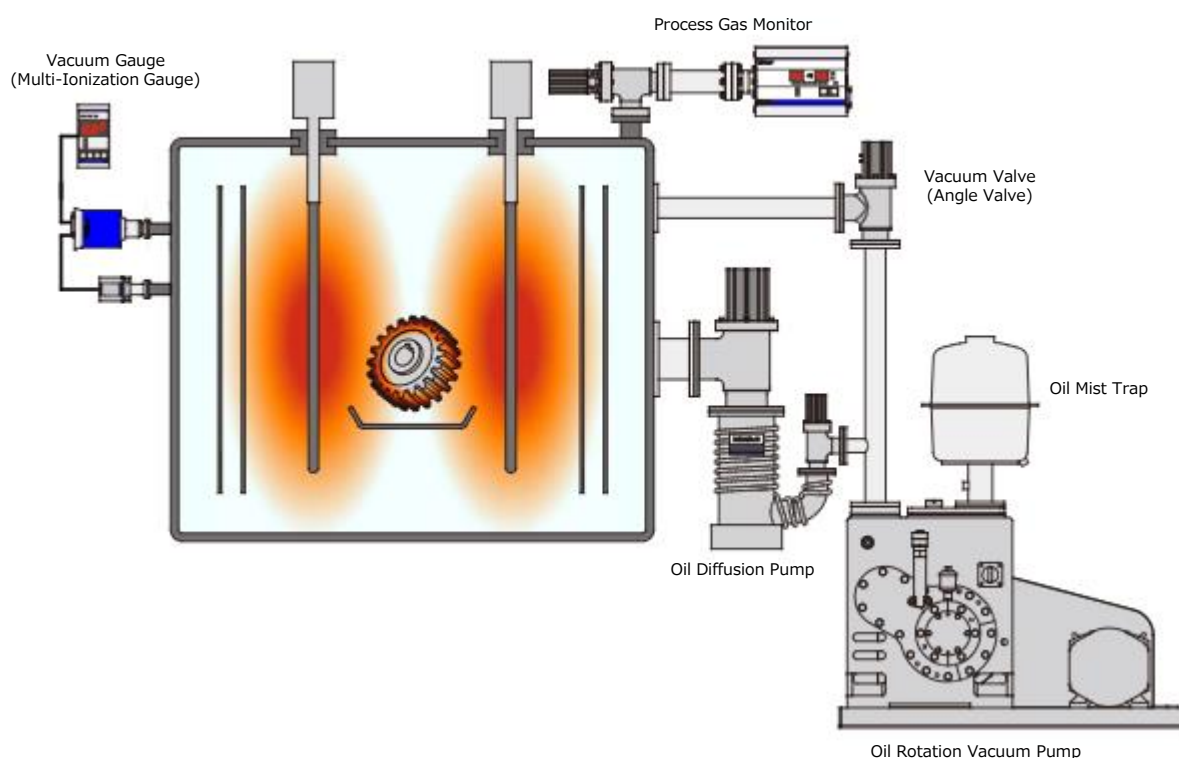
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Cryogenic Equipment

# Examples of Use in Vacuum Equipments

## Sputtering Equipment



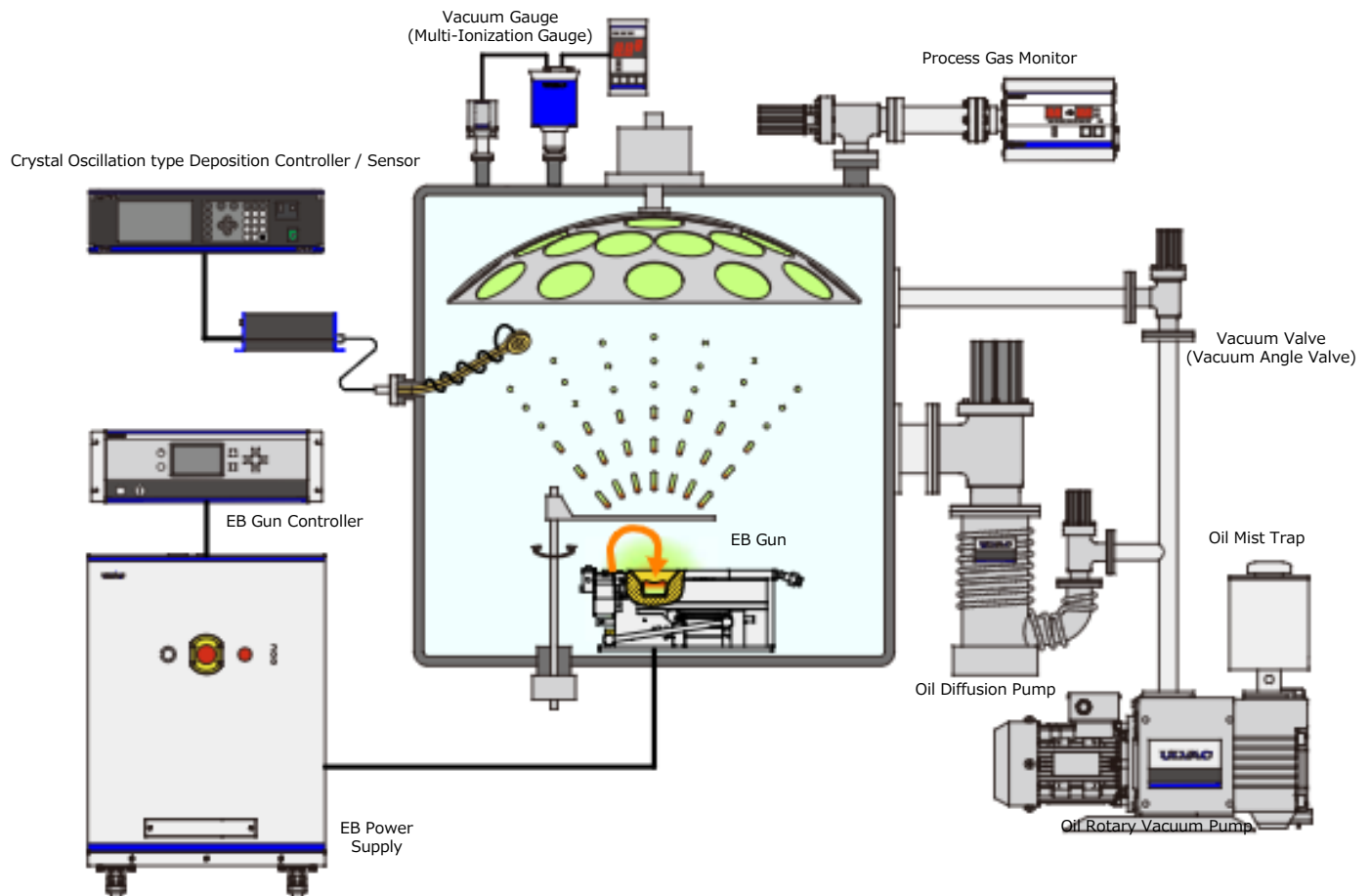
## Vacuum Heat Treatment Furnace



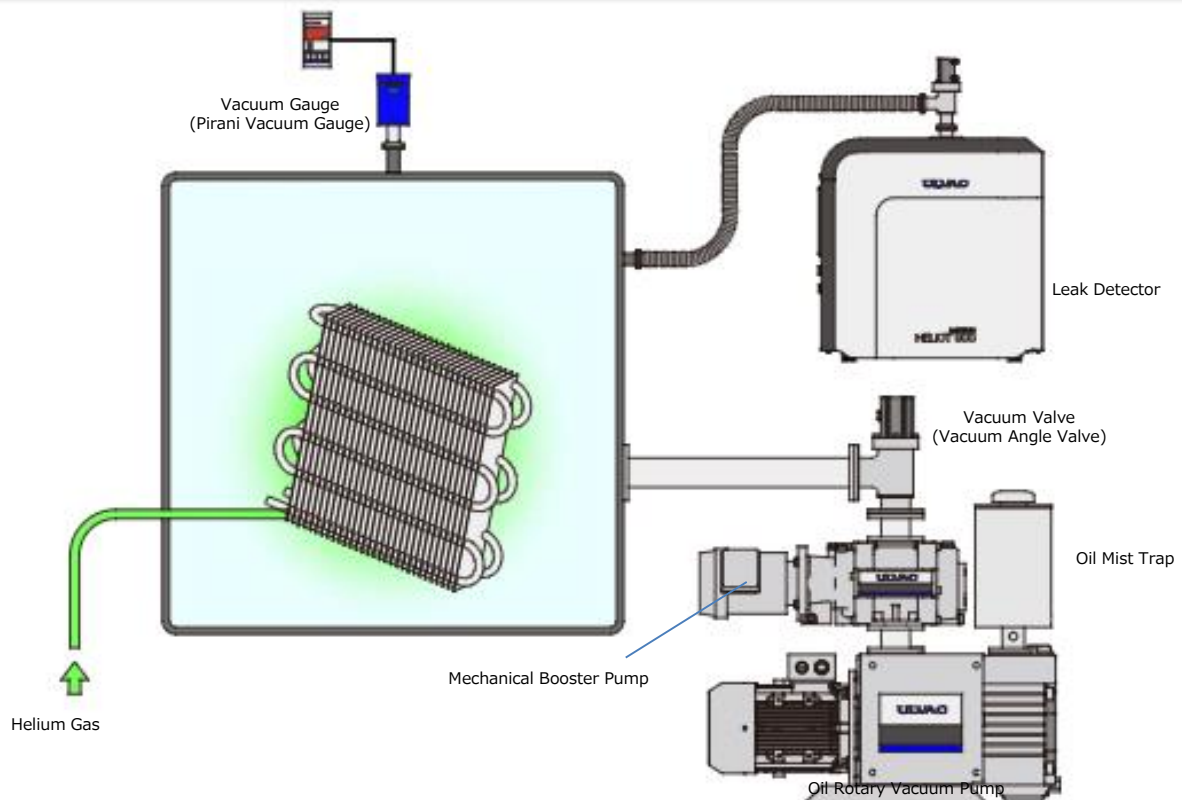


# Examples of Use in Vacuum Equipments

## Evaporation Equipment

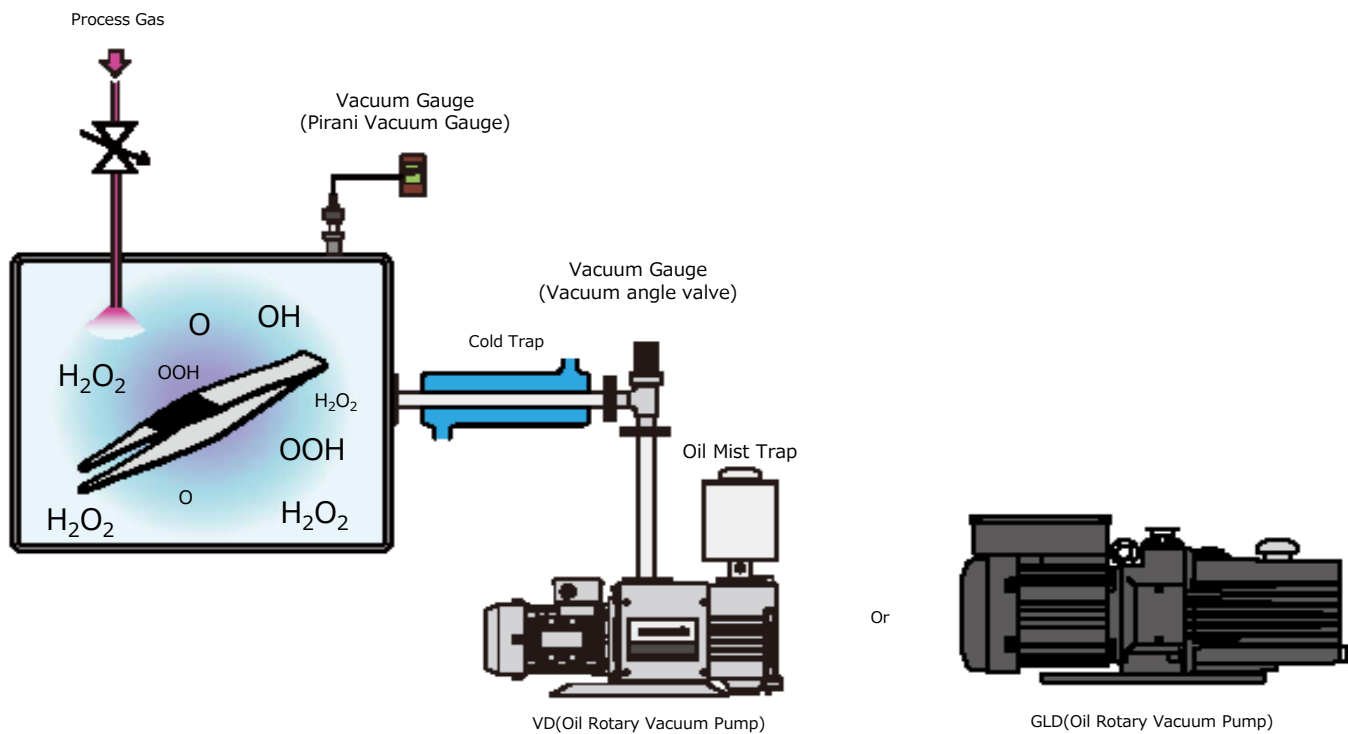


## Leak Test System

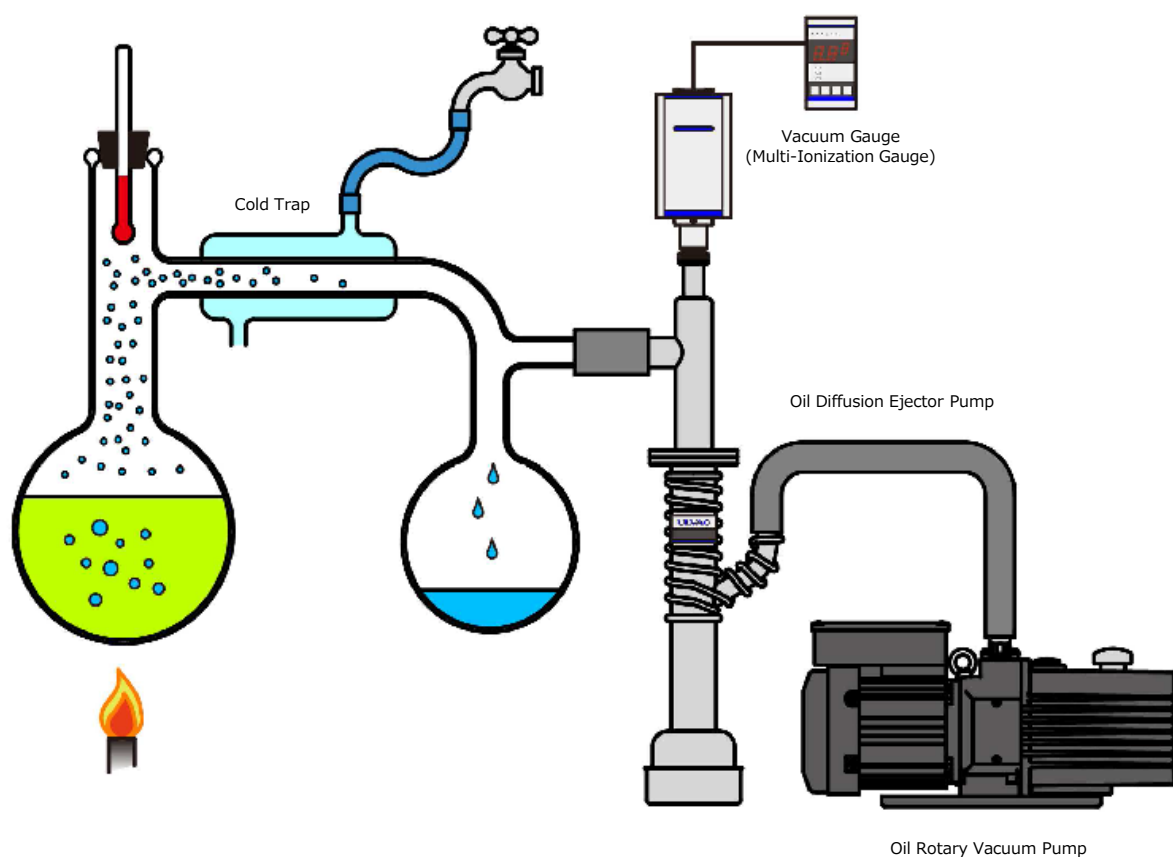


# Examples of Use in Vacuum Equipments

## Plasma sterilization

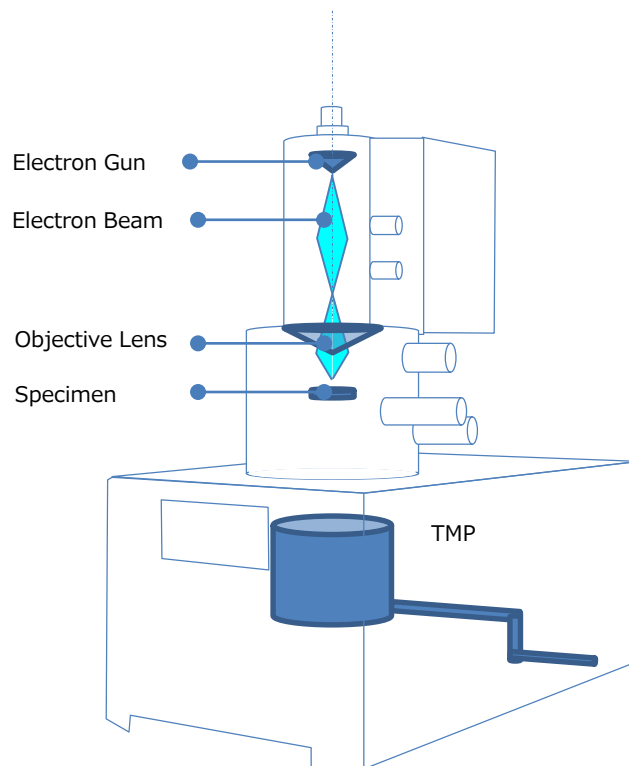


## Vacuum Distillation Equipment

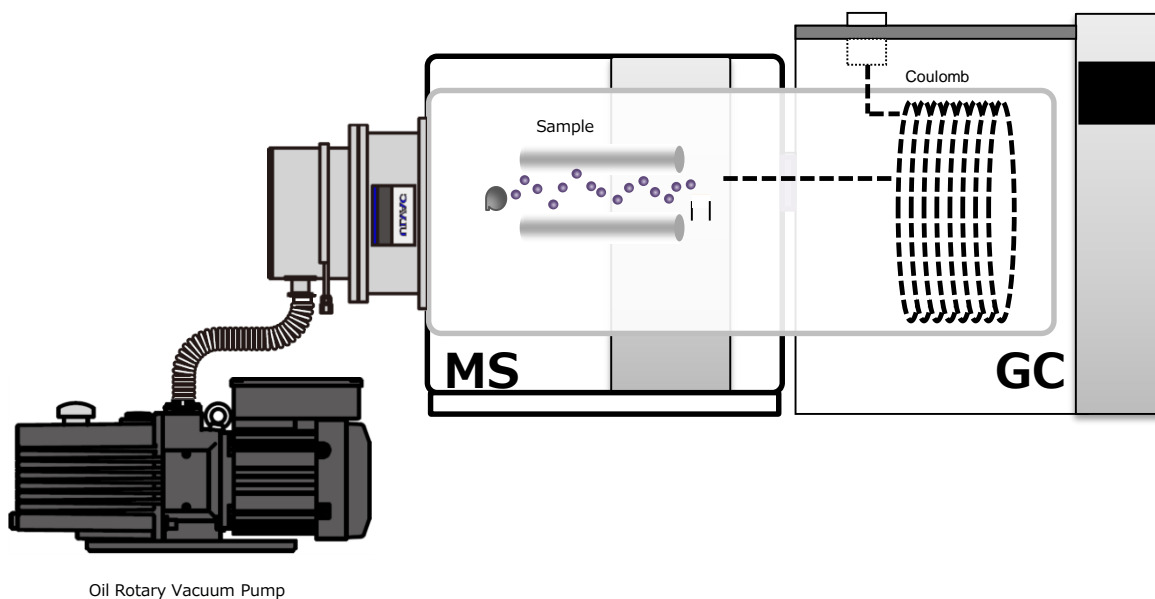


# Examples of Use in Vacuum Equipments

## Scanning Electron Microscope



## Gas chromatography-mass spectrometry



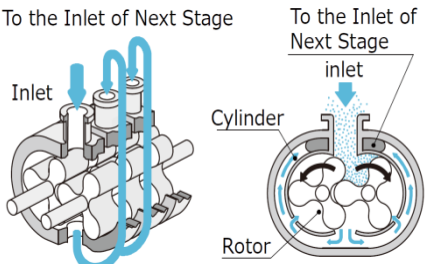
# Vacuum Pump ▶ Selection Guide

## Selection Guide

Unit : Pa

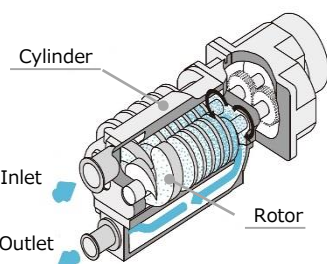
Product	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Dry Vacuum Pump																DAP series
																DA / DAT series
																DTC series
																DOP series
																DAU / DTU series
																DIS series
																GR series
																LR / HR / UR series
																LS series
																MS series
Oil Rotary Vacuum Pump																CR series
																RDA series
																VS series
																PKS series
																G series
																GLD series
																GHD series
																GCD series
Mechanical Booster Pump																VD series
																PVD series
																MBS / VMR series
																PMB series Ver.D
Turbo Molecular Pump																PRC series
																PMB-C series
Oil Diffusion Ejector Pump																UTM-B series
Oil Diffusion Pump																UTM-MI series
																UTM-MS series
Cryo Pump																PBL series
Sputter Ion Pump																PFL series
																ULK series
																CRYO-U series
																PST series

Dry vacuum pump  
Multi-stage roots type



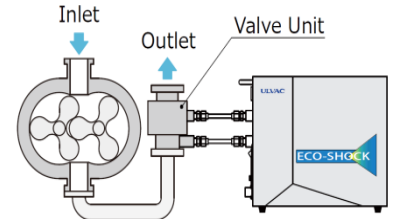
A clean pumping down because oil is not used in the working chamber. It is effective for CVD and etching processes as there are no oil which react to active gases.

Dry vacuum pump  
Screw type



Gas in the groove partitioned by rotor and cylinder is transferred according to the rotation of rotor.

Power saving attachment for Dry vacuum pump



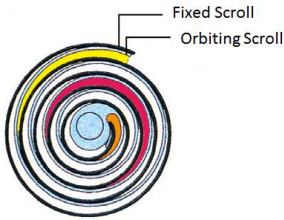
Dry Vacuum Pump      ECO-SHOCK Body

ECO-SHOCK is a revolutionary dry pump accessory that can dramatically reduce power consumption by attaching to the dry pump exhaust line.

# Vacuum Pump ▶ Selection Guide

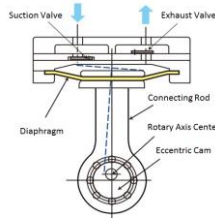
## Selection Guide

### Scroll Type Dry vacuum pump



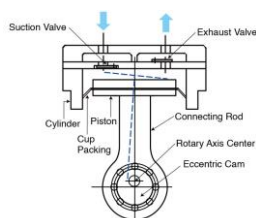
A dry vacuum pump that evacuates by a combination of spiral stator and rotor movements.

### Diaphragm Type Dry vacuum pump



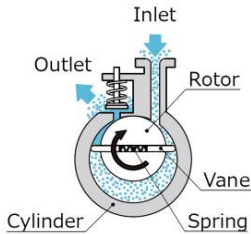
Consists of a diaphragm (membrane) and two valves.  
The diaphragm is moved up and down or left and right to change the volume and perform intake and exhaust.

### Rocking Piston Type Dry vacuum pump



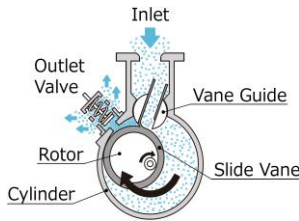
The piston inside the cylinder is reciprocated, and two valves are combined for intake and exhaust.

### Oil rotary vacuum pump Rotary vane type



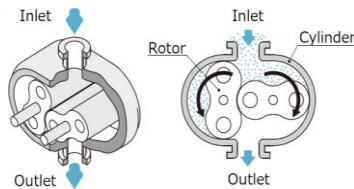
Low vibration and high compression efficiency. It is the pump which mostly used for industrial uses.

### Oil rotary vacuum pump Rotary plunger type



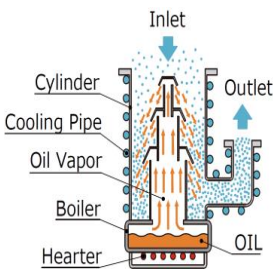
Robust and comparatively strong for foreign materials. Workable for long term with appropriate regular maintenance.

### Mechanical booster pump Roots type



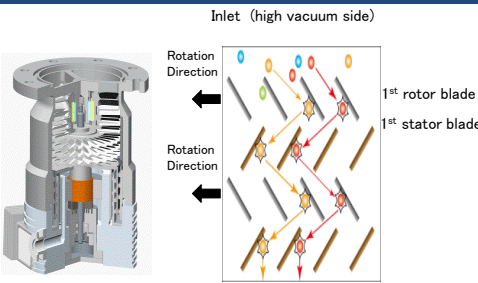
It is possible to accelerate pumping speed in the pressure range where pumping speed of dry vacuum pump and oil rotary vacuum pump decreases.

### Oil diffusion pump



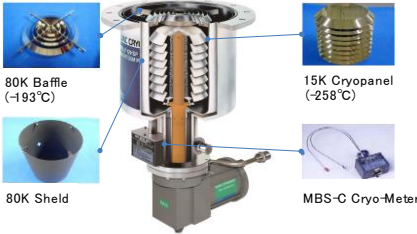
Exhaust gas using oil vapor injection. A high vacuum is created in combination with an oil rotary vacuum pump.

### Turbo molecular pump



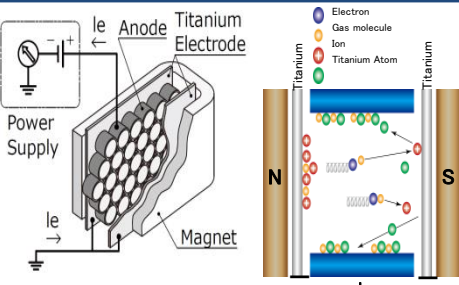
From high to ultra high vacuum generated by high speed rotating turbine blade with tens of thousands rpm. It is not a sorption type and possible to continue evacuation.

### Cryo pump



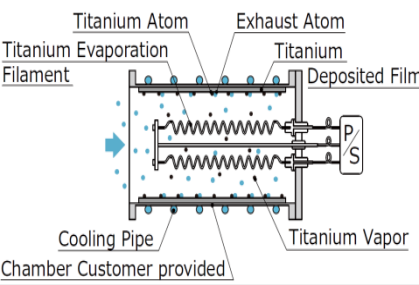
A cryo pump is vacuum pump that traps gases and vapors by condensing them on a cold surface.

### Sputter ion pump



An ultra-high vacuum pump that uses the getter action of sputtered active titanium. The feature is that there is no rotating part.

### Titanium getter pump



Gas molecules are adsorbed and exhausted by titanium which is activated by heating and evaporating titanium directly.

Vacuum Pump	Vacuum Valve	Vacuum Gauge	Process Gas Monitor	Leak Detector	Power Supply (V/Hz)	EB Power Supply / EB Source	Deposition Controller	Thin Film Measurement	Accessories	Vacuum Transfer Robot	Cryogenic Equipments
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# Vacuum Pump ▶ Selection Guide

## Selection Guide (Application Examples)

Vacuum pumps are also used for the following applications other than for the exhaust of gases such as for clean air.

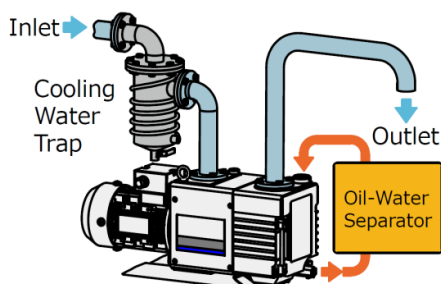
✓✓✓: Highly recommended. ✓✓: Recommended. ✓: Usable depending on conditions.

Product	Model	Water vapor	Flammable gas	Dust	Sublimation gas
Dry Vacuum Pump	LR series	✓✓	✓	✓✓	✓
	HR / UR series	✓✓	✓	✓✓	✓✓✓
	LS series	✓✓✓	✓		✓
	MS series	✓✓✓	✓	✓✓✓	✓
	CR series	✓✓	✓		
	GR series	✓✓	✓	✓✓	✓
Oil Rotary Vacuum Pump	VD series	✓✓	✓	✓✓	✓
	VS series	✓✓	✓	✓✓	✓
	PVD series	✓✓	✓		
	PKS series	✓✓	✓	✓✓✓	✓

### Example of water vapor evacuation and problems

#### <Problems>

- Water condensation
- Oil deterioration

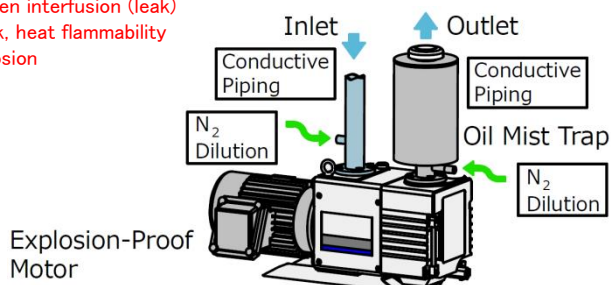


- Countermeasures in pumps: Oil rotation vacuum pump → Gas ballast valve, oil exchange, oil water separator.  
Dry vacuum pump → Gas ballast.
- Countermeasure in the Inlet port: Water cooling trap for the high temperature water vapor.
- Countermeasure in the Outlet port: Piping connection not to return water to pump.

### Example of combustible gas evacuation and problems

#### <Problems>

- Oxygen interfusion (leak)
- Spark, heat flammability
- Explosion

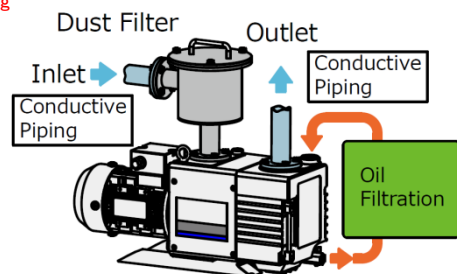


- Countermeasures in pumps: Oil rotation vacuum pump → Helium tight type, explosion-proof motor, electrostatic belt, oil mist trap (helium tight type).  
Dry vacuum pump → GR series.
- Countermeasure in the Inlet port: Conductive piping, dilution with N2 purge.
- Countermeasure in the Outlet port: Conductive piping, dilution with N2 purge.

### Example of dusty gas evacuation and problems

#### <Problems>

- Foreign matter gnawing
- Piping blockage

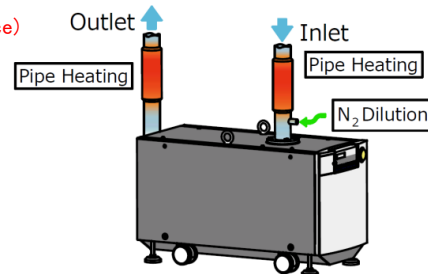


- Countermeasures in pumps: Oil rotation vacuum pump → Oil exchange, oil kind change, oil filtration.  
Dry vacuum pump → Purge gas from the Inlet port, gas ballast.
- Countermeasure in the inlet port: Dust trap.
- Countermeasure in the outlet port: Prevention of explosion by overpressure due to dust clogging.

### Example of sublimation gas evacuation and problems

#### <Problems>

- Deposition of reactive product (solid substance)



- Countermeasures in pumps: High temperature type dry vacuum pump UR series + gas ballast gas (N2) introduction.
- Countermeasure in the Inlet port: Dilution gas introduction (N2 purge), heated piping.
- Countermeasure in the Outlet port: Heated piping.

### What is sublimation gas...?

Sublimation gas changes from solid state to gas state without being in liquid state when it is cooled or compressed.

There are cases which make difficult to run vacuum pumps because many of sublimation gases generated during CVD and dry etching processes for electronic devices and displays manufacturing will change to solid material.

### What is helium tight type...?

It is one of optional selections of oil rotation vacuum pump. This type is tested by the helium leak detector and has a leak tightness specification with  $1 \times 10^{-6}$  (Pa·m<sup>3</sup>/s) or below.

### Precaution of IE3 motor

Although IE3 motor is adopted due to top runner system, inrush current tends to become higher than conventional motor (IE1). Especially for large pumps (5.5kW or more), inrush current value tends to be higher than conventional standard efficiency motor.

Accordingly, it may be necessary to review primary power supply equipment (circuit breaker or overload protection device), so please confirm power supply capacity when purchasing.

### What is gas ballast...?

Gas ballast is a countermeasure when handling condensable gas such as water vapor, etc. Condensable gas is compressed through compression process inside oil vacuum pump, condensed and changed to liquid which mixes with vacuum pump oil. It is left inside in the case of dry vacuum pump. In order to prevent this, it is possible to let condensable gas exhaust without changing from air state to liquid state by opening gas ballast valve and introducing certain amount of air or nitrogen to the working chamber inside pump.

Vacuum Pump											
	Vacuum Valve	Vacuum Gauge	Process Gas Monitor	Leak Detector	Power Supply (V/Hz)	EB Power Supply / EB Source	Deposition Controller	Thin Film Measurement	Accessories	Vacuum Transfer Robot	Cryogenic Equipment



# Vacuum Pump ▶ Dry Vacuum Pump

## Diaphragm Type DAP series

A small, high performance, low noise, low vibration diaphragm type dry vacuum pump.



DAP-6D

Model			DAP-6D	DAP-12S	DAP-9D-DC24	DAP-18S-DC24
Maximum pumping speed	[m <sup>3</sup> /h]	50Hz/60Hz	0.36 / 0.42	0.72 / 0.84	0.54	1.08
	[L/min]	50Hz/60Hz	6 / 7	12 / 14	9	18
	[CFM]	50Hz/60Hz	2.1 x 10 <sup>-1</sup> / 2.45 x 10 <sup>-1</sup>	4.2 x 10 <sup>-1</sup> / 4.9 x 10 <sup>-1</sup>	3.18 x 10 <sup>-1</sup>	6.35 x 10 <sup>-1</sup>
Ultimate pressure	[Pa]		6.65 x 10 <sup>3</sup>	24.0 x 10 <sup>3</sup>	6.65 x 10 <sup>3</sup>	24.0 x 10 <sup>3</sup>
	[Torr]		50	180	50	180
	[mbar]		66.5	240	66.5	240
Inlet port			Rc1/8			
Outlet port			Rc1/8			
Power supply [V]			Single phase 100 200 220 to 230		DC24V BrushlessDCMotor	
Motor [kW]			0.01		0.014	
Full load current [A]			0.5 (100V)		1.3	1.4
Weight [kg]			1.9		1.75	
Dimensions W x D x H [mm]			91 x 163 x 100.6		83.5 x 165 x 123.8	
Applicable standard			—		CE , TUV , cTUVus	

## Diaphragm Type DA/DAT series

A small, high performance, low noise, low vibration diaphragm type dry vacuum pump.



DA-30D



DAT-50D



DA-20DC



DA-41D

Model			DA-30D	DA-60S	DAT-50D	DAT-100S
Maximum pumping speed	[m³/h]	50Hz/60Hz	1.8 / 2.16	3.6 / 4.32	3 / 3.3	6 / 6.6
	[L/min]	50Hz/60Hz	30 / 36	60 / 72	50 /55	100 / 110
	[CFM]	50Hz/60Hz	1.05 / 1.26	2.1 / 2.52	1.75 / 1.93	3.5 / 3.85
Ultimate pressure		[Pa]	6.7 x 10 <sup>3</sup>	2.13 x 10 <sup>3</sup>	3.3 x 10 <sup>3</sup>	13.3 x 10 <sup>3</sup>
		[Torr]	50	16	25	100
		[mbar]	67	21.3	33	133
Inlet port			O.D. ϕ 9 × I.D. ϕ 5 (Female Rc1/4)		O.D. ϕ 12 × I.D. ϕ 8.5 (Female Rc1/4)	
Outlet port			O.D. ϕ 9 × I.D. ϕ 5 (Female Rc1/4)		O.D. ϕ 12 × I.D. ϕ 8.5 (Female Rc1/4)	
Power supply [V]			Single phase 100 200 220			
Motor [kW]			0.2			
Full load current [A]			5.6 (100V , 50Hz) , 5.0 (100V , 60Hz)			
Weight [kg]			11			
Dimensions W x D x H [mm]			212 x 278 x 224.5		150 x 232 x 305	
Applicable standard			—		CE,TUV,cTUVus Compatible models*1	

\*1) DAT-50DA (Three phase 200 to 220V) , DAT-100SA (Three phase 200 to 220V)

Model			DA-20DC	DA-40SC	DA-41D	DA-81S
Maximum pumping speed	[m <sup>3</sup> /h]	50Hz/60Hz	1.2 / 1.44	2.4 / 2.76	2.4 / 2.76	4.5 / 5.1
	[L/min]	50Hz/60Hz	20 / 24	40 / 46	40 / 46	75 / 85
	[CFM]	50Hz/60Hz	0.7 / 0.84	1.4 / 1.61	1.4 / 1.61	2.63 / 2.98
Ultimate pressure	[Pa]		5.33 x 10 <sup>3</sup>	19.9 x 10 <sup>3</sup>	3.3 x 10 <sup>3</sup>	13.3 x 10 <sup>3</sup>
	[Torr]		40	149	25	100
	[mbar]		53.3	199	33	133
Inlet port			O.D. φ 9 × I.D. φ 5 (Female Rc1/4)		O.D. φ 12 × I.D. φ 8 (Female G1/4)	
Outlet port			O.D. φ 9 × I.D. φ 5 (Female Rc1/4)		O.D. φ 12 × I.D. φ 8 (Female G1/4)	
Power supply [V]			Single phase 220		Single phase 220	
Motor [kW]			0.06		0.1	
Current [A]			0.8		1.2 (50Hz) , 1.25 (60Hz)	
Weight [kg]			7.2		10.3	
Dimensions W x D x H [mm]			118 x 242 x 178	128 x 242 x 178	157 x 336.5 x 217	181 x 336.5 x 217
Applicable standard			CE,TUV Compatible models*1		—	

\*1) DA-20DA (Single phase 100V) , DA-20DB (Single phase 115V) , DA-20DC (Single phase 220V)  
DA-40SA (Single phase 100V) , DA-40SB (Single phase 115V) , DA-40SC (Single phase 220V)



Vacuum Pump ▶Dry Vacuum Pump

Diaphragm Type DA series

A small, high performance, low noise, low vibration diaphragm type dry vacuum pump.



DA-60D



DA-121DF

Model			DA-60D	DA-120S	DA-121DF	DA-241SF
Maximum pumping speed	[m <sup>3</sup> /h]	50Hz/60Hz	3.6 / 4.32	7.2 / 8.64	7.2 / 8.7	14.4 / 15.6
	[L/min]	50Hz/60Hz	60 / 72	120 / 144	120 / 145	240 / 260
	[CFM]	50Hz/60Hz	2.1 / 2.52	4.2 / 5.04	4.2 / 5.08	8.4 / 9.1
Ultimate pressure	[Pa]		3.32 x 10 <sup>3</sup>	13.3 x 10 <sup>3</sup>	3.3 x 10 <sup>3</sup>	16 x 10 <sup>3</sup>
	[Torr]		25	100	25	120
	[mbar]		33.2	133	33	160
Inlet port			O.D. φ 14 × I.D. φ 9 (Female G3/8)		O.D. φ 16 × I.D. φ 12 (Female G1/2)	
Outlet port			O.D. φ 14 × I.D. φ 9 (Female G3/8)		O.D. φ 16 × I.D. φ 12 (Female G1/2)	
Power supply [V]			Single phase 220		Single phase 220 to 230	
Motor [kW]			0.2		0.4	
Full load current [A]			2.4		2.3 (50Hz) 2.6 (220V) / 2.5(230V (60Hz)	2.5 (220V) / 2.4(230V , 50Hz) 2.7 (220V) / 2.6(230V , 50Hz)
Weight [kg]			19		26	
Dimensions W x D x H [mm]			156 x 358 x 238	162 x 358 x 238	193.5 x 411 x 285	207 x 411 x 285
Applicable standard			—		CE,TUV,cTUVus Compatible models*1	

\*1) DA-121DC (100V), DA-121DD (115V), DA-121DE (200V), DA-121DF (220 to 230V)  
DA-241SC (100V), DA-241SD (115V), DA-241SE (200V), DA-241SF (220 to 230V) ※All single phase

Diaphragm Type DAU/DTU series

High vacuum type diaphragm type dry vacuum pump.



DAU-20D

Model			DAU-20D	DTU-20D (Chemical type)
Maximum pumping speed	[m <sup>3</sup> /h]	50Hz/60Hz	1.2 / 1.38	
	[L/min]	50Hz/60Hz	20 / 23	
	[CFM]	50Hz/60Hz	0.7 / 0.8	
Ultimate pressure	[Pa]		200	
	[Torr]		1.5	
	[mbar]		2	
Inlet port			O.D. φ 10 × I.D. φ 6 (Female Rc1/8)	
Outlet port			O.D. φ 10 × I.D. φ 6 (Female Rc1/8)	
Power supply [V]			Single phase 220	
Motor [kW]			0.08	
Full load current [A]			0.7 / 0.72	
Weight [kg]			7.5	
Dimensions W x D x H [mm]			161 x 327 x 217	
Applicable standard			CE,TUV,cTUVus Compatible models*1	

\*1) DAU-20A (100V), DAU-20B (115V), DAU-20C (200V), DAU-20D (220V), DAU-20E (230V), DTU-20A (100V), DTU-20B (115V)  
DTU-20C (200V), DTU-20D (220V) , DTU-20E (230V) ※All single phase

Diaphragm Type DTC series

Chemical type diaphragm type dry vacuum pump.



DTC-22



DTC-60

Model			DTC-22B	DTC-41E	DTC-60
Maximum pumping speed	[m <sup>3</sup> /h]	50Hz/60Hz	1.2 / 1.44	2.4 / 2.76	3.6 / 4.2
	[L/min]	50Hz/60Hz	20 / 24	40 / 46	60 / 70
	[CFM]	50Hz/60Hz	0.7 / 0.84	1.4 / 1.61	2.1 / 2.45
Ultimate pressure	[Pa]		1.0 x 10 <sup>3</sup>		
	[Torr]		7.5		
	[mbar]		10		
Inlet port			O.D. φ 10 × I.D. φ 6 (Female G1/4)		O.D. φ 14 × I.D. φ 9 (Female G3/8)
Outlet port			O.D. φ 10 × I.D. φ 6 (Female G1/4)		O.D. φ 14 × I.D. φ 9 (Female G3/8)
Power supply [V]			Single phase 220	Single phase 220	Single phase 220
Motor [kW]			0.05	0.1	0.2
Full load current [A]			0.6 (50Hz) / 0.72 (60Hz)	1.1	2.0 (50Hz) / 2.1 (60Hz)
Weight [kg]			7.1	10.3	18
Dimensions W x D x H [mm]			142 x 288.5 x 202	155 x 336.5 x 217	158 x 340 x 242
Applicable standard			CE , TUV , cTUVus*1		

\*1) DTC-22A (115V), DTC-22B (220V), DTC-22C (230V), DTC-41A (100V), DTC-41B (230V 50Hz) ※All single phase

Vacuum Pump  
Vacuum Valve  
Vacuum Gauge  
Process Gas Monitor  
Leak Detector  
Power Supply (DC/AC)  
EB Power Supply / EB Source  
Deposition Controller  
Thin Film Measurement  
Accessories  
Vacuum Transfer Robot  
Cryogenic Equipments

Vacuum Pump ▶Dry Vacuum Pump

Rocking Piston Type **DOP series**

A large displacement , compact size rocking piston type dry vacuum pump.



DOP-40D



DOP-181SD



DOP-301SB

Model			DOP-40D	DOP-80S	DOP-81SPF	
Maximum pumping speed	[m³/h]	50Hz/60Hz	2.4 / 2.64	4.8 / 5.28	5.1 / 6.0	
	[L/min]	50Hz/60Hz	40 / 44	80 / 88	85 / 100	
	[CFM]	50Hz/60Hz	1.4 / 1.61	2.8 / 3.08	2.975 / 3.5	
Ultimate pressure [Maximum pressure]		[Pa]	1.2 x 10³	5.33 x 10³	[0.5 MPa]	
		[Torr]	9	40	[3750 Torr]	
		[mbar]	12	53.3	[500 mbar]	
Inlet port			O.D.ϕ 9 × I.D.ϕ 5 (Female Rc1/4)			
Outlet port			O.D.ϕ 9 × I.D.ϕ 5 (Female Rc1/4)			
Power supply [V]			Single phase 220		Single phase 220 to 240	
Motor [kW]			0.21		0.3	
Full load current [A]			3.2 (100V , 50Hz) , 3.9 (100V , 60Hz)		2.6 (220V,50Hz)/3.0(220V,60Ha)	
Weight [kg]			7		9	
Dimensions W x D x H [mm]			160 x 270 x 179		168.5 x 288 x 181	
Applicable standard			—			

Model			DOP-181SD	DOP-301SB	DOP-400SB	DOP-420SA
Maximum pumping speed	[m³/h]	50Hz/60Hz	10.8 / 12	18 / 19.8	24 / 26.4	25.2 / 27.6
	[L/min]	50Hz/60Hz	180 / 200	300 / 330	400 / 440	420 / 460
	[CFM]	50Hz/60Hz	6.3 / 7	10.5 / 11.6	14 / 15.1	14.7 / 16.1
Ultimate pressure		[Pa]	10 x 10³	8 x 10³	12 x 10³	17.3 x 10³
		[Torr]	75	60	90	130
		[mbar]	100	80	120	173
Inlet port			Rc3/8	O.D.ϕ 16 × I.D.ϕ 12 (Female Rc1/2)	Adapted tubing O.D. dia.16 (Female Rc1/2)	O.D.ϕ 26 × I.D.ϕ 20 (Female Rc3/4)
Outlet port						
Power supply [V] (*2)			Single phase 220	Three phase 200 to 230	Three phase 200 (50Hz / 60Hz) to 220V (60Hz)	Three phase 200 (50Hz / 60Hz) to 220V (60Hz)
Motor [kW]			0.4			0.55
Full load current [A]			2.6 (60Hz)	2.5 (60Hz)	2.4 (200V , 50Hz) 2.8 (200V , 60Hz) 2.7 (220V , 60Hz)	3.5 (200V , 50Hz) 3.1 (200V , 60Hz) 3.2 (220V , 60Hz)
Weight [kg]			12	20	23	33
Dimensions W x D x H [mm]			172 x 266 x 235	315 x 443 x 231	316 x 434 x 231	310 x 523 x 253
Applicable standard			CE,TUV,cTUVus*1			CE,TUV

\*1) DOP-181SB (Single phase 115V) , DOP-181SC (Single phase 200V) , DOP-181SD (Single phase 220V)  
DOP-181SE (Three phase 200 to 200V) are compatible models too.

Scroll Type **DIS series**

A large displacement , compact size scroll type dry vacuum pump.



DIS-252

Model			DIS-90	DIS-252	DIS-501
Maximum pumping speed	[m <sup>3</sup> /h]	50Hz/60Hz	5.4 / 6.48	12 / 14.4	30 / 36
	[L/min]	50Hz/60Hz	90 / 108	200 / 240	500 / 600
	[CFM]	50Hz/60Hz	2.52 / 3.01	7.0 / 8.4	14.0 / 16.8
Ultimate pressure		[Pa]	5.0	1.6	1.0
		[Torr]	3.75 x 10 <sup>-2</sup>	1.2 x 10 <sup>-2</sup>	7.5 x 10 <sup>-3</sup>
		[mbar]	5.0 x 10 <sup>-2</sup>	1.6 x 10 <sup>-2</sup>	1.0 x 10 <sup>-2</sup>
Inlet port			KF25	KF40	
Outlet port			KF16	KF25	
Power supply [V]		Single phase	100 115 200 230		
		Three phase	— 200 208 230 380 400 415 460		
Motor [kW]			0.15	0.4	0.6
Full load current [A]	Single phase	50Hz	2.6 (100V) , 1.3 (200V) 1.6 (230V)	4.8 (100V) , 2.6 (200V) 2.4 (230V)	8.5 (100V) , 4.3 (200V) 3.9 (230V)
		60Hz	2.1 (100V) , 2.2 (115V) 1.1 (200 , 230V)	4.8 (100V) , 4.3 (115V) 2.8 (200V) , 2.4 (230V)	10 (100V) , 8.6 (115V) 4.8 (200V) , 4 (230V)
	Three phase	50Hz	—	1.6 (200V) , 0.9 (380V) 0.9 (400V) , 1 (415V)	2.7 (200V) 1.57 (380V , 400V) 1.63 (415V)
		60Hz	—	1.9 (200V , 208V) 1.8 (230V) , 1 (460V)	2.8 (200V) , 2.6 (208V) 2.5 (230V) , 1.47 (460V)
Weight [kg]			14 (Single phase)	25 (Single phase) 23 (Three phase)	44 (Single phase) 38 (Three phase)
Dimensions W x D x H [mm]			Single phase 214 x 308 x 225	Single phase 264 x 397 x 338 Three phase 264 x 367 x 338	Single phase 290 x 443 x 397 Three phase 292 x 372 x 397
Applicable standard			CE , cTUV		

Vacuum Pump ▶Dry Vacuum Pump

Air cooling Type **CR series**

Air-cooled dry vacuum pump. 4 models from16 to 300m³/hr.



CR60B

- Air-cooled roots-type vacuum pump. Oil is not used inside working chambers. Long-time stable operation is possible because there is no contact between its rotor and cylinder.

Model		CR16B	CR30B	CR60B	CR300B
Maximum Pumping Speed	[m³/h]	16	30	55	300
	[L/min]	280	500	920	5,000
	[CFM]	9.8	17.6	32.4	176
Ultimate pressure (*1)	[Pa]	3			0.5
	[Torr]	$2 \times 10^{-2}$			$4 \times 10^{-3}$
	[mbar]	$3 \times 10^{-2}$			$5 \times 10^{-3}$
Inlet port		KF25		KF40	KF50
Outlet port		KF25		KF40	
Power supply [V] (*2)		1 phase 100 , 1 phase 200 , 3 phase 200		1 phase 200	3 phase 200
Motor rated value [kW]		0.72		1.5	3
Cooling method		Air cooled			
Gas ballast mechanism		Optional Support			
Maximum water vapor tolerance (*3)		< 300 g/h		< 500 g/h	
Weight [kg]		35		48	100
Dimensions W x D x H [mm]		180 x 520 x 350		210 x 550 x 430	280 x 594 x 595
Applicable standard		CE , cTUVus			

- \*1) With OSLM gas ballast gas flow.  
\*2) When requesting for an estimate or ordering, specify power supply and voltage.  
\*3) Maximum value when gas ballast is used. Make sure to use a gas ballast mechanism when pumping down water vapor.

Multi-Stage Roots Type **RDA series**

Dry vacuum pump achieves equivalent performance as oil rotary vacuum pump.



RDA-281HA

- Single phase or three phase power can be used with one model.
- DC Motor is adopted.

Model		RDA-281HA	RDA-501HA
Maximum pumping speed	[m³/h]	16.8	30
	[L/min]	280	500
	[CFM]	9.84	17.6
Ultimate pressure*1	[Pa]	$\leq 8.0 \times 10^{-2}$	
	[Torr]	$\leq 6.0 \times 10^{-4}$	
	[mbar]	$\leq 8.0 \times 10^{-4}$	
Inlet port		KF25	
Outlet port		KF25	
Power supply [V]		Single phase 100 to 115 / 200 to 240 Three phase 200 to 240	
Motor [kW]		0.72 + 0.01 DC Motor	
Full load current [A] Single phase / Three phase		10 (100 to 115V) , 5 (200 to 240V) / 5 (200 to 240V)	
Cooling		Air cooling	
Water Capability [g/h]		$\leq 300$	
Weight [kg]		38	
Dimensions W x D x H [mm]		180 x 520 x 377	
Applicable standard		CE , cTUVus Compatible models*2	

- \*1) Flush. Air Close  
\*2) RDA-281HA (Single phase 100 to 115V , 200 to 240V , Three phase 200 to 240V)  
RDA-501HA (Single phase 100 to 115V , 200 to 240V , Three phase 200 to 240V)

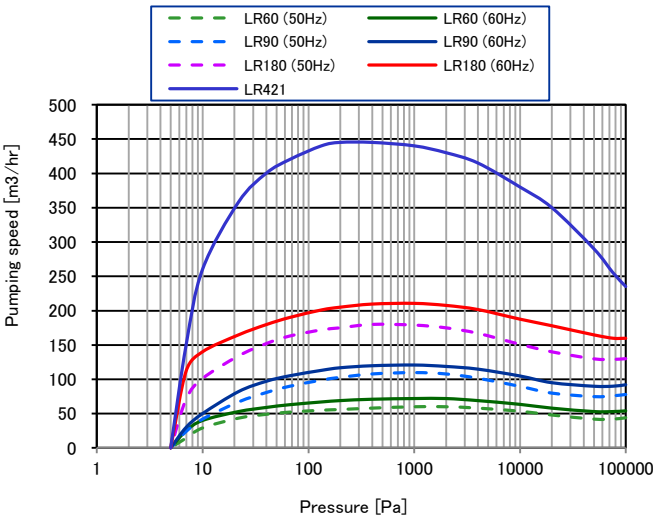
# Vacuum Pump ▶Dry Vacuum Pump

## Roots type LR series

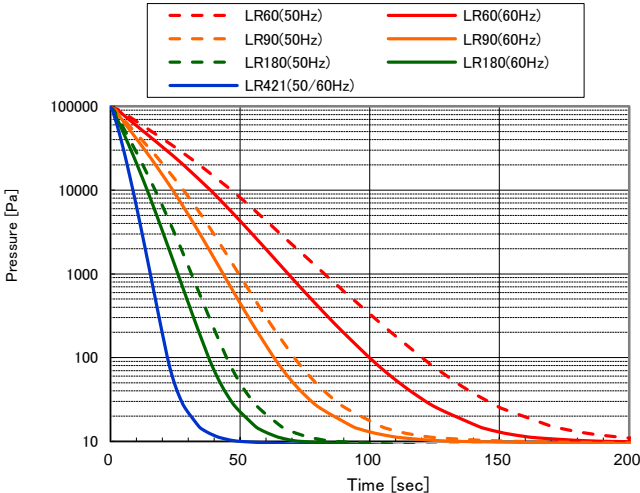
For high speed chamber evacuation.



■ LR60, LR90, LR180, LR421 pumping speed



■ 200L vacuum chamber evacuation time



\*The values herein are calculated values. These may vary in actuality depending on the emission of gas, etc.

- Suitable for high speed evacuation for large vacuum chamber because of high pumping speed at high pressure range is high.
- Special surface processing which has high solidity and excellent corrosion resistant is used for their main parts. This reduces corrosion during pumping of corrosive gases.

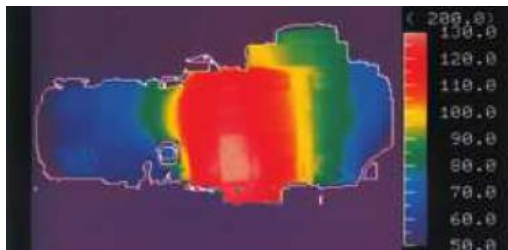
Model			LR60	LR90	LR180	LR421-T	LR300	LR600	LR1200	LR1800	LR3601-R
Maximum pumping speed	[m³/h]	50Hz	62	112	183	440	359	653	1,012	1,701	3,200
		60Hz	80	126	237		365	701	1,051	1,784	
	[L/min]	50Hz	1,030	1,860	3,100	7,333	5,980	10,900	16,900	28,350	53,333
		60Hz	1,333	2,100	3,950		6,080	11,700	17,500	29,700	
	[CFM]	50Hz	36	66	108	259	211	384	596	1001	1,883
		60Hz	47	74	139		215	413	618	1048	
Ultimate pressure [Pa]		[Pa]	5.0				6.7 x 10 <sup>-1</sup>				
		[Torr]	3.7 x 10 <sup>-2</sup>				5 x 10 <sup>-3</sup>				
		[mbar]	5.0 x 10 <sup>-2</sup>				6.7 x 10 <sup>-3</sup>				
Inlet port (optional)			VG50 (KF40)	VG80 (KF50)		VG100	VG80 (KF80)		VG100 (KF100)	VG150	
Outlet port			KF40			VG50	KF40				KF50
Dry pump surface treatment							with				
Mechanical booster pump surface treatment			n/a	n/a	n/a	n/a	with				none
Power supply [VAC] (Hz)		3 phase	200 (50/60) , 220 (60)			180 to 240, 380 to 440 (50/60)	200 (50/60), 220 (60)				180 to 240, 380 to 440 (50/60)
Current (at max. load) [A]			7.0	11.8	20.6	48.5	9.6	19	24.2	39.8	82
Cooling Water Flow Rate [L/min]			>5.0			>4.0	>5.0				>4.0
Nitrogen purge [SLM]		Shaft seal	5								
		Gas ballast	0 to 45								
Weight [kg]			180	245	335	415	251	371	403	553	660
Dimensions [mm]		W	378	428	528	668	378	470		528	668
		D	900	967	1,042	1,106	910	987		1,213	1,111
		H	530	579	645	742	831	951		1,037	1,274

\*) When making a request for an estimate or ordering, notify us about the voltage.

# Vacuum Pump ▶Dry Vacuum Pump

## Roots type HR / UR series

Whole working chambers inside the pump are uniformly kept at high temperature by utilizing excellent aluminium heat conductivity. Most suitable for processes such as CVD and dry etching processes for semiconductor, electronic devices and displays manufacturing, where sublimation gases are generated.



Whole working chambers inside the pump are uniformly kept at high temperature by utilizing excellent aluminum heat conductivity.

### ■ Experience in multi layer film process in liquid crystal low temperature polysilicon CVD production line.

UR series is the best for processes where a large volume of sublimation gases occurs.



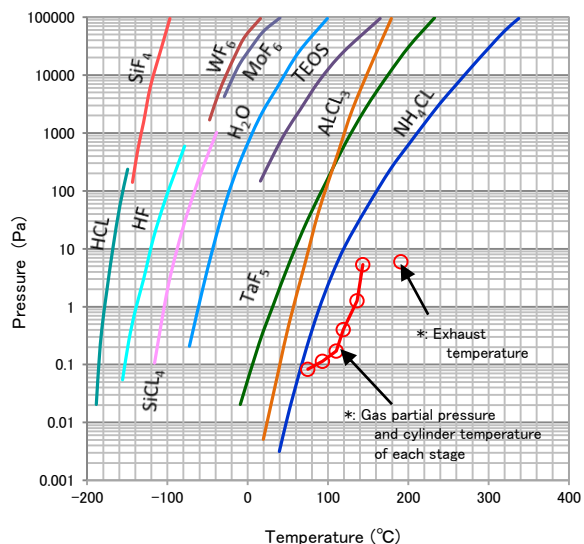
HR series

Stuck by by-product in 3 months.



UR series

After 12 months running, exceedingly a few by-products are found but the pump could still run.



• The left side of each curved line of the steam pressure indicates a solid (liquid) state while the right side indicates a gas state.  
\*) An example of process gas evacuation by HR series.

- High temperature uniformity makes it possible to exhaust reactive gases (sublimation gases) generated in CVD, etching, etc. in gas state, and to restrain from being in solid state.
- Special surface processing which has high solidity and excellent in corrosion resistance is used for their main parts. This reduces corrosion during corrosive gas evacuation.

Model			HR60	HR90	UR421-T	HR300	HR600	UR600	HR1200	UR1200	UR1800	UR3601-TT	
Maximum pumping speed	[m <sup>3</sup> /h]	50Hz	62	112	410	359	653	653	1,012	1,012	1,701	2,700	
		60Hz	80	126		365	701		1,051				
	[L/min]	50Hz	1,030	1,860	6,833	5,980	10,900	10,883	16,900	16,867	28,350	45,000	
		60Hz	1,333	2,100		6,080	11,700		17,500				
	[CFM]	50Hz	36	66	242	211	384	384	596	596	1,001	1,589	
		60Hz	47	74		215	413		618				
Ultimate pressure   (*1)		[Pa]	5.0		10	6.7 x 10 <sup>-1</sup>		1.2	6.7 x 10 <sup>-1</sup>		1.2	6.7 x 10 <sup>-1</sup>	
		[Torr]	3.7 x 10 <sup>-2</sup>		0.08	5.0 x 10 <sup>-3</sup>		0.01	5.0 x 10 <sup>-3</sup>		0.01	5.0 x 10 <sup>-3</sup>	
		[mbar]	5.0 x 10 <sup>-2</sup>		0.1	6.7 x 10 <sup>-3</sup>		0.01	6.7 x 10 <sup>-3</sup>		0.01	6.7 x 10 <sup>-3</sup>	
Inlet port   (optional)			VG50 (KF40)	VG80 (KF50)	VG100	VG80 (KF80)			VG100 (KF100)		VG150		
Outlet port			KF40		VG50	KF40						KF50	
Dry pump surface treatment			with										
Mechanical booster pump surface treatment			with										
Power supply [VAC]   (Hz)		3 phase	200 (50/60) , 220 (60)			200 (50/60) , 220 (60)						180 to 240 (50/60), 380 to 440 (50/60)	
Current   (at max. load) [A]			7.3	11.8	52.5	8.1	13.8	17.3	18.9	22.4	34.9	68.3	
Cooling Water Flow Rate [L/min]			>5.0									> 4.0	
Nitrogen purge [SLM]		Shaft seal	5										
		Gas ballast	0 to 45		0 to 195	0 to 45						0 to 195	
Operation mode			3										
Weight [kg]			180	245	415	251	371		403		545	720	
Dimensions [mm]		W	378	428	668	378	470				528	668	
		D	900	967	1,106	910	987 (UR:1054)				1,213	1,159	
		H	530	579	742	831	951				1,037	1,274	
Applicable standard			CE (Option)										

\*) When making a request for estimation/when ordering, please notify us about the voltage used. \* The HR and UR series include the exhaust piping heater.

\*) Please do not carry out continuous operation for the HR300, HR600, HR1200, UR600, UR1200, UR1800 and UR3601 at a pressure above 200Pa. There may be a case where the pump temperature may become abnormal and the interlock may activate. \*) 1 Values only when flowing 5SLM shaft seal gas for HR series. The value when flowing 5SLM gas ballast gas for UR series.



# Vacuum Pump ▶Dry Vacuum Pump

## Screw type LS series

Dry Pump which has both high pumping speed and low power consumption.

Enable to select suitable pump from 4 different pumping speed model depending on the use condition.



LS120A

### •High pumping speed

High pumping speed at near atmospheric pressure, and pumping down time can be drastically reduced

### •Low power consumption

ECO-SHOCK technology realizes low power consumption (C Type)  
Power consumption at the ultimate pressure is the industry-leading 0.6kW or less(LS120A-C)

### •Low noise

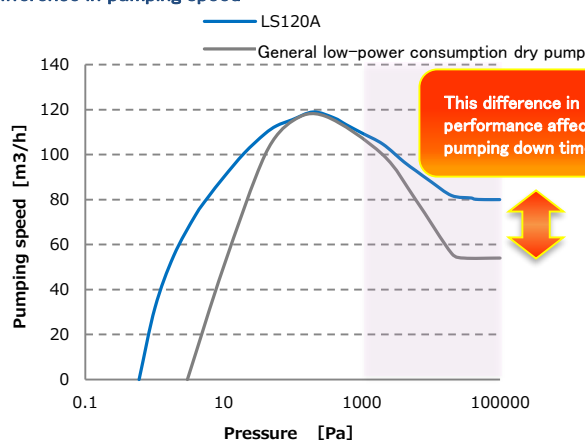
Built-in silencer achieves the noise level 61dB(A) or less

### •Low running-cost

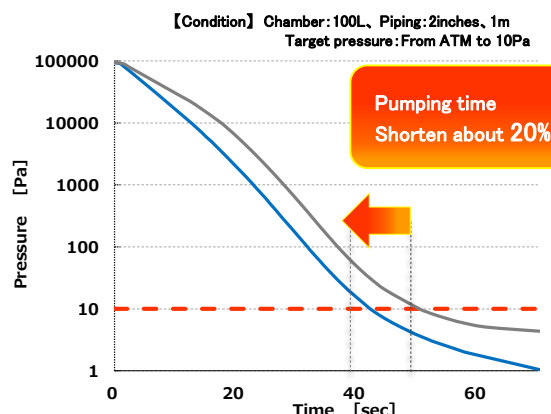
No shaft sealing gas

※Purge gas is available with L Type.

### •Difference in pumping speed



### •Influence on pumping down time



This data is a calculated value. It may differ from the actual condition under the influence of the discharge Gas etc.

### •2 types for specific application

#### C Type: Clean process (LS\*\*\*A-C)

Feature: Low power consumption model (with built-in ECO-SHOCK)

Applications: For clean process such as air and N<sub>2</sub>

Sputtering/Vapor deposition/Lamination/Load lock/  
TMP backing pump etc.

#### L Type: Light process (LS\*\*\*A-L)

Features: Light process model (with surface treatment and purge function)

Applications: For light process such as steam and volatile liquid medicine

Vacuum drying/Freeze drying/Ashing/  
General industrial use etc.

Model		(C: C Type) (L: L Type)		LS120A		LS300A		LS600A		LS1200A	
				C	L	C	L	C	L	C	L
Max.pumping speed		m <sup>3</sup> /h	120		380		600		1000		
		L/min	2000		6333		10000		16666		
		CFM	71		223		353		588		
Ultimate pressure		Pa	0.6				0.1				
		Torr	0.005				0.0008				
		mbar	0.006				0.001				
Power supply		200V Class: 3Phase,50/60Hz,AC200~240V or 400V Class: 3Phase,50/60Hz,AC380~480V									
Power consumption * 1		kW	0.6	2.0	1.0	2.5	1.3	2.6	1.3	2.7	
Cooling water flow rate		L/min	>2.0				>4.0				
Purge gas flow rate * 2		SLM	-	0~50	-	0~50	-	0~50	-	0~50	
Max.water vapor tolerance * 3		kg/h	-	1.5	-	1.5	-	1.5	-	1.5	
Noise		dB(A)	61		61		62		64		
Inlet port		KF50(Horizontal)／VG50(Vertical)		ISO-F-80		ISO-F-80		ISO-F-100			
Outlet port		KF40									
Dimension	W × D × H	mm	311 × 639 × 307		311 × 639 × 537		311 × 639 × 563		311 × 639 × 563		
Weight		kg	142		220		242		266		
Applicable standard		CE, cTUVus									
Standard accessory		Instruction manual(CD-R)、Power connector, Waterproof cable clamp, Remote connector, Guard for power connector									
Pump head option		Power supply: 200V Class or 400V Class, Material of seal : FFKM(L type only)									
External option		MBP inlet flange adaptor, Package Exhaust port, Earthquake-proof Bracket, LR compatible Unit(Inlet, Remote), Purge gas valve									

\*1: At ultimate pressure (reference only)

\*3: Max.water vapor tolerance is a value when purge gas is used.

\*2: Purge gas is not available with C Type.

\*4: C type is not leak less.

Screw type MS series

MS series is a vacuum pump which is categorized as screw type dry vacuum pump. Corrosion resistance and powder exhaust are improved as process resistance model based on traditional LS series. This model is designed for the process of using corrosion gas and powder exhausting.



MS120A

- **High corrosion resistance**  
Applying special surface treatment , corrosion resistance is equivalent to SUS.
- **High powder exhausting**  
Unique screw design is applied.
- **High motive power**  
Applying ULVAC design high motive power motor. 6 times higher motive power than traditional model(LS120).  
Showing power at rebooting after powder exhausting
- **Continuous exhausting in all pressure**  
Realize Continuous running in all pressure from atmosphere to ultimate.

Model			MS120A	MS600A	MS1200A
Max.pumping speed	m <sup>3</sup> /h		115	560	980
	L/min		1917	9333	16333
	CFM		68	331	580
Ultimate pressure	Pa		0.6	0.1	
	Torr		0.005	0.0008	
	mbar		0.006	0.001	
Power supply			200V Class:3Phase,50/60Hz,AC200-240V±10% or 400V Class:3Phase,50/60Hz,AC380-480V±10%		
Power consumption * 1	kW		2.4	3.1	3.1
Cooling water flow rate	L/min		>4.0		
Purge gas flow rate	SLM		0~50		
Max.water vapor tolerance * 2	kg/h		1.5		
Noise	dB(A)		61	62	64
Inlet port			KF50(Horizontal)／VG50(Vertical)	ISO-F-80	ISO-F-100
Outlet port			KF40		
Dimension	W×D×H	mm	311×945×536	311×945×563	311×945×563
Weight		kg	139	241	264
Applicable standard			CE, cTUVus		
Standard accessory			Quick manual, Power connector, Waterproof cable clamp , Remote connector, Guard for power connector, Silencer		
Pump head option			Power supply: 200V Class or 400V Class, Material of seal: FKM or FFKM		
External option			Package Exhaust port, Earthquake-proof Bracket, LR compatible Unit(Inlet, Remote), Purge gas valve		

\* 1 : At ultimate pressure (reference only)  
\* 3 : Max.water vapor tolerance is a value when purge gas is used.

# Vacuum Pump ▶ Dry Vacuum Pump

## Roots type with General-purpose Motor GR series

Simplified designed for general industrial applications based on long time experience of the LR series.



GR90A

- Multi-voltage motor.
- General-purpose induction motor. Special motor such as explosion-proof motor is available (RFQ).

Model			GR60A	GR90A	GR180A
Maximum pumping speed	[m <sup>3</sup> /h]	50Hz/60Hz	62 / 80	112 / 126	183 / 237
	[L/min]	50Hz/60Hz	1,030 / 1,333	1860 / 2100	3100 / 3950
	[CFM]	50Hz/60Hz	36.4 / 47.1	65.7 / 74.2	109.5 / 139.5
Ultimate pressure (*1)	[Pa]		5.0		
	[Torr]		3.7 x 10 <sup>-2</sup>		
	[mbar]		5.0 x 10 <sup>-2</sup>		
Inlet port (optional)			VG50 (ISO63F)		VG80 (ISO80F)
Outlet port			KF40		
Power supply (*2)	50Hz		Multi voltage motor : AC200 to 240V / AC380 to 415V		
	60Hz		Multi voltage motor : AC200 to 240V / AC380 to 460V		
Motor rated value [kW]			2.2	3.7	7.5
Cooling water flow rate [L/min]			> 5.0		
Nitrogen gas [SLM]	Shaft seal		5 (*3)		
	Gas ballast		Optional		
Weight [kg]			128	188	268
Maximum water vapor tolerance (*4)			< 500 g/h	< 1,000 g/h	< 3,000 g/h
External dimensions W x D x H [mm]			320 x 1000 x 442	380 x 1100 x 495	470 x 1300 x 582

\*1) With 5SLM shaft seal gas flow. \*2) When requesting for an estimate or ordering, specify power supply and voltage. \*3) Nitrogen gas (shaft seal) is constant at 5SLM. \*4) Maximum value when gas ballast is used. Make sure to use a gas ballast mechanism when pumping down water vapor.

## Silencer for Dry Vacuum Pumps RS series



RS-01

RS-02

RS-03

Model	Applicable pump model	Accessories			
		Clamp	Outer ring	Connection piping	Stay
RS-01 kit A	CR60B, LR60, 90, 300, GR60A, 90A	1	1	n/a	n/a
RS-01 kit B	LR600, 1200	2	2	1	1
RS-01 kit C	CR300B, GR180A	2	2	1	1
RS-01 kit D	CR16B, 30B	1	1	1	n/a
RS-02 kit A	LR180, (LR60, 90, 300)	2	2	1	1
RS-02 kit B	LR1800, (LR600, 1200)	2	2	1	1
RS-03 kit A	LR421(-T)	1	1	1	1
RS-03 kit B	LR3601(-T/TT/R/TR/TTR)	3	3	1	1
EFS-11-NW25/2/2516 (*1)	CR16B, 30B	1	1	n/a	n/a
EFS-19-NW40/1 (*1) (*2)	CR60B, 300B	1	1	n/a	n/a

\*1) Do not use for harmful gas. \*2) Open type which is not connectable to rearward piping.



Power Saving Attachment for Dry Vacuum Pump **ECO-SHOCK**

An attachment which reduces electrical power consumption by connecting to dry vacuum pumps.

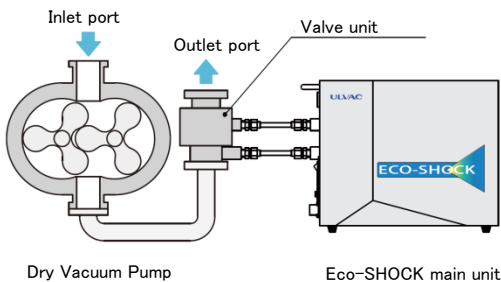
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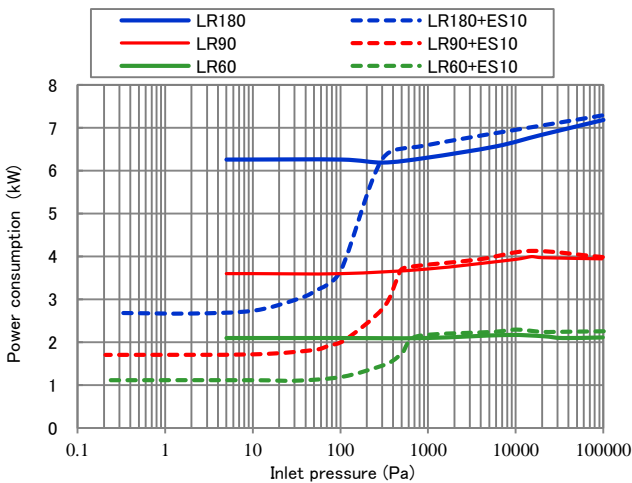
ES4A

- Electrical power consumption can be reduced by connecting to dry vacuum pumps. It is possible to connect to any dry vacuum pump which there is not any problem to reduce pressure at its outlet port.
- Select the ES4A for frequently repetitive pumping down of large vacuum chamber and the pumps with an high pumping speed near atmospheric pressure.
- \* Note: Do not use for any application where pump takes combustible, burnable and toxic gases, etc. and solid materials and liquids.

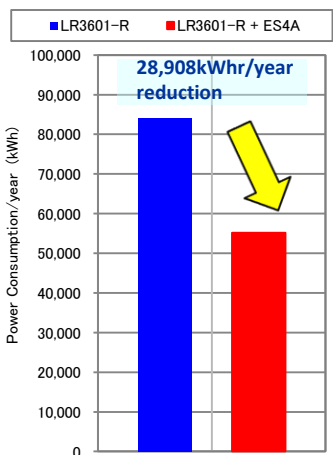
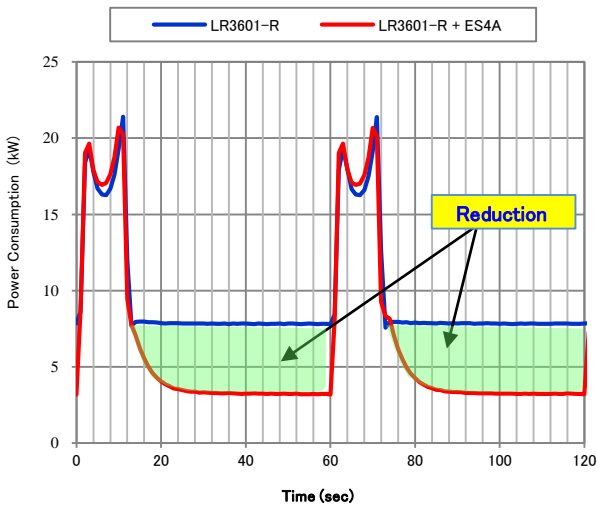
How to connect the ECO-SHOCK



Electric power reduction efficiency of the ECO-SHOCK ES10



Electrical power consumption effect  
300L chamber repeat pumping down by 60 sec tact time.  
Dry vacuum pump LR3601-R + ECO-SHOCK ES4A



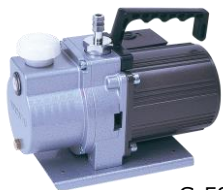
Model		ES10	ES4A
Power Supply	Specifications	Single phase AC100 to 220V (±5%) 50/60Hz	Single phase AC200 to 220V (±5%) 50/60Hz
	Maximum apparent power [VA]	250	600
	Consumed electrical power [W]	65	400
External dimensions W x D x H	Main unit [mm]	175 x 330 x 240	250 x 515 x 373 (250 x 515 x 378) (*1)
	Valve unit [mm]	dia. 66 x 110 (KF40)	Not included (Optional)
Connection port		3/8 inch tube connector	16mm tube connector

\* The valve unit is not included in the ES4A and sold separately. Select it in conformity with the pump to be connected.

# Vacuum Pump ▶ Oil Rotary Vacuum Pump

## Single Stage Oil Rotary Vane type G series

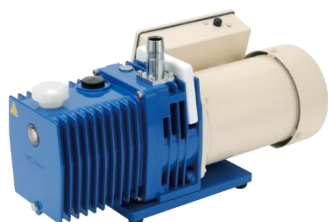
High performance, low noise, low vibration directly connected oil rotary vacuum pump.



G-5SA



G-25SA



G-101S

- This pump has many achievements. Inexpensive vacuum pump.
- Small and easy to carry. Suitable for embedding in equipment.
- These vacuum pumps are safe because they have built-in manual reset thermal protectors.

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve

Model		G-5SA	G-25SA	G-50SA	G-101S
Maximum pumping speed [m <sup>3</sup> /h] (L/min/CFM)	50Hz	0.3 (5/0.175)	1.20 (20/0.7)	3.0 (50/1.75)	6.0 (100/3.5)
	60Hz	0.36 (6/0.21)	1.44 (24/0.84)	3.6 (60/2.1)	7.2 (120/4.2)
Ultimate pressure [Pa](Torr/mbar)	GP	100 (0.75/1)	9.3 (7.0x10 <sup>-3</sup> /9.3x10 <sup>-3</sup> )	9.3 (7.0x10 <sup>-3</sup> /9.3x10 <sup>-3</sup> )	9.3 (7.0x10 <sup>-3</sup> /9.3x10 <sup>-3</sup> )
	Close				
Motor	Output [kW](Poles)	0.04 (4)	0.1 (4)	0.2 (4)	0.4 (4)
	Voltage [V]	50Hz	Single phase 100	Single phase 100 200	Single phase 100 200
		60Hz	220 to 230	220 to 230	220 to 230
	Full load current [A]	50Hz	0.92 (100V)	3.7 (100V)	5.6 (100V)
		60Hz	0.73 (100V)	3.0 (100V)	4.8 (100V)
Oil		SMR-100			
Oil capacity [L]		0.23	0.23	0.36	1.2
Cooling		Air cooled			
Inlet port		O.D.φ12 × I.Dφ6	O.D.φ12 × I.Dφ6	O.D.φ12 × I.Dφ6	O.D.φ12 × I.Dφ6
Outlet port		Exhaust cap (G3/4)			Exhaust cap (G1)
Weight [kg]		4.5	8.5	11.0	22.3
Dimensions W x D x H [mm]		130 × 203 × 159.5	156 × 284 × 199.5	156 × 341 × 199.5	234 × 500.5 × 264
Applicable standard		-	-	-	-

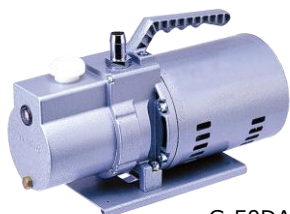
※ Select the motor voltage specification from among several specifications.

## Two Stage Oil Rotary Vane type G series

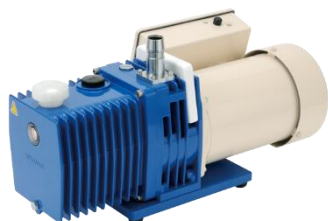
High performance, low noise, low vibration directly connected oil rotary vacuum pump.



G-10DA



G-50DA



G-101D

- This pump has many achievements. Inexpensive vacuum pump.
- Small and easy to carry. Suitable for embedding in equipment.
- These vacuum pumps are safe because they have built-in manual reset thermal protectors.

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve

Model		G-5DA	G-10DA	G-20DA	G-50DA	G-101D
Maximum pumping speed [m <sup>3</sup> /h] (L/min/CFM)	50Hz	0.3 (5/0.175)	0.60 (10/0.35)	1.20 (20/0.7)	3.0 (50/1.75)	6.0 (100/3.5)
	60Hz	0.36 (6/0.21)	0.72 (12/0.42)	1.44 (24/0.84)	3.6 (60/2.1)	7.2 (120/4.2)
Ultimate pressure [Pa](Torr/mbar)	GP	6.7 (5.0x10 <sup>-2</sup> /6.7x10 <sup>-2</sup> )	1.3 (9.8x10 <sup>-3</sup> /1.3x10 <sup>-2</sup> )	1.3 (9.8x10 <sup>-3</sup> /1.3x10 <sup>-2</sup> )	1.3 (9.8x10 <sup>-3</sup> /1.3x10 <sup>-2</sup> )	0.67 (5.0x10 <sup>-3</sup> /6.7x10 <sup>-3</sup> )
	Close					
Motor	Output [kW](Poles)	0.04 (4)	0.06 (4)	0.1 (4)	0.2 (4)	0.4 (4)
	Voltage [V]	50Hz	Single phase 100 115	Single phase 100 200	Single phase 100 200	Single phase 100 200
		60Hz	220	220 to 230	220 to 230	220 to 230
	Full load current [A]	50Hz	0.92 (100V)	1.38 (100V)	3.7 (100V)	5.6 (100V)
		60Hz	0.73 (100V)	1.22 (100V)	3.0 (100V)	4.8 (100V)
Oil		SMR-100				
Oil capacity [L]		0.18	0.25	0.18	0.26	0.8
Cooling		Air cooled				
Inlet port		O.D.φ12×I.Dφ6	O.D.φ18×I.Dφ14	O.D.φ18×I.Dφ14	O.D.φ18×I.Dφ14	O.D.φ27×I.Dφ20
Outlet port		Exhaust cap (G3/4)				Exhaust cap (G1)
Weight [kg]		5.0	5.5	9.0	11.0	23.1
Dimensions W x D x H [mm]		130×203×159.5	130×228×165	156×295.5×199.5	156×341×199.5	234×500.5×264
Applicable standard		-	-	-	-	-

※ Select the motor voltage specification from among several specifications.

Vacuum Pump ▶Oil Rotary Vacuum Pump

Two Stage Oil Rotary Vane type GLD series

High performance, low noise, low vibration directly connected oil rotary vacuum pump.



GLD-137CC

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve

- The exhaust speed is stable due to the installation of the forced oil supply mechanism.
- The backflow prevention mechanism prevents oil from flowing back to the vacuum chamber when it is stopped due to a power failure.

Model		GLS-051		GLD-051		GLD-040	
Maximum pumping speed [m³/h] (L/min/CFM)	50Hz	3.0 (50/1.75)				2.4 (40/1.4)	
	60Hz	3.6 (60/2.1)				2.88 (48/1.68)	
Ultimate pressure [Pa] (Torr/mbar)		9.3 (7.0x 10 <sup>-2</sup> /9.3x 10 <sup>-2</sup> )		6.7 x 10 <sup>-1</sup> (5.0x 10 <sup>-3</sup> /6.7x 10 <sup>-3</sup> ) GP Close			
Motor	Output [kW](Poles)		0.2 (4)				
	Voltage [V]	50Hz	Single phase 100 200 220 to 230		Single phase 100 200 220-230 Three phase 200-240 / 380-460		Single phase 100 to 120 / 200 to 240
		60Hz					
	Full load current [A]	50Hz	5.6 (100V)			4.2 (100V) / 4.4 (110V) 4.6 (115V) / 5.05 (120V) 2.1 (200V) / 2.2 (220V) 2.3 (230V) / 2.6 (240V)	
		60Hz	4.8 (100V)			3.6 (100V) 4.2 / 3.4 (110V) 3.4 (115V) / 3.6 (120V) 1.8 (200V) / 1.7 (220V) 1.7 (230V) / 1.8 (240V)	
Oil		SMR-100					R-2
Oil capacity [L]		0.4 ~ 0.7		0.5 ~ 0.8		0.55 ~ 0.8	
Cooling		Air cooled					
Inlet port		KF25					
Outlet port		Exhaust cap (G3/4)					
Weight [kg]		12.9		13.9		16	
Dimensions W x D x H [mm]		165.5 x 361 x 222.5		165.5 x 395 x 222.5		150 x 427 x 227.5	
Applicable standard		-		-		CE, TUV, cTUVus	

Model			GLD-137AA		GLD-137CC		GLD-202AA		GLD-202BB		GLD-280A	
Maximum pumping speed[m³/h] (L/min/CFM)		50Hz	8.1 (135/4.725)				12 (200/7.0)				16.8 (280/9.8)	
		60Hz	9.72 (162/5.67)				14.4 (240/8.4)				20.2 (336/11.76)	
Ultimate pressure [Pa] (Torr/mbar)			6.7 x 10 <sup>-1</sup> (5.0x 10 <sup>-3</sup> /6.7x 10 <sup>-3</sup> ) GP Close									
Moto	Output [kW](Poles)		0.4 (4)		0.4 (4)		0.55 (4)		0.55 (4)		0.75 (4)	
	Voltage [V]	50Hz	Three phase		Single phase		Three phase		Single phase		Three phase	
		60Hz	200 to 240 / 380 to 460		100 to 120 / 200 to 240		200 to 240 / 380 to 460		100 to 120 / 200 to 240		200 to 240 / 380 to 460	
	Full load current [A]	50Hz	2.1 (200V) / 2.2 (220V)		6.8 (100 ~ 120V)		2.9 (200V) / 3.1 (220V)		8.2 (100 ~ 120V)		3.6 (200V) / 3.8 (220V)	
			2.3 (230V) / 2.5 (240V)		3.5 (200 ~ 240V)		3.3 (230V) / 3.6 (240V)		4.1 (200 ~ 240V)		4.0 (230V) / 4.2 (240V)	
		1.3 (380V) / 1.3 (400V)		1.8 (380V) / 1.9 (400V)		2.2 (380V) / 2.2 (400V)		2.4 (415V)		2.2 (380V) / 2.2 (400V)		
60Hz		1.4 (415V)		2.0 (415V)		2.0 (415V)		2.4 (415V)		2.4 (415V)		
	2.0 (200V) / 1.9 (220V)		5.8 (100 ~ 120V)		2.7 (200V) / 2.6 (220V)		7.9 (100 ~ 120V)		3.2 (200V) / 3.2 (220V)			
	1.9 (230V) / 2.0 (240V)		2.9 (200 ~ 240V)		2.7 (230V) / 2.7 (240V)		3.9 (200 ~ 240V)		3.2 (230V) / 3.3 (240V)			
		1.1 (380V) / 1.1 (400V)		1.5 (380V) / 1.6 (400V)		1.5 (380V) / 1.6 (400V)		1.8 (380V) / 1.9 (400V)		1.8 (380V) / 1.9 (400V)		
		1.15 (440V) / 1.2 (460V)		1.6 (440V) / 1.7 (460V)		1.6 (440V) / 1.7 (460V)		2.0 (440V) / 2.1 (460V)		2.0 (440V) / 2.1 (460V)		
Oil			SMR-100								ULVOIL R-72	
Oil capacity [L]			1.0				1.1				0.7 ~ 1.1	
Cooling			Air cooled									
Inlet port			KF25									
Outlet port			Exhaust cap (G1)									
Weight [kg]			26		29		29		31		34.5	
Dimensions W x D x H [mm]			170 x 485.5 x 240		170 x 487.5 x 249.5		170 x 513.5 x 240		170 x 515.5 x 249.5		181 x 536 x 269	
Applicable standard			CE , TUV		CE , TUV , cTUVus		CE , TUV		CE , TUV , cTUVus		CE , TUV	

Two Stage Oil Rotary Vane type GHD series

Oil rotary vacuum pump with magnet coupling structure.



GHD-031A

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve

- Wide range voltage motor and correspond to CE, cTUVus.
- Integrated check valve below the inlet port for backflow prevention.

Model			GHD-031B	GHD-101D
Maximum pumping speed [m³/h] (L/min/CFM)	50Hz		1.8 (30/1.05)	6 (100/3.53)
	60Hz		2.16 (36/1.26)	7.2 (120/4.24)
Ultimate pressure [Pa](Torr/mbar)		GP Close	6.7 x 10 <sup>-1</sup> (5.0 x 10 <sup>-3</sup> /6.7 x 10 <sup>-3</sup> )	
Motor	Output [kW](Poles)		0.1 (2)	0.3 (2)
	Voltage [V]	50Hz	Single phase 200 to 240	Single phase 220 to 240
		60Hz		
	Full load current [A]	50Hz	0.94 (200V) / 0.84 (240V)	2.5
60Hz		1.02 (200V) / 1.03 (240V)	2.7	
Oil			ULVOIL R-2	
Oil capacity [L]			0.37	1.0
Cooling			Air cooled	
Inlet port			KF16	KF25
Outlet port			Exhaust cap (G3/4)	Exhaust cap (G1)
Weight [kg]			9.3	22
Dimensions W x D x H [mm]			120 x 288.5 x 163	150 x 413.5 x 234.5
Applicable standard			CE , TUV , cTUVus <sup>*1</sup>	

<sup>\*1</sup>) GHD-031B (200 to 240V) , GHD-101B (115 to 120V) , GHD-101C (200V) , GHD-101D (220 to 240V) are compatible models too.  
※All single phase

# Vacuum Pump ▶Oil Rotary Vacuum Pump

## Two Stage Oil Rotary Vane type GCD series

A chemical type oil rotary vacuum pump with surface treatment on the gas contact part.

- Wide range voltage motor adopted.
- Connectable to Oil Filtration Device



GCD-136X

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve

Model		GCD-051X		GCD-136X		GCD-201X		
Maximum pumping speed [m³/h] (L/min/CFM)		50Hz	3 (50/1.75)	8.1 (135/4.73)		12 (200/7)		
		60Hz	3.6 (60/2.1)	9.72 (162/5.67)		14.4 (240/8.4)		
Ultimate pressure [Pa](Torr/mbar)	GP Close		6.7 x 10 <sup>-1</sup> (5.0 x 10 <sup>-3</sup> /6.7 x 10 <sup>-3</sup> )					
Motor	Output [kW](Poles)		0.2 (4)		0.4 (4)		0.7 (4)	
	Voltage [V]	50Hz	Single phase 220 to 230		Single phase 220		Single phase 220	
		60Hz						
	Full load current [A]	50Hz	2.4 (100V) / 2.5(230V)		3.6		3.6	
		60Hz	2.0 (220V) / 2.0(230V)		2.8		3.3	
	Oil			SO-M				
Oil capacity [L]			0.5 to 0.8		1.0		1.1	
Cooling			Air cooled					
Inlet port			KF25					
Outlet port			KF25					
Weight [kg]			14.1		25.4		26.6	
Dimensions W x D x H [mm]			165.5 x 419 x 222.7		170 x 493 x 241.1		170 x 509.5 x 241.1	
Applicable standard			—					

Vacuum Pump ▶Oil Rotary Vacuum Pump

Double Stage Rotary Vane type **VD series Ver. C**

With high efficiency (IE3) full multi-voltage motor developed by ULVAC. For various kinds of application.



VD90C



Original  
IE3 Motor

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water Cooling
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve
Option	
Type. F: Fluorine Oil	
Type. N: NBR(Nitrile rubber)	
Type. B: Silicon&Nitrile rubber	
Type. H: Helium tight	

- Single kind high efficient (IE3) full multi-voltage covers wide range voltage from 200 to 240V / 380 to 460V.
- Forced oil circulation makes pumping performance stable even near atmospheric pressure. Suitable for repetitive and consecutive operation between atmospheric and vacuum.
- Various specification , F , N , B and H are available in addition to standard model.

Model		VD30C	VD40C	VD60C	VD90C
Designed pumping speed [m³/h] (LPM / CFM)	50Hz	30 (500 / 17.7)	40 (670 / 23.5)	60 (1,000 / 35.3)	90 (1,500 / 53)
	60Hz	36 (600 / 21.3)	48 (800 / 28.3)	72 (1,200 / 42.4)	108 (1,800 / 63.6)
Ultimate pressure [Pa] (Torr / mbar)	Gas ballast port closed	0.67 (5 x 10 <sup>-3</sup> / 6.7 x 10 <sup>-3</sup> )			
Motor	Output [kW] (Poles)	1.5 (4)	1.5 (4)	2.2 (4)	3.7 (4)
	Voltage [V]	50Hz	200 to 240 / 380 to 415 (Multi-Voltage Motor)		
		60Hz	200 to 240 / 380 to 460 (Multi-Voltage Motor)		
Standard Oil		ULVOIL R-72			
Oil capacity [L]		1.0 to 2.5		2.5 to 4.0	
Cooling method		Air cooled			
Inlet port (optional)		VG40 (KF40)		VG50 (KF50 or ISO63F)	
Outlet port (optional)		VG40 (KF40)			
Weight [kg]		58	60	90	113
Dimensions W x D x H [mm]		210 x 660 x 324	210 x 680 x 324	280 x 761 x 371	280 x 831 x 371
Applicable standard		CE, cTUVus			
Type F		○	○	○	○
Type N		○	○	n/a	n/a
Type B		○	○	n/a	n/a
Type H		○	○	○	○

Type	Target model	Spec	Remarks
F	VD series	J60F (Fluorine Oil)	Flammable Gas Countermeasures. Countermeasures against oil degradation by oxidizing gases.
N	VD series	NBR (Nitrile rubber)	When evacuating gases or solvents that FKM ( fluorine rubber ) is not resistant to.
K	PVD series PKS series	FKM (Fluorine rubber)	When the pump is used at high-temperature. For continuous vacuum evacuation at high pressure.
B	VD series	Silicone rubber + NBR (Nitrile rubber) Structure to put new oil into oil seal. Surface treatment to rotor shaft.	Brake fluid filling process.
R	VS1501 / VS2401 PKS series	Cooling water pipe : SUS	Cooling water pipe for corrosion prevention.
H	VD series PVD series PKS series	He leak test. Structure to put new oil into oil seal.	Countermeasures to Flammable Gases. Helium tight.
Z	PVD series	Large Oil Tank.	Increase the amount of oil and extend the oil change cycle.

Vacuum Pump

Vacuum Valve

Vacuum Gauge

Process Gas Monitor

Leak Detector

Power Supply  
(V/Hz)

EB Power Supply / EB Source

Deposition Controller

Thin Film  
Measurement

Accessories

Vacuum  
Transfer Robot

Cryogenic  
Equipment

Vacuum Pump ▶Oil Rotary Vacuum Pump

Single Stage Oil Rotary Vane type VS1501／VS2401

Lower ultimate pressure even it is single stage oil rotary vane pump.



VS2401

- Main applications:
- Evaporation, sputtering system
  - Vacuum absorption, transportation, moulding
  - Vacuum impregnation, casting
  - Vacuum drying, freeze drying
  - Leak test system

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve
Option	
Type. R. Anti-rust cooling water system	

- High efficiency multi voltage motor (IE-3) which enable to use 200-240 / 380-460 V.
- Lower vibration structure compared with Rotary plunger model. Suitable when installing at upper floor.
- Forced oil circulation makes pumping performance stable even near atmospheric pressure. Suitable for repetitive and consecutive operation between atmospheric and vacuum.

Model			VS1501	VS2401
Designed pumping speed [m³/h] (LPM / CFM)		50Hz	150 (2,500 / 88.2)	240 (4,000 / 141.2)
		60Hz	180 (3,000 / 105.9)	288 (4,800 / 169.4)
Ultimate pressure [Pa] (Torr / mbar)	Gas ballast port closed		5.3 (3.9x10 <sup>-2</sup> / 5.3x10 <sup>-2</sup> )	
	Output [kW] (Poles)		5.5 (4)	7.5 (4)
Motor	Voltage [V]	50Hz	200 to 240 / 380 to 415 (Multi-Voltage Motor)	
		60Hz	200 to 240 / 380 to 460 (Multi-Voltage Motor)	
Oil			ULVOIL R-72	
Oil capacity [L]			8.0 to 10.5	
Cooling method			Water cooled	
Inlet port (optional)			VG80 (ISO80F)	
Outlet port (optional)			VG50 (KF50 or ISO63F)	
Weight [kg]			232	271
Dimensions W x D x H [mm]			333 x 941 x 460	333 x 1061 x 460

Single Stage Oil Rotary Vane type VS300A-W

VS300A-W is classified as a single stage oil rotary vane pump.  
Smallest footprint in the class and allows the direct mounting of Mechanical booster pump.



VS300A-W



PMB1200D  
+ VS300A-W

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve

- Main applications:
- Evaporation, sputtering system
  - Vacuum Heat treatment furnace systems
  - Vacuum drying
  - Leak test system

- Smallest footprint in the class : Compact design of 874 × 404mm.
- Mechanical booster pump allowed to be directly mounted : MBP mount kit allows a direct mounting without frame.
- Built-in oil mist separator : Oil mist separator is build-in in standard.

Model			VS300A-W
Designed pumping speed [m³/h] (LPM / CFM)		50Hz	250 (4,166 / 147.0)
		60Hz	300 (5,000 / 176.5)
Ultimate pressure [Pa] (Torr / mbar)	Gas ballast port closed		15 (1.1x10 <sup>-1</sup> / 1.5x10 <sup>-1</sup> )
Motor	Output [kW] (Poles)		7.5 (4)
	Voltage [V]	50Hz	200 to 240 / 380 to 415 (Multi-Voltage Motor)
		60Hz	200 to 240 / 380 to 460 (Multi-Voltage Motor)
	Oil		
Oil capacity [L]			10.0 to 15.0
Cooling method			Water cooled
Inlet port (optional)			DN 63 ISO-F
Outlet port (optional)			G2
Weight [kg]			270
Dimensions W x D x H [mm]			404 x 871 x 585
Overseas safety standards			CE, cTUVus



Vacuum Pump ▶Oil Rotary Vacuum Pump

Large Size Single Stage Oil Rotary Vane VS650B / VS750B

Large size and low vibration single stage oil rotary vane pump.



VS650B-A



PMB2400D+VS650B-W

- Selectable from air and water cooled type. Oil cooler is used for oil temperature cooling for a air cooled model.
- Equipped with a cartridge-type oil mist filter inside the oil tank.
- VS650B-WL: Low noise (72dB) pumps has been added to the lineup.

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve

- Main applications:
- Evaporation, sputtering system
  - Vacuum furnace
  - Leak test system
  - Large vacuum chamber evacuation.

Model		VS650B-A	VS650B-W	VS750B-A	VS750A-W	VS650B-WL	
Design Exhaust Speed [m³/h] (LPM / CFM)		50Hz	650 (10,833 / 383)		750 (12,500 / 441)		600 (10,000 / 353)
		60Hz	750 (12,500 / 441)		n/a		
Ultimate pressure [Pa] (Torr / mbar)	Gas ballast port closed		8 (6x10 <sup>-2</sup> / 8x10 <sup>-2</sup> )				
	Output [kW] (Poles)		22 (4)				
Motor	Voltage [V]	50Hz	200 to 240 / 380 to 415 (Multi-Voltage Motor)				
		60Hz	200 to 240 / 380 to 460 (Multi-Voltage Motor)		n/a		
Oil			ULVOIL R-72				
Oil capacity [L]			23 to 27	25 to 30	23 to 27	25 to 30	25 to 30
Cooling method			Air cooled	Water cooled	Air cooled	Water cooled	Water cooled
Inlet port			DN 100 ISO-K				
Outlet port			DN 100 ISO-K				
Weight [kg]			Approx. 820				
Dimensions W x D x H [mm]			1,490 x 905 x 705	1,490 x 841 x 705	1,490 x 905 x 705	1,490 x 841 x 705	1,490 x 841 x 705

Vacuum Pump
Vacuum Valve
Vacuum Gauge
Process Gas Monitor
Leak Detector
Power Supply (V/Hz)
EB Power Supply / EB Source
Deposition Controller
Thin Film Measurement
Accessories
Vacuum Transfer Robot
Cryogenic Equipment

# Vacuum Pump ▶Oil Rotary Vacuum Pump

## Double Stage Rotary Vane type PVD series

Legacy and small size double stage oil rotary vane pump.



PVD-180

- Quiet and low speed rotation.
- PVD-180B / PVD-360B: A solenoid valve is installed to prevent oil from flowing back to the intake side.

- Main applications:
- Vacuum drying, freeze drying
  - Gas and liquid charging
  - Vacuum absorption, transportation, moulding
  - Vacuum impregnation, casting

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve
Option	
Type. K: FKM(Fluorine rubber)	
Type. H: Helium tight	
Type. Z: Large Oil Tank	

Model			PVD-180 (B)	PVD-360 (B)
Designed pumping speed [m3/h] (LPM / CFM)		50Hz	9 (155 / 5.3)	19 (310 / 11.2)
		60Hz	11 (186 / 6.5)	22 (372 / 13)
Ultimate pressure [Pa] (Torr / mbar)	Gas ballast port closed		0.67 (5x10 <sup>-3</sup> ／6.7x10 <sup>-3</sup> )	
Motor	Output [kW] (Poles)		0.4 (4)	0.75 (4)
	Voltage [V]	50Hz	200 (380, 400, 415, 440)	
		60Hz	200 to 220 (480)	
Oil			ULVOIL R-72	
Oil capacity [L]			0.3	0.5
Cooling method			Air cooled	
Inlet port			dia. 28 x dia. 19	dia. 34 x dia. 27
Outlet port			G3/4	G1
Weight (without Motor) [kg]			33.5	43
Dimensions W x D x H [mm]			265 x 470 x 321	303 x 488 x 321

## Rotary Plunger type PKS series

Legacy and robust single rotary plunger pump.



PKS-070B

- Robust and long life. Low speed rotation with few sliding parts.
- Excellent abrasion resistance material are used.
- High efficiency multi voltage motor (IE-3) which enable to use 200-240 / 380-460 V.  
※ Please select the voltage of solenoid for oil circulation.
- For PKS-070B with 200V class, a single voltage motor will be recommended.
- For PKS-070B, bigger oiler and oil level gauge are introduced. Inspection hole for V belt is added.

- Main applications:
- Vacuum heat treatment, vacuum sintering, vacuum carburization
  - Solvent evacuation
  - Vacuum impregnation, casting
  - Large vacuum chamber evacuation

Structure	
Single stage	Double stage
Rotary vane	Rotary plunger
Direct driven	Belt driven
Air cooled	Water cooled
Forced oil circulation	Differential pressure oil circulation
Oil back flow prevention mechanism	Back flow prevention valve
Option	
Type. R: Anti-rust cooling water system	
Type. K: FKM(Fluorine rubber)	
Type. H: Helium tight	

Model			PKS-016		PKS-030		PKS-070B		
Design Exhaust Speed [m³/h] (LPM / CFM)			96 (1,600 / 56.5)		180 (3,000 / 105.9)		420 (7,000 / 247.2)		
Ultimate pressure [Pa] (Torr / mbar)		Gas ballast port closed		2.7 (2x10 <sup>-2</sup> / 2.7x10 <sup>-2</sup> )					
Motor		Output [kW] (Poles)		2.2 (4)		3.7B B(4)		11 (6)	
		Voltage [V]	50Hz	200 to 240 / 380 to 415 (Multi-Voltage Motor) , 200 (Single-Voltage Motor) Only available with PKS-070B					
			60Hz	200 to 240 / 380 to 460 (Multi-Voltage Motor) , 200( Single-Voltage Motor) Only available with PKS-070B					
Oil			ULVOIL R-72						
Oil capacity [L]			6.5		8		20		
Cooling method			Air cooled		Water cooled				
Inlet port (optional)			VG50 (ASA1.5)		VG80 (ASA2)		VG100 (ASA3)		
Outlet port (optional)			VF50 (ASA1.5)		VF80 (ASA2)		VF100 (ASA3)		
Weight (without motor) [kg]			225		380		900		
Dimensions W x D x H [mm]			587 x 884 x 572		721 x 675 x 973		971 x 983 x 1190		



Oil Mist Trap **TM / TMX series**

The trap to eliminate oil smoke exhausted from oil rotary vacuum pump.

- Exhaust sound is reduced especially at the time of repeat operation between ultimate and atmospheric pressure.
- Cartridge type filter makes filter replacement easy.



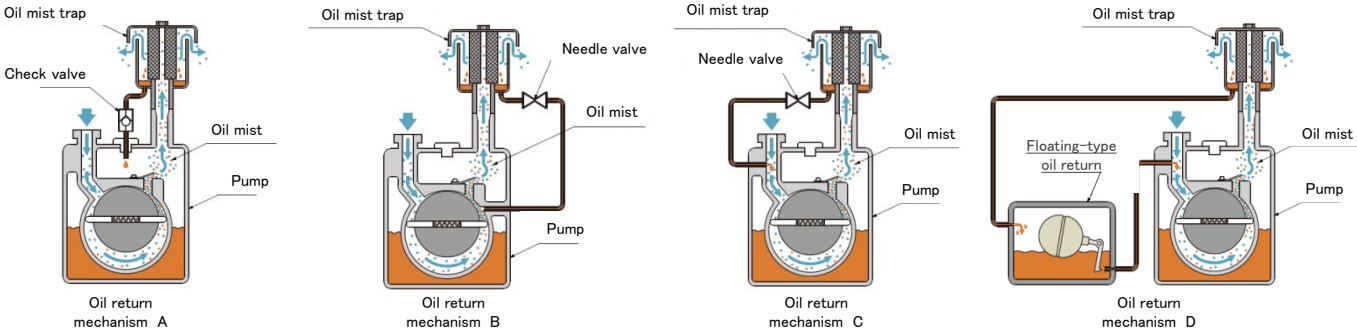
TM401

Model *1	Connecting flange (pump side / outlet side)	Weight [kg]	Material	Dimensions [mm]	For (pump model)	Remarks *2
TMX-1	Special (with adapter ) / G1 x 1/2 (with screwed cover)	1.1	Main unit : soft steel (SPCC)  Filter : glass wool	dia. 106 x 193	PVD-180, PVD-360, GLD-202, GLD-280	
TM201	VF40 / G1 x 1/2 (with screwed cover)	8.5		dia. 165.2 x 280	VD30C / VD301, VD40C / VD401	Low load type
TM401	VF40 / G1 x 1/2 (with screwed cover)	10		dia. 165.2 x 350	VD30C / VD301, VD40C / VD401	High load type
					VD60C / VD601, VD90C / VD901	Low load type
TM-2	VF40 (with adapter) / G2 (with screwed cover)	9.3		dia. 285 x 520	VD60C / VD601, VD90C / VD901	High load type
	VG50 / G2 (with screwed cover)			dia. 285 x 450	PKS-016	
TM-2F	VF40 (with adapter) / VG50	9.8		dia. 285 x 525	VD60C / VD601, VD90C / VD901	High load type
	VG50 / VG50			dia. 285 x 455	PKS-016	
TM-3	VF50 / G3 (with screwed cover)	17		dia. 362 x 635	VS1501	
	VG80 / G3 (with screwed cover)			dia. 362 x 735	PKS-030	
TM-3F	VF50 / VG80	18		dia. 362 x 600	VS1501	
	VG80 / VG80			dia. 362 x 700	PKS-030	
TM-4	VF50 / G4 (with screwed cover)	35		dia. 442 x 945	VS2401	
	VG100 / G4 (with screwed cover)			dia. 442 x 1160	PKS-070	
TM-4F	VF50 / VG100	36		dia. 442 x 900	VS2401	
	VG100 / VG100			dia. 442 x 1120	PKS-070	
TM-4S	VF50 / VG100	64		dia. 450 x 1487	VS2401	High load type
	VG100 / VG100			dia. 450 x 1387	PKS-070	High load type

\*1 F: Flange connection type instead of screwed cover.  
\*2 Select the high load when the pump repeatedly runs from atmosphere to vacuum in a short period or at the pressure higher than 10,000 Pa (100mbar / 75 Torr) for a long period .

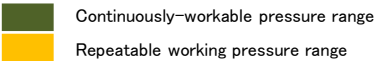
Oil Mist Trap **Oil Return Mechanism**

Oil return from the oil mist trap into the pump.



	Details	Recovery method	Effect on ultimate pressure	Recommended pressure range				
Oil return mechanism A	Oil returns into the pump case through the check valve when the pump stops.	Semi-auto	Low					
Oil return mechanism B	Oil returns from the gas ballast port through the needle valve.	Manual	Some					
Oil return mechanism C	Oil returns from the inlet port side through the needle valve.	Manual	High					
Oil return mechanism D	Oil collected in the floating type oil return returns from the inlet port side.	Auto	Low					

\* Oil return mechanism is not workable with the oil mist trap TMX-1.  
The TMX-1 has a check valve inside like the oil return mechanism A.



Oil Mist Trap **OMT/OMI series**

The trap to eliminate oil smoke exhausted from oil rotary vacuum pump.

- These traps are particularly effective when operating the pump at high pressure causing excessive oil misting from the pumps exhaust.
- Exchange of only an element (filter) is also possible.
- OMI is pipe connection-type oil-mist trap.



OMT-200A

Model*1	Connecting Size	Weight [kg]	Material	Dimensions [mm]	For (pump model)	Remarks*2
OMT-050A	G3/4	0.105	Body: resin Filter: resin	dia.65 × 93	G-5DA, G-10DA, G-20DA, G-25SA, G-50SA, G-50DA, GLS-051, GHD-031A, GLD-040, GLD-051	
OMT-100A	G1	0.43	Body: resin Filter: resin	dia.113 × 135	GLD-040,GHD-031,GHD-101	
OMT-200A	G1	0.55	Body: resin Filter: resin	dia.113 × 135	GLD-137AA,GLD-137CC,GLD- 202AA,GLD-202BB	
OMI-100	G1	1.25	Body: steel plate Filter: resin	dia.94 × 177	GLD-040,GHD-031,GHD-101	
OMI-200	G1	1.47	Body: steel plate Filter: resin	dia.116 × 178	GLD-137AA,GLD-137CC,GLD- 202AA,GLD-202BB	

\*1 Filter replaceable

\*2 Adapter for Oil-mist Trap is necessary for GLD-040,GHD-031.

Used to change screw diameter G3/4 to G1 when you want to put an Oil-mist trap (OMT, OMI) on your exhaust port screw G3/4 pump.



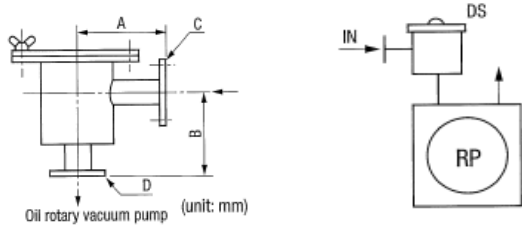
Model	Connecting size	Applicable models	Adaptive oil-mist traps
Adapter for Oil-mist Trap	G3/4 × G1	GLD-051, GLS-051, GLD-040, GHD-031	OMT-100A,OMI-100

Dust Filter **DS series**

Dust filter for gases containing dust, glass particle, etc.



- Stainless steel made enclosure powder fore line trap equipped with a filter element inside.
- Suitable when pumping down gases including dry powder with diameters of 10 μm or more.



Unit: mm					
Model	For (pump model)	A	B	C (inlet port)	D (outlet port)
DS-20	PVD-180, GLD-202	90	90	VG20	VF20
DS-25	PVD-360, GLD-280			VG25	VF25
DS-40	VD30C / VD301, VD40C / VD401	140	195	VG40	VF40
DS-50	VD60C / VD601, VD90C / VD901			VG50	VF50
DS-2	PKS-016		290	VG50	VF50
DS-3	PKS-030	200	530	VG80	VF80
DS-4	PKS-070	220	583	VG100	VF100

Vacuum Pump
Vacuum Valve
Vacuum Gauge
Process Gas Monitor
Leak Detector
Power Supply (DC/RF)
EB Power Supply / EB Source
Deposition Controller
Thin Film Measurement
Accessories
Vacuum Transfer Robot
Cryogenic Equipment

# Vacuum Pump ▶ Vacuum pump oil

## Vacuum pump oil ULVOIL series

The ULVOIL series is a vacuum pump oil developed for improving performance and extending life of vacuum pumps.



Model			R-42	R-72	R-80	Super R-7000
Type			Mineral oil			Synthetic oil
Ultimate pressure [Pa](Torr/mbar)			$<4 \times 10^{-1}$			$<7 \times 10^{-1}$
Characteristics	Color		Transparent pale yellow			
	Kinetic viscosity [mm <sup>2</sup> /s]	40°C	46	68	57	68
		100°C	8	10	8	10
	Viscosity index		142	132	110	110
	Water content [%]		$<0.01$			
	Acid number [mgKOH/g]		$<0.01$			$<0.1$
	Density [g/cm <sup>3</sup> ]		0.86	0.88		0.91
	Flash point [°C]		276	274	230	220
	Pour point [°C]		-17.5	-25	-37.5	-20
Features			For low temperature start-up	For general purpose	For high temperature and load	For active gas exhaust
Applicable vacuum pump			Oil rotary vacuum pump			
			Mechanical Booster Pump			-

Model			D-11	D-31	B-6
Type			Hydrocarbon	Silicon	Hydrocarbon
Ultimate pressure [Pa](Torr/mbar)			$7 \times 10^{-5}$	$3 \times 10^{-8}$	$2.7 \times 10^{-2}$
Characteristics	Color		Transparent Pale Yellow		
	Kinetic viscosity [mm <sup>2</sup> /s]	25°C	-	170	-
		40°C	32	-	22
	Steam pressure [Pa] (Torr / mbar)	20°C	$7.3 \times 10^{-5}$	$2.1 \times 10^{-8}$	$1.2 \times 10^{-5}$
		40°C	$1.7 \times 10^{-3}$	$2.1 \times 10^{-6}$	$1.4 \times 10^{-4}$
		100°C	$1.5 \times 10^{-1}$	$1.1 \times 10^{-3}$	$3.3 \times 10^{-1}$
	Flash point [°C]		220	210	200以上
Features			For general purpose	For stable heat resistant	For ejector pump
Applicable vacuum pump			Oil diffusion pump		
			-		
			Oil diffusion ejector pump		

Model			SMR-100	MR-200	SO-M	R-2
Type			Mineral oil			Synthetic oil
Ultimate pressure [Pa](Torr/mbar)			$<7 \times 10^{-1}$			
Characteristics	Color		Transparent Pale Yellow			
	Kinetic viscosity [mm <sup>2</sup> /s]	40°C	44.6	71	63.7	17.3
		100°C	5.5	8.0	9.0	3.9
	Viscosity index		100	98	118	121
	Water content [%]		0.01			
	Acid number [mgKOH/g]		0.01			0.01 >
	Density [g/cm <sup>3</sup> ]		0.88	0.88	0.90	0.82
	Flash point [°C]		200	250	250	230
	Pour point [°C]		-15	-10	-15	-50
Features			For low temperature start-up	For high temperature and load	For heat and acid resistance	For low temperature start-up
Applicable vacuum pump			Oil rotary vacuum pump	Mechanical Booster Pump	Oil rotary vacuum pump	Oil rotary vacuum pump

Vacuum Pump Oil **BARRIERTA J FLUID** series

A non-flammable and low vapor pressure fluorine oil.  
Excellent heat-resistance and oxidation resistance.



Model			J25F	J60F	J100F	J100F E
Type			Fluorine Oil			
Characteristics	Color		Colorless and transparent.			
	Kinetic viscosity [mm <sup>2</sup> /s]	40°C	25	60	95	
		100°C	5	9	13	
	Viscosity index		85	130		
	Steam pressure [Pa] (Torr / mbar)	20°C	2 x 10 <sup>-3</sup> (1.5 x 10 <sup>-5</sup> / 2 x 10 <sup>-5</sup> )	1 x 10 <sup>-4</sup> (7.5 x 10 <sup>-6</sup> / 1 x 10 <sup>-6</sup> )	6 x 10 <sup>-6</sup> (4.5 x 10 <sup>-8</sup> / 6 x 10 <sup>-8</sup> )	9 x 10 <sup>-5</sup> (6.7 x 10 <sup>-7</sup> / 9 x 10 <sup>-7</sup> )
	Operating temperature range [°C]		-55 to 140	-50 to 160	-40 to 180	
Features			Low steam pressure, nonflammable, heat resistance, oxidation resistance, alkali resistance			
Applicable vacuum pump			Oil rotation vacuum pump		-	
			Mechanical booster pump		Mechanical booster pump	
			-		Dry vacuum pump	

Vacuum Pump
Vacuum Valve
Vacuum Gauge
Process Gas Monitor
Leak Detector
Power Supply (V/Hz)
EB Power Supply / EB Source
Deposition Controller
Thin Film Measurement
Accessories
Vacuum Transfer Robot
Cryogenic Equipment

# Vacuum Pump ▶Mechanical Booster Pump

## Mechanical Booster Pump MBS series

A small type of a root type vacuum pump



MBS-053

- No oil leakage by adoption of magnet coupling.
- Can run it with the rotating speed that is the optimum which accepted load of a pump by using DC brushless motor, and can pump it from atmospheric pressure.
- Setting of a driver circuit is necessary in 100V system and 200V system.

Model			MBS-053
Maximum pumping speed[m <sup>3</sup> /h] (L/min/CFM)	50Hz		50 (833/29.2)
	60Hz		
Ultimate pressure [Pa] (Torr/mbar)			4.0 x 10 <sup>-2</sup> (3.0 x 10 <sup>-4</sup> /4.0 x 10 <sup>-4</sup> )
Motor	Output [kW] (Poles)		0.2 (DC Brushless motor)
	Voltage [V]	50Hz	Single phase 100 to 120 / 200 to 240
		60Hz	
	Current [A]	50Hz	1.2 (100V) / 0.8 (200V) ※At Ultimate pressure 4.33 (100V) / 2.54 (200V) ※At maximum load
		60Hz	
Oil			ULVOIL SMR-200
Oil capacity [L]			0.07
Cooling			Air cooled
Inlet port			VG40
Outlet port			VF40
Weight [kg]			11
Dimensions W x D x H [mm]			167 x 410 x 130
Backing pump			Oil rotary vacuum pump 130 to 240L/min
Applicable standard			-

## Mechanical Booster Pumping Systems VMR series

It is the small high vacuum pumping system which made a mechanical booster pump, an oil rotary vacuum pump, and piping unify compactly.



VMR-050

- Handling and maintenance check are easy and ideal for an experiment.
- It is a pressure domain where the pumping speed of a backing pump decreases, and the steep rise of pumping speed is possible.
- An installation space is compact.
- By pushing a button, it exhausts at a stretch to ultimate pressure.

Model			VMR-050
Maximum pumping speed[m <sup>3</sup> /h] (L/min)	50Hz		833 (9633.5)
	60Hz		
Ultimate pressure [Pa](Torr/mbar)			4.0 x 10 <sup>-2</sup> (5.32/4.0 x 10 <sup>-4</sup> ) (at 100Pa)
Motor	Output [kW](Poles)		0.75
	Voltage [V]	50Hz	Single phase 100 to 120 / 200 to 240 1.5kVA
		60Hz	
	Current [A]	50Hz	12.5 (100 to 120V , 50Hz / 60Hz)
		60Hz	6.6 (200 to 240V , 50Hz / 60Hz)
Oil			Main pump ULVOIL SMR-200 / Backing pump ULVOIL SMR-100
Oil capacity [L]			Main pump 0.07 / Backing pump 1.1
Cooling			Air cooled
Inlet port			VG-40
Outlet port			—
Weight [kg]			42
Dimensions W x D x H [mm]			241.4 × 532 × 399 (100V) 241.4 × 581 × 399 (200V)
Backing pump			Oil rotary vacuum pump (200L/min)
Applicable standard			-

Vacuum Pump ▶Mechanical Booster Pump

With General-purpose Motor **PMB series Ver.D**

Mechanical booster pump with general-purpose motor for a wide range of applications.



PMB1200D

- It effectively shortens pumping down time by adding this pump to oil rotary vacuum pump or dry vacuum pump. Its maximum pumping speed is in about the range from 1,000Pa (7.5Torr / 10mbar) to 1Pa (7.5 x 10<sup>-3</sup>Torr / 0.01mbar).
- It also helps to achieve further lower ultimate pressure of the oil rotary vacuum pump and dry vacuum pump.
- Atmospheric pressure start operation is possible with the optional inverter.
- Setting for either air-cooled or water-cooled is selectable for the optional inverter.
- Surface treatment (Alumite) is available as an option.

Model		PMB100D	PMB300D	PMB600D	PMB1200D	PMB2400D
Maximum pumping speed [m³/h] (LPM / CFM)	50Hz	95 (1,580 / 56)	280 (4,670 / 165)	500 (8,330 / 294)	1,000 (16,667 / 589) / 1,000 (16,667 / 589)	2,500 (41,667 / 1,471) 2,000 (33,330 / 1,177)
	60Hz	115 (1,920 / 68)	330 (5,500 / 194)	600 (10,000 / 353)	1,200 (20,000 / 706) / 1,200 (20,000 / 706)	3,100 (51,667 / 1,825) / 2,400 (40,000 / 1,412)
Ultimate pressure [Pa] (Torr / mbar)		0.4 (3 x 10 <sup>-3</sup> / 4 x 10 <sup>-3</sup> )			0.67(5 x 10 <sup>-3</sup> / 6.7 x 10 <sup>-3</sup> )	
Motor	Capacity [kW] (Poles)		0.4(2)	0.75(2)	2.2(2)	3.7(2)
	Voltage [V]	50Hz	200※1			
		60Hz	200 to 220※1			
Oil model		ULVOIL R-4		ULVOIL R-4 (Water cooled) / R-7 (Air cooled)		
Oil capacity volume [L]		0.35	0.7	1.5	1.9	4 (2.2※2)
Cooling method		Air cooled		Water cooled／Air cooled (options: to be selected by inverter setting)		
Inlet port (optional)		VG50 ( KF50 or ISO63F)		VG80 (ISO80F or 100F)		VG100 (ISO100F)
Outlet port (optional)		VF50 ( KF50 or ISO63F)		VF80 (ISO80F or 100F)		VF200 (ISO200F)
Weight [kg]		26	51	82	115	260
Dimensions W x D x H [mm]		267 x 576 x 180	321 x 685 x 260	362 x 784 x 320	417 x 970 x 340	520 x 1260 x 460
Standard backing pump		VD40C / VD40I	VD60C / VD60I	VD90C / VD90I	VS300 / VS240I	VS650 / PKS-070
Applicable standard		CE, cTUVus				CE

※1) 400V class is optional. (50 Hz: 220~240 / 380~415V, 60Hz: 208~240 / 380~460V)  
※2) Values for the horizontal exhaust direction type.

With Canned Motor **PRC series**

Mechanical booster pump with canned motor for clean environment



PRC-012A

- It effectively shortens pumping down time by adding this pump to oil rotary vacuum pump or dry vacuum pump. Its maximum pumping speed is in about the range from 1,000Pa (7.5Torr / 10mbar) to 1Pa (7.5 x 10<sup>-3</sup>Torr / 0.01mbar).
- It also helps to achieve further lower ultimate pressure of the oil rotary vacuum pump and dry vacuum pump.
- There is no oil leakage to the outside in the case of canned motor. Suitable for clean room environment.
- Surface treatment (Alumite) for corrosion resistance is standard specification.
- Atmospheric pressure start operation is possible with the optional inverter.

Model			PRC-003A	PRC-006A	PRC-012A	PRC-018A
Maximum pumping speed [m³/h](LPM / CFM)		50Hz	280 (4,670 / 165)	500 (8,330 / 294)	1,000 (16,667 / 590)	1,500 (25,000 / 882)
		60Hz	330 (5,500 / 194)	600 (10,000 / 353)	1,200 (20,000 / 706)	1,600 (30,000 / 941)
Ultimate pressure [Pa] (Torr / mbar)			0.4 (3 x 10 <sup>-3</sup> /4 x 10 <sup>-3</sup> )		0.67 (5 x 10 <sup>-3</sup> /6.7 x 10 <sup>-3</sup> )	
Motor	Capacity [kW](Poles)		0.75(2)	2.2(2)	3.7(2)	5.5(2)
	Voltage [V]	50Hz	200(380, 400, 415, 440)			
		60Hz	200 to 220 (480)			
Oil model			ULVOIL R-4			
Oil capacity [L]			0.7	1.5	1.9	
Cooling method			Water cooled			
Inlet port (optional)			VG80 (ISO80F or 100F)		VG100 (ISO100F)	VG150 (ISO160F)
Outlet port (optional)			VF80 (ISO80F or 100F)			VF100 (ISO100F)
Weight [kg]			51	86	118	150
Dimension W x D x H [mm]			296 x 575 x 260	356 x 619 x 320	406 x 759 x 340	406 x 989 x 340
Standard backing pump			VD60C / VD60I	VD90C / VD90I	VS240I	VS240I



# Vacuum Pump ▶Mechanical Booster Pump

## For Large Capacity. With General-purpose Motor **PMB-C series**

Mechanical booster pump with low speed rotation. Suitable for large-scale chambers such as vacuum furnaces, etc.

- Belt driven low speed rotation makes it robust.



PMB-040C

			PMB-040C	PMB-060C
Maximum pumping speed [m³/h] (LPM / CFM)			3,800 (63,300 / 2,235)	6,200 (103,300 / 3,646)
Ultimate pressure [Pa] (Torr / mbar)			0.67 (5 x 10 <sup>-3</sup> / 6.7 x 10 <sup>-3</sup> )	
Motor	Output [kW](Poles)		15(4)	18.5(4)
	Voltage [V]	50Hz	200 (380, 400, 415, 440)	
		60Hz	200 to 220 (480)	
Oil model			ULVOIL R-7	
Oil capacity [L]			8	
Cooling Method			Water cooled	
Inlet port (optional)			VG250 (ISO250F)	VG300 (ISO320F)
Outlet port (optional)			VF150 (ISO160F)	VF200 (ISO200F)
Weight(without motor)[kg]			970	1,100
Dimensions (without motor) W x D x H [mm]			772 x 1182 x 680	772 x 1452 x 680
Standard backing pump			PKS-070	PKS-070 x2

## Frame Unit for Mechanical Booster Pump **YMV series**

Frame unit for combining a mechanical booster pump and oil rotary vacuum pump.

- Removable frame makes it possible to pull out oil rotary vacuum pump from the system.



Frame unit  
YMV series

YMV standard configuration	Frame, connection piping, bellows, caster, adjuster
Option	Atmospheric pressure start operation (inverter is attached to frame), oil mist trap, control box, terminal box, inlet flange (gauge port + leak port ), vacuum delay solenoid valve, cooling water flow switch.

Model	Recommended pump	
	Mechanical booster pump	Oil rotation vacuum pump
YMV-01A	PMB100D	VD30C / VD301
YMV-03A	PMB300D	VD40C / VD401
YMV-06A	PMB600D	VD60C / VD601
		VD90C / VD901
YMV-12A	PMB600D	VS1501
		VS2401
	PMB1200D	VS1501
		VS2401

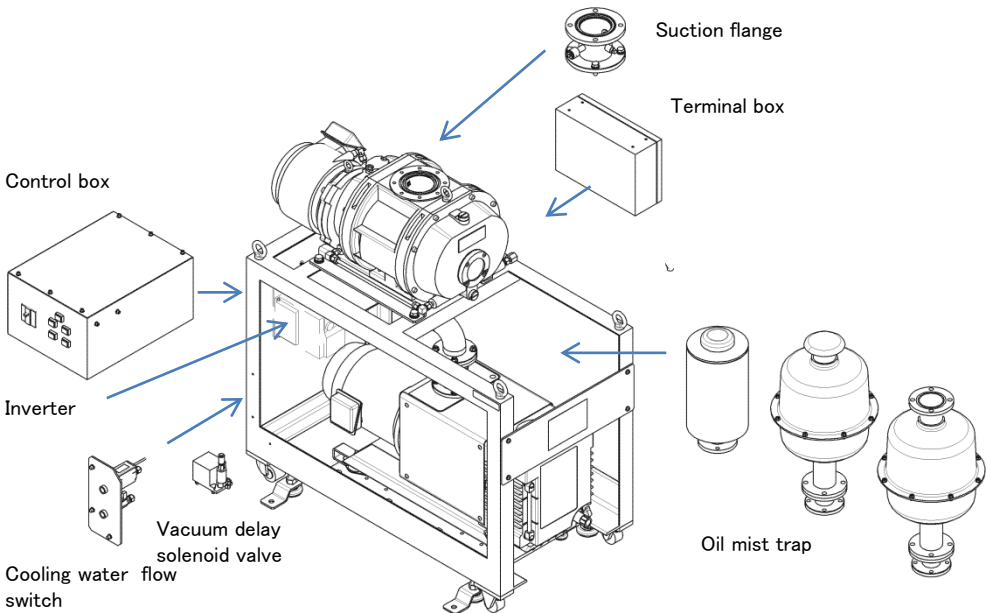
Separate arrangements are made for each kind of pump.



Mechanical booster pump



Oil rotary vacuum pump





# Vacuum Pump ▶ Turbo Molecular Pump

## TMP with separate controller UTM-MS series

This is a turbo molecular pump with a separate controller that uses magnetic bearings.

We have a lineup of models with pumping speeds of 300 to 4000 L/s. The controller unit can monitor the operating status and supports various communication standards.



UTM400A-MS

- **Separated pump body and controller**  
The controller can monitor the operating status and support various communication standards.
- **Free mounting direction**  
Free mounting direction makes the system design flexible.
- **Pumping speed 300L/s to 4000L/s class lineup**
- **Pump rotation variable from 25% to 100%**  
Enabling the pressure adjustment in a chamber by changing the rotation speed.
- **High durability and safety**  
Safety confirmation tests are passed, such as air rushing-in test and touch down test.

Model		UTM300A-MS	UTM400A-MS	UTM800A-MS	UTM1000A-MS	UTM1300A-MS	UTM1500A-MS	UTM2400A-MS	UTM3400A-MS	UTM4300A-MS	
Inlet port		VG100 / ICF152	VG150 / ICF203		VG200 / ICF253		VG250		VG300 / VG350	VG350	
Outlet port		KF25			KF40						
Cooling method		Water cooling	Air cooling	Water cooling	Air cooling	Water cooling	Air cooling	Water cooling			
Ultimate pressure *1	Pa/Torr/mbar	$10^{-7} / 10^{-9} / 10^{-9}$			$10^{-8} / 10^{-10} / 10^{-10}$		$10^{-7} / 10^{-9} / 10^{-9}$				
Pumping speed *2	N2 L/s	320	420	800	1080	1300	1500	2100	3200	4400	
Compression rate	N2	$1 \times 10^9$				$6 \times 10^8$		$1 \times 10^9$			
Max inlet pressure *3	Pa/Torr/mbar	Water cooling:200 / 1.5 / 2.0 Air cooling:1.3 / 0.01 / 0.01			Water cooling:400 / 3.0 / 4.0 Air cooling:1.3 / 0.01 / 0.01		133 / 1.0 / 1.3		40 / 0.3 / 0.4		
Max outlet pressure *3	Pa/Torr/mbar	Water cooling:400 / 3.0 / 4.0 Air cooling:40 / 0.3 / 0.4			Water cooling:665 / 5.0 / 6.7 Air cooling:40 / 0.3 / 0.4		270 / 2.0 / 2.7		270 / 2.0 / 2.7		
Rotation speed	rpm	45000			35000		30300	27000	27600	24000	
Start-up time		5minutes or less				7minutes or less		11minutes or less	12minutes or less	18minutes or less	
Mounting position		In any desired direction									
Surface treatment		Nickel plating									
Cooling water	Flow rate L/min	1~3	—	1~3	—	1~3	—	1~3	2~4		
Noise	dB(A)	60					57		60		
Weight	kg	14			33	32	39	42	70	84 105	
Recommended backing pump		200L/min or more			500L/min or more		600L/min or more		1300L/min or more	1500L/min or more	
Controller	Composition	Separate type									
	Input electric Power	Single phase AC200 ~240V ±10% ( 50/60Hz ±2Hz)									
	Max power	0.55			1.0				1.5		
	Speed variation	Speed is variable between 25% and 100% of the rated speed. ( set as 0.1%)									
	Weight kg	8									

\*1 : digit number is expressed. \*2: Without a protective net. \*3: Max inlet pressure and Max outlet pressure cannot be satisfied at same time.

## Ceramic Ball Bearing type UTM-B series

Compound turbo molecular pump with ceramic ball bearings. An integrated controller saves installation space. Installation in any orientation makes your system design flexible. Excellent high back pressure performance allows to use smaller backing pump.



UTM70B

Model		UTM70B		UTM300B	
Pump	Inlet flange (*1)	VG65, ICF114, ISO63-K		VG100, ICF152, ISO100-K	
	Outlet flange	KF16		KF16	
	Cooling method	Natural air cooled    Forced air cooled		Natural air cooled    Forced air cooled	
	Pumping speed(N2) [L/sec]	280		280	
	Ultimate pressure [Pa] / [Torr] / [mbar] (*2)	After baking (*3)	$10^{-8} / 10^{-10} / 10^{-10}$	Before baking (*3)	$10^{-8} / 10^{-10} / 10^{-10}$
	(with double stages backing pump)		$10^{-8} / 10^{-8} / 10^{-8}$		$10^{-8} / 10^{-8} / 10^{-8}$
	Maximum compression ratio(N2)	$> 1 \times 10^9$		$> 1 \times 10^9$	
	Maximum inlet pressure(N2) [Pa] / [Torr] / [mbar] (*4)	$4.3 / 3.2 \times 10^{-2} / 4.3 \times 10^{-2}$		$6 \times 10^{-2} / 5 \times 10^{-4} / 6 \times 10^{-4}$	
	Maximum outlet pressure(N2) [Pa] / [Torr] / [mbar] (*4) (*5)	300 / 2.3 / 3		100 / 0.75 / 1.0	
	Surface treatment	None		None	
	Recommended backing pump (when evacuating 10SCCM)	Approx. 60L/min		Approx. 120L/min	
	Weight [kg]    VG / ISO / ICF	3.3 / 3.0 / 5.0		6.0 / 6.0 / 9.0	
Power Supply		DC24V, 120W		DC24V, 180W	
Applicable standard		CE, Tute's		CE, TÜVus	

\*1) Select inlet flange type from VG100, ICF152 and ISO100-K when ordering. \*2) Value is described by range.

\*3) Baking is available only when forced air cooling method with ICF flange is selected.

\*4) Max. inlet and outlet pressure are not satisfied at same time. \*5) Continuous workable pressure when 5scm gas flow from the inlet port.

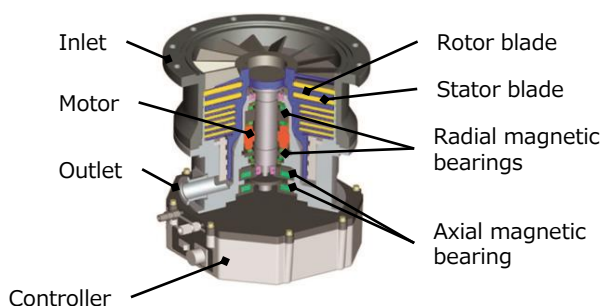
## TMP with integrated controller UTM-MI series

**Controller integrated turbo molecular pump with magnetic bearings saves wiring work and installation space.**



UTM1600A

- **Controller integrated with the pump body**  
No wiring work between pump body and controller.
- **Free mounting direction**  
Free mounting direction makes the system design flexible.
- **5 models from 1000L/S to 4000L/S class.**
- **Wide range and high flow for the light processes.**
- **Pump rotation variable from 25% to 100%**  
Enabling the pressure adjustment in a chamber.
- **High durability and safety**  
Safety confirmation tests are passed, such as air rushing-in test and touch down test.



Model		UTM1200A	UTM1600A	UTM2300A	UTM3400A
Inlet port		VG150 ISO160F	VG200/VG250 ISO200F/ISO250F	VG250 ISO250F	VG300/VG350 ISO320F
Outlet port		KF40			
Ultimate pressure(*1) [Pa/ torr/ mbar]		10 <sup>-7</sup> / 10 <sup>-9</sup> / 10 <sup>-9</sup>			
Pumping speed (*2)(*3) N2 [L/s]		1030	1400	2100	3200
Compression rate N2		2 × 10 <sup>8</sup>		1 × 10 <sup>8</sup> or more	1 × 10 <sup>9</sup> or more
Max inlet pressure(*4) [Pa/ torr/ mbar]		26 / 0.2 / 0.3		4.5 / 0.03 / 0.05	7 / 0.05 / 0.07
Max outlet pressure(*4) [Pa/ torr/ mbar]		266 / 2 / 2.7		200 / 1.5 / 2	270 / 2 / 2.7
Rotation speed [rpm]		37200		33700	27600
Speed variation		Speed is variable between 25% and 100% of the rated speed. (set as 0.1%)			
Start-up time		8 minutes or less		9 minutes or less	16 minutes or less
Mounting position		In any desired direction			
Surface treatment(*5)		None			
Communication	Contact	D-sub 25 pin female		D-sub 37 pin female	
		Contact input and output signal		Contact input and output signal	
	Serial	Serial connector RS232C/RS485		D-sub 9 pin male RS232C/RS485	
Controller	Composition	Pump with integrated controller			
	Input electric power	Single phase AC200~240V ±10% (50/60Hz ±2Hz)			
	Max power	0.75kVA		1.2kVA	
Cooling method		Water cooled			
Cooling water(*6)	Flow rate [L/min]	3~4			
	Pressure [MPaG]	0.2~0.4			
Noise [dB(A)]		57		60	
Weight [kg]		43	41	56	94
Recommended backing pump(*7)		600L/min or more		1500L/min or more	
Applicable standard		CE, TUVus			
Standard accessories		O-ring(Only VG), Dust cap(Outlet port), Remote-control Connector, Instruction manual(CD-ROM)			
Select parts	AC Cable	AC Connector / AC Cable (5m/10m/15m/20m)			
	Special bolt for fixing pump	M10 (Non-RoHS / RoHS) / M12 (Non-RoHS / RoHS)			

\*1: A digit number is expressed. \*2: Without a protective net. \*3: Calculated values: UTM2300A and UTM3400A \*4: Max inlet pressure and Max outlet pressure cannot be satisfied at same time. \*5: Do not flow reactive gas and corrosive gas. Please contact us when using other gases. \*6: Not condensing \*7: When evacuating 30SCCM \*8: Grade of bolts, Fixing method and etc. are subject to various conditions. Please contact us for the detailed information.

# Vacuum Pump ▶ Turbo Molecular Pump

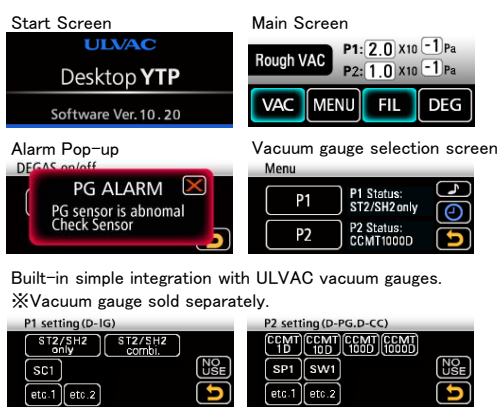
## Turbo Molecular Pumping System Desktop YTP

Desktop high vacuum pumping station featuring a low noise, low vibration design and ceramic ball bearing turbo molecular pump.

Simple, easy to read touch screen control for user-friendly operation.



YTP70A-D



➤ **Consideration for use environment on desktop**  
Running noise and vibration during operation are reduced.

➤ **Low noise**  
43dB(A) or less at Ultimate pressure.  
(Measured by ULVAC standard for ICF flange type.)

➤ **User-friendly**  
Simple operation with easy to read touch panel display

➤ **Pressure indication**  
Designed for easy integration of up to 2 vacuum gauges

Model		YTP70A-D
Inlet port		ICF114, VG65, ISO63-K
Ultimate pressure(*1)	Pa / Torr / mbar	$10^{-6}$ / $10^{-8}$ / $10^{-8}$
Pumping speed (*2)	N2	L/s
	He	L/s
	H2	L/s
Backing pump	L/min	20
Weight	kg	17.5
Noise (*3)	dB(A)	< 43
Input power source		Single phase AC100~240V(50/60Hz)
Power capacity		300W
Standard accessories		Instruction manual(CD-R), I/F connector, Protective net, Gasket
External option		AC cable (3m) (*4)
Applicable standard		CE, cTUVus

\*1: A digit number is expressed. \*2: Without a protective net.

\*3: At ultimate pressure. Measured by ULVAC standard for ICF flange type. \*4: Plug is selectable.

## Turbo Molecular Pumping System YTP series Ver.B

YTP series version B is a high vacuum pumping system with a ceramic ball bearing turbo molecular pump. Vacuum pumping from atmospheric pressure to high vacuum is possible.

SA type automatically starts up entire system by pushing start button and M type manually starts up turbo molecular pump by checking its back pressure.



YTP-50MB-DRY

YTP-300SAB

- The system with oil rotary backing pump is standard and dry backing pump is also available.
- A solenoid fore valve is equipped as standard configuration to prevent back flow and accident in case of black out.
- Pirani vacuum gauge is equipped as a standard configuration to monitor pressure during roughing evacuation.

Model		YTP-50MB YTP-50SAB	YTP-50MB-DRY YTP-50SAB-DRY	YTP-300MB YTP-300SAB	YTP-300MB-DRY YTP-300SAB-DRY
Inlet port		VG65, ICF114, ISO63-K		VG100, ICF152, ISO100-K	
Ultimate pressure	Before baking	$10^{-6}$ / $10^{-8}$ / $10^{-8}$		$10^{-6}$ / $10^{-8}$ / $10^{-8}$	
*1 *2 [Pa] / [Torr] / [mbar]	After baking	$10^{-8}$ / $10^{-10}$ / $10^{-10}$		$10^{-8}$ / $10^{-10}$ / $10^{-10}$	
Pumping speed	N2	70 L/s		280 L/s	
*3	H2	49 L/s		220 L/s	
Outlet port		G3/4	KF16	G1	KF16
Backing pump	50Hz	50 L/min	90 L/min	200 L/min	250 L/min
	60Hz	60 L/min	100 L/min	240 L/min	300 L/min
Dimension W×D×H mm		400×592×470	450×592×463	492×665×576	542×665×576
Weight		55 kg	57 kg	86 kg	85 kg
TMP back pressure and rough pressure monitoring		Pirani vacuum gauge ( $2.7 \times 10^3 \sim 10^{-1}$ Pa) ( $0.2 \times 10^2 \sim 7.5 \times 10^{-4}$ Torr) ( $2.7 \times 10^1 \sim 10^{-3}$ mbar)			
Fore valve		Solenoid valve for rotary pump automatic vent system (Solenoid valve)			
Input power source		Single phase AC100V (50/60Hz)			
Input cable length		5m with 3P outlet			
Power capacity		1.2 kVA	0.9 kVA	1.7 kVA	1.6 kVA
Power consumption during stable operation		0.6 kVA	0.4 kVA	1 kVA	

\*1 Baking is only available with ICF flange type. \*2 A digit number is expressed. (Display only the digits of power.) \*3 Without a protective net.

## CRYO Pump CRYO-U series

An ultra-high vacuum pump that excels in exhausting water and exhausts all gases.



CRYO-U12HSP / C30VRT

- Provide Ultra clean vacuum which is exclusive to our cryo pumps.
- Vacuum any kind of gas
- No liquid helium needed means low running cost.
- Can be installed in any orientation.
- Easy operation.
- Higher pumping speed compared to ion pumps or turbo molecule pumps.

Model			CRYO-U4H	CRYO-U6H	CRYO-U8H	CRYO-U10H
Pumping speed @20°C	[L/s]	Nitrogen	450	750	1,700	2,400
		Hydrogen	500	1,100	2,700	3,600
		Argon	370	620	1,400	2,000
		Water	1,100	2,100	4,000	6,900
Ultimate pressure		[Pa]	10 <sup>-7</sup>			
Maximum throughput	[Pa L/s]	Argon	1.3 × 10 <sup>3</sup>	1.1 × 10 <sup>3</sup>	1.2 × 10 <sup>3</sup>	1.3 × 10 <sup>3</sup>
	[Pa L/s]	Hydrogen	—	1.1 × 10 <sup>2</sup>	2.4 × 10 <sup>2</sup>	1.5 × 10 <sup>2</sup>
Pumping capacity	[Pa L]	Argon	1.0 × 10 <sup>7</sup>	5.6 × 10 <sup>7</sup>	1.0 × 10 <sup>8</sup>	1.0 × 10 <sup>8</sup>
	[Pa L]	Hydrogen	1.5 × 10 <sup>5</sup>	3.1 × 10 <sup>5</sup>	1.0 × 10 <sup>6</sup>	1.2 × 10 <sup>6</sup>
Mounting flange			ISO-K DN100	UVG-150 ICF-203	UVG-200 , 6 <sup>B</sup> ANSI UFC-253	UVG-250 ICF-305
Cool down time[ <i>min</i> ]			45 / 40 (50Hz / 60Hz)	80 / 70 (50Hz / 60Hz)	100 / 90 (50Hz / 60Hz)	110 / 100 (50Hz / 60Hz)
Compressor unit			C10T , C10AT	C10T , C10AT		C15T
Weight [kg]			14.5	19	25	29

Model			CRYO-U12H	CRYO-U12HSP	CRYO-U16P	CRYO-U20H
Pumping speed @20°C	[L/s]	Nitrogen	4,000	4,100	5,000	10,000
		Hydrogen	6,000	6,000	10,000	18,000
		Argon	3,300	3,400	4,200	8,400
		Water	9,500	9,500	16,000	29,000
Ultimate pressure		[Pa]	10 <sup>-7</sup>			
Maximum throughput	[Pa L/s]	Argon	2.0 x 10 <sup>3</sup>	2.0 x 10 <sup>3</sup>	1.6 x 10 <sup>3</sup>	1.7 x 10 <sup>3</sup>
	[Pa L/s]	Hydrogen	4.1 x 10 <sup>2</sup>	4.1 x 10 <sup>2</sup>	4.5 x 10 <sup>2</sup>	5.0 x 10 <sup>2</sup>
Pumping capacity	[Pa L]	Argon	2.1 x 10 <sup>8</sup>	4.4 x 10 <sup>8</sup>	4.3 x 10 <sup>8</sup>	5.8 x 10 <sup>8</sup>
	[Pa L]	Hydrogen	9.8 x 10 <sup>5</sup>	1.6 x 10 <sup>6</sup>	2.4 x 10 <sup>6</sup>	4.6 x 10 <sup>6</sup>
Mounting flange			UVG-300 , 10 <sup>B</sup> ANSI	UVG-300 , 10 <sup>B</sup> ANSI	UVG-400	UVG-500 , 20 <sup>B</sup> ANSI ISO-500
Cool down time[min]			85 / 75 (50Hz / 60Hz)	90 / 80 (50Hz / 60Hz)	120 / 100 (50Hz / 60Hz)	160 / 140 (50Hz / 60Hz)
Compressor unit			C15T , C30VRT		C30VRT	C30PVRT
Weight [kg]			40	42	65	72

Model			CRYO-U22P	CRYO-U22WB	CRYO-U22H	CRYO-U30HP
Pumping speed @20°C	[L/s]	Nitrogen	11,500	13,000	17,000	28,000
		Hydrogen	14,000	16,500	25,000	43,000
		Argon	9,700	11,000	14,000	23,000
		Water	39,000	39,000	39,000	70,000
Ultimate pressure		[Pa]	10 <sup>-7</sup>			
Maximum throughput	[Pa L/s]	Argon	1.7 x 10 <sup>3</sup>	3.5 x 10 <sup>3</sup>	4.1 x 10 <sup>3</sup>	2.7 x 10 <sup>3</sup>
	[Pa L/s]	Hydrogen	5.0 x 10 <sup>2</sup>	1.3 x 10 <sup>3</sup>	1.3 x 10 <sup>3</sup>	7.4 x 10 <sup>2</sup>
Pumping capacity	[Pa L]	Argon	5.8 x 10 <sup>8</sup>	8.1 x 10 <sup>8</sup>	8.1 x 10 <sup>8</sup>	7.8 x 10 <sup>8</sup>
	[Pa L]	Hydrogen	6.0 x 10 <sup>6</sup>	8.5 x 10 <sup>6</sup>	8.5 x 10 <sup>6</sup>	1.5 x 10 <sup>7</sup>
Mounting flange			UVG-550			VG-750
Cooldown time[min]			180 / 170 (50Hz / 60Hz)	165 / 150 (50Hz / 60Hz)	150 / 135 (50Hz / 60Hz)	240 / 200 (50Hz / 60Hz)
Compressor unit			C30PVRT	C30PMVRT × 1	C30VRT x 2	C30PVRT x 2
Weight [kg]			115	125	200	

### ■ Export control policy

Vacuum pumps that pump nitrogen gas at pumping speed of 15,000L/s or more fall under row 2(35) of appended table 1 of Japan's Export Trade Control Order, which is based on international export control regimes. Customers must follow all related rules and regulations such as Foreign Exchange and Foreign Trade Act and take appropriate procedures when exporting or re-exporting those products.

# Vacuum Pump ▶Oil Diffusion Pump

## 4 to 14 inch ULK series

4 kinds of models from 4" to 14".

Required pumping speed and ultimate pressure are selectable by 2 types of oils and heaters.

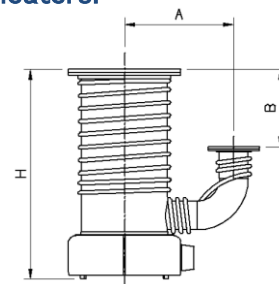


ULK-14A

- A steady high vacuum pump without mechanical moving parts.
- A mechanism preventing oil backflow to the backing pump is included.

Major applications

- Vacuum deposition system
- High vacuum laboratory equipments



Model	ULK-04A		ULK-06A		ULK-10A		ULK-14A	
Pumping speed [L/sec]	550	500	1,200	1,100	3,400	3,000	5,400	4,900
Ultimate pressure [Pa] (Torr / mbar)	$<2.6 \times 10^{-5}$ ( $1.9 \times 10^{-7} / 2.6 \times 10^{-7}$ )	$<2.6 \times 10^{-6}$ ( $1.9 \times 10^{-8} / 2.6 \times 10^{-8}$ )	$<2.6 \times 10^{-5}$ ( $1.9 \times 10^{-7} / 2.6 \times 10^{-7}$ )	$<2.6 \times 10^{-6}$ ( $1.9 \times 10^{-8} / 2.6 \times 10^{-8}$ )	$<2.6 \times 10^{-5}$ ( $1.9 \times 10^{-7} / 2.6 \times 10^{-7}$ )	$<2.6 \times 10^{-6}$ ( $1.9 \times 10^{-8} / 2.6 \times 10^{-8}$ )	$<2.6 \times 10^{-5}$ ( $1.9 \times 10^{-7} / 2.6 \times 10^{-7}$ )	$<2.6 \times 10^{-6}$ ( $1.9 \times 10^{-8} / 2.6 \times 10^{-8}$ )
Critical backing pressure [Pa] (Torr / mbar)	40 (0.3 / 0.4)	60 (0.4 / 0.6)	40 (0.3 / 0.4)	60 (0.4 / 0.6)	35 (0.26 / 0.35)	40 (0.3 / 0.4)	30 (0.22 / 0.3)	30 (0.22 / 0.3)
Oil	ULVOIL D-11	ULVOIL D-31	ULVOIL D-11	ULVOIL D-31	ULVOIL D-11	ULVOIL D-31	ULVOIL D-11	ULVOIL D-31
Oil capacity [L]	0.15		0.35		0.8		1.5	
Cooling water capacity [L/min]	1	1	1	1.5	2.5	3	2.5	3.5
Voltage	Single phase, AC200V							
Required electric power [kW]	0.55	0.73	0.9	1.2	2	2.4	2.25	2.4
Recommended backing pump	VD201		VD40C / VD401		VD90C / VD901		VS2401	
Dimensions A x B x H [mm]	175 x 150 x 341		250 x 180 x 449		340 x 240 x 650		340 x 240 x 670	
Inlet port	VG100		VG150		VG250		VG350	
Outlet port	VG25		VG40		VG80		VG80	
Weight [kg]	7.5		13.5		47		56	
Oil level gauge	None		None		Viewport		Viewport	
Thermostat option	Available		Available		Available		Available	
Thermostat setting temperature [°C]	250		250		180		180	

## 22 to 52 inch PFL series

4 kinds of models from 22" to 52" for large size vacuum systems such as vacuum furnaces, etc.

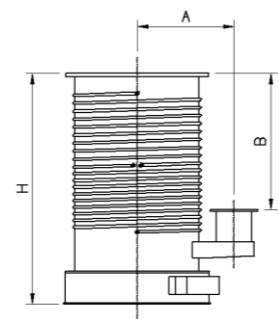


PFL-22

- A steady high vacuum pump without mechanical moving parts.
- An efficient and economical pump because required electric power and oil volume are small.

Major applications

- Vacuum heat treatment furnace, sintering furnace, carburizing furnace, etc.
- Large chamber evacuation.



Model	PFL-22	PFL-22TM	PFL-36	PFL-52
Pumping speed [L/sec]	10,000	10,000	34,000	70,000
Ultimate pressure [Pa] (Torr / mbar)	3.0 x 10 <sup>-4</sup> (2.2 x 10 <sup>-6</sup> / 3.0 x 10 <sup>-6</sup> )			
Maximum fore pressure [Pa] (Torr / mbar)	16 ( 1.2 x 10 <sup>-1</sup> / 1.6 x 10 <sup>-1</sup> )		6.7 (5 x 10 <sup>-2</sup> / 6.7 x 10 <sup>-2</sup> )	16 (1.2 x 10 <sup>-1</sup> / 1.6 x 10 <sup>-1</sup> )
Oil	ULVOIL D-11			
Oil capacity [L]	5	5	13	27
Cooling water capacity [L/min]	12	15	38	50
Voltage	3 phase, AC200V			
Required electric power [kW]	8	10	Start up: 22, Normal: 11	Start up: 45, Normal: 30
Recommended backing pump	PMB-040C + PKS-070			PMB-060C + PKS-070 x 2
Dimensions A x B x H [mm]	480 x 630 x 1,330	480 x 630 x 1,330	725 x 1,022 x 1,732	1,000 x 2,000 x 2,845
Inlet port	VG550	VG550	VG900	VG type equivalent 52 inch
Outlet port	VG150	VG200	VG250	VG350
Weight [kg]	290	290	650	1,400
Oil level gauge	Viewport	Viewport	Viewport	Viewport
Thermostat option	Available	Available	Available	Available
Thermostat setting temperature [°C]	180	180	110	110

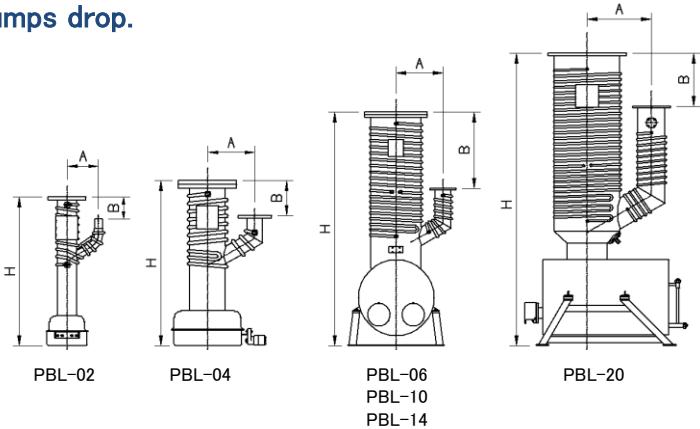


Oil Diffusion Ejector Pump **PBL series**

It has maximum pumping speed at the range of 10<sup>-1</sup> Pa (10<sup>-3</sup> mbar and Torr), where pumping speed of oil rotary vacuum pumps and mechanical booster pumps drop.



PBL-02



- A steady high vacuum pump without mechanical moving parts.
- Suitable in intermediate pressure range between oil rotary vacuum pump / mechanical booster pump and oil diffusion pump.
- Body of the pump from the PBL-02 to the PBL-04 is made of stainless copper which is excellent for corrosion resistance.
- Excellent heating efficiency because a pipe heater is placed directly in hydraulic oil for large pumps bigger than the PBL-06.

Model	PBL-02	PBL-04	PBL-06	PBL-10	PBL-14	PBL-20
Pumping speed [L/sec]	80	200	500	1,800	4,000	7,000
Ultimate pressure [Pa] (Torr / mbar)	2.7 x 10 <sup>-2</sup> ( 2 x 10 <sup>-4</sup> / 2.7 x 10 <sup>-4</sup> )					
Maximum fore pressure [Pa] (Torr / mbar)	40 ( 3 x 10 <sup>-1</sup> / 4 x 10 <sup>-1</sup> )					
Oil	ULVOIL B-6					
Oil capacity [L]	0.1	0.6	7.5	18	36	90
Cooling water capacity [L/min]	1.5	5	8	12	18	25
Voltage	Single phase, AC200V			3 phase, AC200V		
Required electric power [kW]	0.44	1.8	4 2kW x 2 pcs	8 4kW x 2 pcs	11 5.5kW x 2 pcs	18 6kW x 3 pcs
Recommended backing pump	VD30C / VD30I	PKS-016	PKS-030	PKS-070	PMB1200D + PKS-030	PMB-040C + PKS-070
Dimensions A x B x H [mm]	100 x 70 x 463	150 x 112 x 524	200 x 152 x 973	300 x 346 x 1,321	340 x 548 x 1,687	510 x 444 x 2,320
Inlet port	VG50	VG100	VG150	VG250	VG350	VG500
Outlet port	3/4B Hose port	VG40	VG50	VG80	VG100	VG200
Weight [kg]	6	17	86	198	313	495
Oil level gauge	None	None	Level gauge	Level gauge	Level gauge	Level gauge
Thermostat option	None	None	None	None	None	None
Thermostat setting temperature [°C]	-	-	-	-	160	160

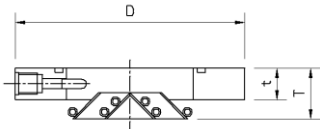
Water-Cooling Baffle **BW series**

For reducing oil steam backflow from oil diffusion pump into suction side.



BW-04B + Adapter

- For preventing inside of vacuum chamber from the oil steam contamination from the oil diffusion pump.
- It is designed to minimize exhaust resistance.
- By setting the adapter for BW-04B and BW-06B, volume of the oil steam backflow volume can be suppressed additionally.



Model	BW-02	BW-04B	BW-06B	BW-10	BW-14	BW-20	BW-22	BW-36	BW-52
Conductance [L/sec]	100	940	2,200	3,130	5,000	13,000	14,000	54,000	75,000
Outer diameter Dimensions [mm]	D	dia. 120	dia. 149	dia. 199	dia. 350	dia. 450	dia. 625	dia. 680	dia. 1,065
	T	16	28	28	44	50	152	101	113
	t	16	25	25	22	22	24	26	28
Cooling water ports (Size)	Rc 1/8	Rc 1/4	Rc 1/4	Rc 1/4	Rc 3/8	Rc 3/8	Rc 3/8	Rc 3/8	Rc 1/2
Coolant Volume [L/min]	1.5	0.7	1	2	2	3	3	5	5
Weight [kg]	1	1.3	1.7	7.6	11	22	28	66	200



Sputter Ion Pump PST series

New type element, which is actor element and optimized magnet filed improves pumping speed in extreme and ultra high vacuum ranges.



Model		PST-030CU	PST-030AU	PST-050CU	PST-050AU	PST-100CX	PST-100AX	PST-110AU	PST-200CX II	PST-200AX II	PST-400CX II	PST-400AX II
Gas type		Active Gas	Rare Gas	Active Gas	Rare Gas	Active Gas	Rare Gas	Rare Gas	Active Gas	Rare Gas	Active Gas	Rare Gas
Regenerated pumping speed [m3/sec]	N2 (*2)	0.03 (0.02)		0.045 (0.03)		0.10 (0.08)		0.11 (0.06)	(0.20)		(0.36)	
	Ar (*2)	(0.013)		(0.016)		(0.05)		—	(0.02)	(0.105)	(0.04)	(0.19)
Ultimate pressure		10 <sup>-9</sup> Pa range (10 <sup>-11</sup> Torr and mbar)		10 <sup>-9</sup> Pa range (10 <sup>-11</sup> Torr and mbar)		10 <sup>-9</sup> Pa range (10 <sup>-11</sup> Torr and mbar)		10 <sup>-9</sup> Pa range (10 <sup>-11</sup> Torr and mbar)	10 <sup>-10</sup> Pa range (10 <sup>-12</sup> Torr and mbar)		10 <sup>-10</sup> Pa range (10 <sup>-12</sup> Torr and mbar)	
Operation pressure (*1)	Recommended value	< 8x10 <sup>-3</sup> Pa (<6x10 <sup>-5</sup> Torr, <8x10 <sup>-5</sup> mbar)		< 8x10 <sup>-3</sup> Pa (<6x10 <sup>-5</sup> Torr, <8x10 <sup>-5</sup> mbar)		< 5x10 <sup>-3</sup> Pa (<4x10 <sup>-5</sup> Torr, <5x10 <sup>-5</sup> mbar)		< 5x10 <sup>-3</sup> Pa (<4x10 <sup>-5</sup> Torr, <5x10 <sup>-5</sup> mbar)	< 4x10 <sup>-3</sup> Pa (<3x10 <sup>-5</sup> Torr, <4x10 <sup>-5</sup> mbar)		< 8x10 <sup>-3</sup> Pa (<6x10 <sup>-5</sup> Torr, <8x10 <sup>-5</sup> mbar)	
		CF70		CF114		CF152		CF152	CF203		CF203	
Recommended controller		GST-07L-B		GST-07L-B		GST-07L-B		GST-07L-B	GST-07L-B		GST-07L-B	
Applied voltage [kV]		DC +7.5		DC +7.5		DC +7.5		DC +7.5	DC +7.5		DC +7.5	
Bake-out temperature [°C]		250		250		250		250	250		250	
Weight [kg]		About 9.5		About 12.8		About 37		About 37	About 65		About 124	
Dimensions W x D x H [mm]		108 x 183 x187		153 x 204 x 241		155 x 340 x 340		180 x 390 x 300	296 x 361 x 376		296 x 544 x 376	
Power for Heater Unit		—		Single phase 200V,300W		Single phase 200V,320W		—	Single phase 200V,600W		Single phase 200V,800W	

\*1) During the time of use of the GST-07L-B-Type controller.  
\*2) At 1 x 10<sup>-7</sup> Pa (8 x 10<sup>-10</sup>Torr, 1 x 10<sup>-9</sup> mbar).

Controller for PST series GST-07L-B

The GST-07L-B is a sputter ion pump controller with the high functionality and reliability through the plenty of technology and long time experience in ultra-high vacuum area that ULVAC has engaged.



GST-07L-B

Model	GST-07L-B
Display range	7 segments LED display
a) Output current display	2 ranges, mA and $\mu$ A, automatic switchable (linear scale)
b) Output voltage display	DC 0.0 to 7.5kV
c) Pressure display	10 <sup>-2</sup> to 10 <sup>-8</sup> Pa, 10 <sup>-4</sup> to 10 <sup>-10</sup> mbar)
Output release voltage	DC +7.5kV (2 points, H and L, setting switchable on the front control panel) Volume variable from about 1.0 to 7.5kV for H and L setting voltage
Input voltage / current	AC100 to 115V $\pm$ 10%, 50/60Hz, 3.0A or lower AC200 to 240V $\pm$ 10%, 50/60Hz, 1.5A or lower
Monitor terminal output signal	Output of signals being proportionate to 7 segments panel display. DC 0 to 10V full scale for each range, more than 100k $\Omega$
Pressure set point	2 points
Remote / Local	Switchable on the front control panel
External control functions	Various input functions (with remote connector) for remote control and RS-232C communication
Protection functions	Error display / various protection functions High voltage output cutoff when error lighted (ERR 0 to 5) Startup protection timer (adjustable from 1 to 255 minutes)
Weight	Main unit: Approx. 4kg
Dimensions W x D x H	240 x 370 x 99 mm ( W : 200mm without the rack mounting bracket.)

# Vacuum Valve ▶ Selection Guide

Wide range line-up to meet various needs, from vacuum angle valve to pendulum valve, from 16A (5/8 inch) to 900A (36 inch) and from atmospheric pressure to extreme high vacuum.



## Category chart

Type	Category	Series
Vacuum angle valve	VLP vacuum angle valve (double acting)	VLP-SA vacuum angle valve (double acting / stainless / O-ring shaft feedthrough)
		VLP-SB vacuum angle valve (double acting / stainless / bellows shaft feedthrough)
		VLP-MB vacuum angle valve (double acting / stainless / ultra-high vacuum)
		VLP-U vacuum angle valve (double acting / iron / O-ring shaft feedthrough)
	VLB vacuum angle valve (single acting)	VLB-SA vacuum angle valve (single acting / stainless / O-ring shaft feedthrough)
		VLB-SB vacuum angle valve (single acting / stainless / bellows shaft feedthrough)
	VLH vacuum angle valve (manual)	VLH-SB vacuum angle valve (manual / stainless / bellows shaft feedthrough)
		VLH-MB vacuum angle valve (manual / stainless / ultra-high vacuum)
Pendulum valve	VFR pendulum valve	

## Specifications

Series	Vacuum level (*1)	Pressure range abs. [Pa] <mbar> (Torr)	Type	Actuation	Body material	Max. baking temperature [°C] (*2)	Allowable pressure difference [MPa] <bar> (Torr)
VLP-SA	V	Atm. to [1.0E-5] <1.0E-7> (7.5E-8)	Angle	Double acting	Stainless steel 304	150	[0.10] <1> (750)
VLP-SB	HV	Atm. to [1.0E-6] <1.0E-8> (7.5E-9)	Angle	Double acting	Stainless steel 304	150	[0.10] <1> (750)
VLP-MB	UHV	Atm. to [1.0E-8] <1.0E-10> (7.5E-11)	Angle	Double acting	Stainless steel 304	150 (200)	[0.10] <1> (750)
VLP-U	V	Atm. to [1.0E-5] <1.0E-7> (7.5E-8)	Angle	Double acting	Steel 400+Ni Plating	60	n/a
VLB-SA	V	Atm. to [1.0E-5] <1.0E-7> (7.5E-8)	Angle	Single acting NC(*3)	Stainless steel 304	150	[0.10] <1> (750)
VLB-SB	HV	1.0E-6 <1.0E-8> (7.5E-9)	Angle	Single acting NC(*3)	Stainless steel 304	150	[0.10] <1> (750)
VLH-SB	HV	Atm. to 1.0E-6 <1.0E-8> (7.5E-9)	Angle	Manual	Stainless steel 304	150	[0.10] <1> (750)
VLH-MB	UHV	Atm. to [1.0E-8] <1.0E-10> (7.5E-11)	Angle	Manual	Stainless steel 304	150 (200)	[0.10] <1> (750)
VFR	HV	[1.2E5] <1.2E4> (900) to [1.0E-6] <1.0E-8> (7.5E-9)	Pendulum	Double acting CL retention (*4)	Aluminum Alloy	120	[0.12] <1.2> (900)

\*1) Refer to "Feedthrough" about relationship between vacuum level and feedthrough.  
\*2) Actuator < 60 °C. The value inside the ( ) are when it is opened.  
\*3) Single acting NC・・・Normally closed (Valve automatically closes when compressed air is released).  
\*4) Double acting CL retention・・・Double-acting but the valve is kept closed when compressed air is released.

# Vacuum Valve ▶ Selection Guide

## Portfolio table

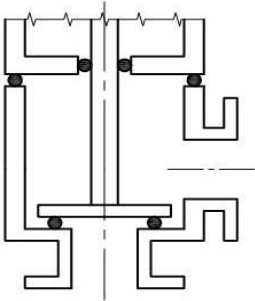
Nominal diameter (※1)	◆A (ISO)	[mm]	016	020	025	040	050	063	080	100	160	200	250	320	—	400	—	500	550	900
	◇A (JIS)	[mm]	—	020	025	040	050	065	080	100	150	200	250	300	350	400	450	500	600	900
	●B	[inch]	5/8	3/4	1	1·1/2	2	2·1/2	3	4	6	8	10	12	14	16	18	20	22	36
VLP-SA□JH	VF		◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇					
VLP-SA□KF	ISO-KF	◆		◆	◆	◆	◆													
VLP-SA□KC	ISO-K							◆	◆	◆	◆	◆	◆							
VLP-SB□JH	VF		◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇							
VLP-SB□KF	ISO-KF	◆		◆	◆	◆	◆													
VLP-SB□KC	ISO-K							◆	◆	◆	◆	◆	◆							
VLP-SB□CH	ISO-CF	◆				◆														
VLP-MB□CH	ISO-CF	◆				◆		◆		◆	◆									
VLP-U□	VF																	●	●	●
VLB-SA□KF	ISO-KF	◆		◆	◆	◆	◆													
VLB-SB□KF	ISO-KF	◆		◆	◆	◆	◆													
VLH-SB□JH	VF		◇	◇	◇	◇	◇	◇	◇	◇	◇									
VLH-SB□KF	ISO-KF	◆		◆	◆	◆	◆													
VLH-SB□KC	ISO-K							◆	◆	◆	◆									
VLH-SB□CH	ISO-CF	◆				◆														
VLH-MB□CH	ISO-CF	◆				◆		◆		◆	◆									
VFR-□	VF															◇		◇		

※1) Numerical number used in model is : ◆ “Nominal Diameter: A (ISO) mm”, ◇ “Nominal Diameter: A(Former JIS) mm”, ● “Nominal Diameter: B inch”.  
◇ “Nominal Diameter: A (JIS) mm” is the standard for the JIS B2290 appendix (maintenance flange).

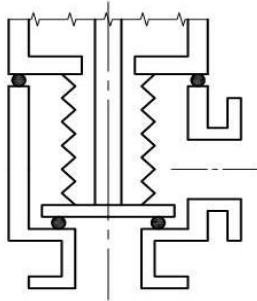
※2) Contact us for details.

ISO-CF nominal diameter	016	025	040	063	100	160	200	250
ULVAC-UFC nominal diameter	034	054	070	114	152	203	253	306

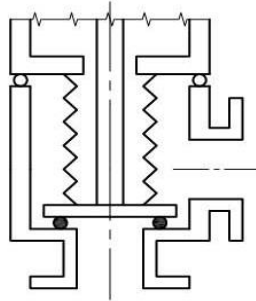
## Feedthrough



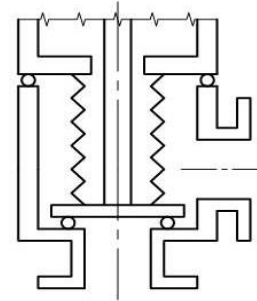
Type	Vacuum level
Angle	V
	HV
	UHV
	XHV



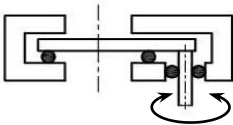
Type	Vacuum level
Angle	V
	HV
	UHV
	XHV



Type	Vacuum level
Angle	V
	HV
	UHV
	XHV



Type	Vacuum level
Angle	V
	HV
	UHV
	XHV



Type	Vacuum level
Pendulum	V
	HV
	UHV
	XHV

- O-ring seal
- Metal seal
- 〰 Bellows seal

Vacuum level	
V	$\leq 10^{-5}$ Pa $10^{-7}$ Torr(mbar)
HV	$\leq 10^{-6}$ Pa $10^{-8}$ Torr(mbar)
UHV	$\leq 10^{-8}$ Pa $10^{-10}$ Torr(mbar)
XHV	$\leq 10^{-9}$ Pa $10^{-11}$ Torr(mbar)

# Vacuum Gauge ▶ Selection Guide

## Selection Guide

Long time experienced and proven know-how from ULVAC who is the leading company of vacuum technology is also utilized in our vacuum measurement product line-up.

Product	Pa	1E-11	1E-10	1E-9	1E-8	1E-7	1E-6	1E-5	1E-4	1E-3	1E-2	1E-1	1E+0	1E+1	1E+2	1E+3	1E+4	1E+5
	mbar	1E-13	1E-12	1E-11	1E-10	1E-9	1E-8	1E-7	1E-6	1E-5	1E-4	1E-3	1E-2	1E-1	1E+0	1E+1	1E+2	1E+3
	Torr	7.5E-14	7.5E-13	7.5E-12	7.5E-11	7.5E-10	7.5E-9	7.5E-8	7.5E-7	7.5E-6	7.5E-5	7.5E-4	7.5E-3	7.5E-2	7.5E-1	7.5E+0	7.5E+1	7.5E+2
Transducer type G-tran series	Atmospheric Pressure Sensor																	SAU
	Capacitance Manometer																	CCMT-1000D
																		CCMT-100D
																		CCMT-10D
																		CCMT-1D
	Pirani Gauge																	SW100
																		SP1
	Cold Cathode Type Ionization gauge																	
	Multi Ionization Gauge																	
General purpose	Pirani Gauge																	GP-1G(RY)/1000G
																		GP-2001G
	Hot Cathode Type Ionization gauge																	
	Extremely High Vacuum Gauge																	
	Samrtphone-Direct Pirani Gauge																	SWU10-U

## Vacuum Gauge Calibration Service JCSS

ULVAC is the first company in Japan to receive JCSS accreditation in the vacuum field as a vacuum gauge calibration laboratory.



Vacuum gauge calibration room

- At June 3, 2010, accredited as a JCSS-MRA calibration laboratory (JCSS 0258), the first ISO/IEC 17025 compliant calibration laboratory of pressure (vacuum) field in Japan.
  - Running JCSS calibration based on ISO/IEC17025.
  - JCSS-calibration certificate is available around the countries and region of the ILAC and APLAC MRA.
  - Vacuum gauge compliant with calibration possible : Thermal conductivity gauge (pirani vacuum gauge), diaphragm vacuum gauge, ionization vacuum gauge, viscosity vacuum gauge.
- (Supports all vacuum gauges from our company as well as those manufactured by other companies.)

Designation for the classification of calibration method	Category	Calibration range	Highest measurement capacity (trust level approx. 95%)
Vacuum gauge	Viscosity vacuum gauge	Above 0.1mPa less than 1mPa	2.0%
		Above 1mPa less than 10mPa	1.0%
		Above 10mPa less than 0.1Pa	0.8%
		Above 0.1Pa less than 1Pa	0.7%
	Diaphragm vacuum gauge	Above 1Pa less than 100Pa	1.5%
		Above 10kPa less than 133kPa	0.6%
		Above 0.1mPa less than 1mPa	0.3%
	Ionization gauge	Above 0.1mPa less than 1mPa	5.0%
		Above 1mPa less than 1Pa	3.0%
	Thermal conductivity gauge	Above 1Pa less than 1kPa	2.0%

Vacuum Gauge ▶ Transducer type Vacuum Gauge

Multi-Ionization Gauge G-TRAN series ST200/SH200

Transducer type vacuum gauge which is connectable with different measurement range sensor units. It saves running cost significantly.



- ST200-A/ST200-R
  - The world's first metal type triode ionization gauge (patented). Long lifetime taking advantage of triode type even in harsh environment for vacuum gauges.
  - Measurement accuracy is improved at  $\pm 10\%$  and sensitivity stability is also improved significantly.
  - For measurement of ultimate pressure of vacuum furnaces / organic EL or touch panel manufactured systems, in atmosphere with lots of hydrocarbon or cleaning fluid, and in equipments where reduction of replacement frequency for sensor heads is required.
- SH200-A/SH200-R
  - For measurement from ultra-high vacuum to high-vacuum.
  - For measurement of ultimate pressure of sputtering or evaporation system for PV·FPD / SEMI and electronic component manufacturing systems, and pressure monitoring for ultra high vacuum equipment.
- Common to ST200/SH200
  - Operable in combination with optional pirani sensor unit and pressure sensor unit.
  - The world's smallest class (56% reduction of controller volume compared to the previous model).
  - Easy set point setting and status check by connecting PC/smartphone.
  - Filament life alarm function by monitoring filament power.

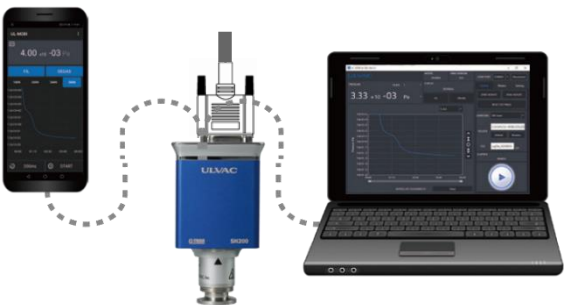
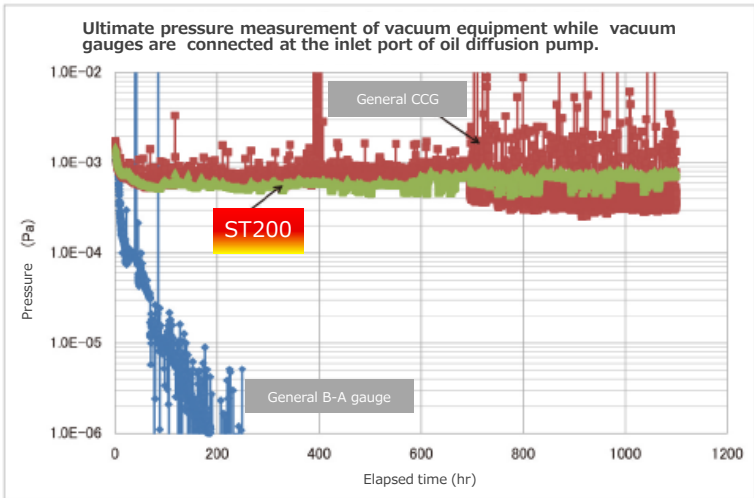


Image of connection by PC/smartphone

Model	ST200-A	ST200-R	SH200-A	SH200-R
Measurement pressure range	1 x 10 <sup>-5</sup> to 1 x 10 <sup>-1</sup> Pa 7.5 x 10 <sup>-8</sup> to 7.5 x 10 <sup>-2</sup> Torr 1 x 10 <sup>-7</sup> to 1 x 10 <sup>-1</sup> mbar		5 x 10 <sup>-8</sup> to 1 x 10 <sup>-1</sup> Pa 7.5 x 10 <sup>-11</sup> to 7.5 x 10 <sup>-2</sup> Torr 1 x 10 <sup>-10</sup> to 1 x 10 <sup>-1</sup> mbar	
Accuracy	±10%: 1 x 10 <sup>-4</sup> to 3Pa, 7.5 x 10 <sup>-7</sup> to 2.2 x 10 <sup>-2</sup> Torr, 1 x 10 <sup>-8</sup> to 3 x 10 <sup>-2</sup> mbar		±15%	
Filament	1 pc (Ir/Y <sub>2</sub> O <sub>3</sub> )		2 pcs (Ir/Y <sub>2</sub> O <sub>3</sub> and W)	
Degas method	Electron bombardment			
Measurement value output	LOG output (DC 0 to 10V)			
Set point	3 points (open collector output)	None	3 points (open collector output)	None
Serial communication	None	RS232C / RS485	None	RS232C / RS485
Power supply voltage	DC 20 to 28V			
Dimensions	69 x 63 x 125 mm (ST200 / SWT-16)			
Connectable sensor unit	Pirani sensor unit SWU10-R (optional), pressure sensor unit SAU (optional)			
Connectable sensor head	SWT-16 (KF16), SWT-25 (KF25)		M-44 (KF16), M-45 (KF25), M-46 (ICF070)	
Applicable standard	CE			

\* Connectable with different measurement range sensor units. Measurable from low-vacuum to atmospheric pressure in combination with pirani sensor unit SWU10-R and pressure sensor unit SAU.

Advantage of ST200 in contamination resistance



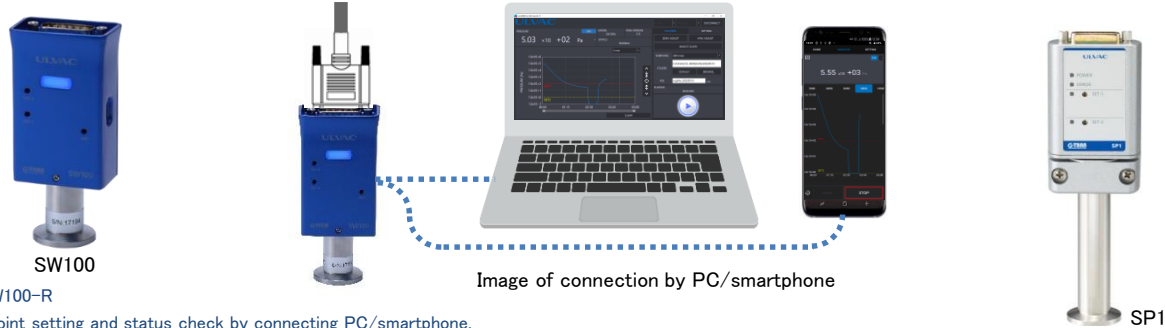
- [General B-A gauge]  
Sensitivity got deteriorated (measurement value got lower) significantly in short time. Cannot continue to use.
  - [General CCG]  
Measurement value fluctuated and the fluctuation range became wider halfway through measurement. Difficult to continue to use any longer.
  - [ST200]  
Measurement value was stable from start to finish.
- Long life of ST200 can be expected in applications much contamination.



Vacuum Gauge ▶ Transducer type Vacuum Gauge

Pirani Vacuum Gauge **G-TRAN series SW100/SP1**

Pirani vacuum gauge which has user-friendly functions with a renewed design.



SW100-A/SW100-R

- Easy set point setting and status check by connecting PC/smartphone.
- Wide measurement range:  $5 \times 10^{-2}$  to  $1 \times 10^{+5}$  Pa ( $3.75 \times 10^{-4}$  to 760Torr,  $5 \times 10^{-4}$  to 1,013mbar).
- Excellent shock-resistance and vibration resistance design (patented).
- For sputtering system, vacuum laminator, vacuum pump carousel system, manufacturing system where there is vibration from vacuum pumps, etc.

SP1

- Long time experienced sensor head WP series is used. Sensor head is fully compatible with other ULVAC Pirani vacuum gauges.
- For interlock and sequence control for various kind of vacuum manufacturing equipment, other rough pumping systems, etc.

Model	SW100-A	SW100-R	SP1
Measurable pressure range	$5 \times 10^{-2}$ to $1 \times 10^{+5}$ Pa $3.75 \times 10^{-4}$ to 760 Torr $5 \times 10^{-4}$ to 1,013 mbar		$4 \times 10^{-1}$ to $3.0 \times 10^{+3}$ Pa $3 \times 10^{-3}$ to 22 Torr $4 \times 10^{-3}$ mbar
Accuracy	$\pm 10\%$ ( $1 \times 10^{-1}$ to $1 \times 10^{+4}$ Pa, $7.5 \times 10^{-4}$ to 75Torr, $1 \times 10^{-3}$ to 100mbar) $\pm 20\%$ ( $5 \times 10^{-2}$ to $1 \times 10^{+5}$ Pa, $3.75 \times 10^{-4}$ to 760Torr, $5 \times 10^{-4}$ to $1 \times 1,013$ mbar)		$\pm 15\%$ (51 to 760Pa, $3.8 \times 10^{-1}$ to 5.7Torr, $5.1 \times 10^{-1}$ to 7.6mbar) $\pm 30\%$ (10 to 1,000Pa, $7.5 \times 10^{-2}$ to 7.5Torr, 0.1 to 10mbar) $\pm 50\%$ (0.4 to 3,000Pa, $3 \times 10^{-3}$ to 22Torr, $4 \times 10^{-3}$ to 30mbar)
Filament	Platinum (Pt)		
Measurement value output	DC 0 to 10V LOG output		
Set point	2 points (open collector output)	None	2 points (open collector output)
Serial communication / Digital output	None	RS232C/RS485	None
Power supply voltage	DC 14 to 30V		
Dimensions	48 x 30 x 104 mm		
Sensor head model	SWP-16 (KF16), SWP-25(KF25), SWP-P18(dia.18), SWP-P15(dia.15), SWP-CF16(ICF034), SWP-R1/8 (R1/8)		
Applicable standard	CE		

Capacitance Manometer **G-TRAN series CCMT**

Vacuum gauge which detects change of static electric capacitance occurring from the ceramic diaphragm transforms due to the change of gas pressure.



- Excellent corrosion resistance and long-time stable ceramic (alumina) diaphragm.
- Total pressure measurement not depending on gas types.
- Equipped with temperature compensation circuit.
- Sensor protection structure against contamination from flying objects.
- Warming up time after power-on until stabilization is greatly reduced.
- Coating process control for equipments such as sputtering, evaporator, etc. and pressure monitor for various kind of manufacturing equipment such for photovoltaic cell, etc.

Model	CCMT-1000D	CCMT-100D	CCMT-10D	CCMT-1D
Range full scale (F.S.)	133kPa 1,000Torr 1,330mbar	13.3kPa 100Torr 133mbar	1.33kPa 10Torr 13.3mbar	133Pa 1Torr 1.33mbar
Lowest reading	13Pa, $10^{-1}$ Torr, $1.3 \times 10^{-1}$ mbar	1.3Pa, $10^{-2}$ Torr, $1.3 \times 10^{-2}$ mbar	0.13Pa, $10^{-3}$ Torr, $1.3 \times 10^{-3}$ mbar	0.013Pa, $10^{-4}$ Torr, $1.3 \times 10^{-4}$ mbar
Practical lowest reading	66.6Pa, $5 \times 10^{-1}$ Torr, $6.7 \times 10^{-1}$ mbar	6.7Pa, $5 \times 10^{-2}$ Torr, $6.7 \times 10^{-2}$ mbar	0.67Pa, $5 \times 10^{-3}$ Torr, $6.7 \times 10^{-3}$ mbar	6.7 x $10^{-2}$ Pa, $5 \times 10^{-4}$ Torr, $6.7 \times 10^{-4}$ mbar
Accuracy	$\pm 0.2\%$ for the indicated value $\pm$ temperature coefficient (2 hours after power-on at 25 °C)			
Display	None (optional display: ISG1)			
Measurement value output	Linear output (DC 0 to 10V)			
Set point	None			
Material where gas contacts	AL <sub>2</sub> O <sub>3</sub> , Vacon70, SUS316, glass ceramic solder, Ag Ti Cu hard solder			
Power supply voltage	DC 14 to 30V			
Dimensions	Dia. 55 x 117 mm			
Fitting	KF16, 1/2 pipe (dia.12.7), 8VCR			
Applicable standard	CE			



Vacuum Gauge ▶Transducer type Vacuum Gauge

Pressure Sensor Unit **G-TRAN series SAU**

Semiconductor type thin-film element makes measurement near atmospheric pressure (gauge pressure : -100 kPa to 10kPa, -1bar to 0.1 bar, -14.5psi to 1.45psi) accurate.



SAU

- Optimum for atmospheric pressure checking because pressure standard is for gauge pressure. It measure atmospheric pressure accuracy.
- Semiconductor type thin film element makes continuous use in high vacuum process possible (SUS316L).
- DC 0-5 linear output as standard.
- Power supply is widely supported from DC 12V to 24V.
- Atmospheric pressure checking or gauge pressure measurement for various kind of coating system such as PV・FPD・SEMI・electronic devices manufacturing system.

Model	SAU
Pressure standard	Gauge pressure
Measurable pressure range (gauge pressure)	-100 to 10kPa -750 to 75Torr -1,000 to 100mbar
Accuracy	±3% F.S.
Measurement value output	DC 0 to 5V linear output
Material	SUS316L
Sensor pressure proof	200kPa, 1,500Torr, 2,000mbar (gauge pressure) *need for the consideration of pressure resistance of the flange and the clamp.
Power supply	DC 12 to 24V±10%
Dimensions	dia. 30 x 68mm
Flange	KF16

Cold Cathode Ionization Gauge **G-TRAN series SC1**

Reverse magnetron cold cathode gauge.



SC1

- Simple structure makes periodical maintenance easy and inexpensive.
- No filament. Sensor is recyclable by cleaning.
- 2 set points.
- Various kind of vacuum furnace, evaporator, organic EL manufacturing system and other high vacuum system.

Model	SC1
Measurable pressure range	$1 \times 10^{-5}$ to $1 \times 10^0$ Pa $7.5 \times 10^{-8}$ – $7.5 \times 10^{-3}$ Torr $1 \times 10^{-7}$ – $1 \times 10^{-2}$ mbar
Accuracy	-50 to +100% ( $1 \times 10^{-4}$ to $1 \times 10^{-1}$ Pa, $7.5 \times 10^{-7}$ – $7.5 \times 10^{-4}$ Torr, $1 \times 10^{-6}$ – $1 \times 10^{-3}$ mbar)
Measurement value output	DC 0 to 10V nonlinear output
Set point	2 points (open collector output)
Serial communication / digital output	None
Power supply voltage	DC 24V±2V
Dimensions	dia. 90 x 145 (C-21)
Sensor head model	C-21 (dia. 18/15), C-23 (ICF034), C-24 (KF16), C-25 (KF25)

Display Unit **G-TRAN series ISG1**

Display for all G-TRAN series and CCMT series.



ISG1

- Usable with all G-TRAN series (excluding serial communication model: SW100-R/ST200-R/SH200-R)
- 3 set points
- DIN standard compact design
- LED display

Model	ISG1
Number of connectable sensor unit	1 unit
Connectable sensor unit	SW100-A, SP1, ST200-A, SH200-A, SC1, CCMT
Indication	Digital display mantissa portion: 2 digit Exponent portion: 1 digit
Measurement value output	DC 0 to 10V
Set point	3 points
Sampling time	70ms
Power supply	DC 24V±1V
Dimensions	DIN 48 x 70 x 96 mm
Applicable standard	CE

# Vacuum Gauge ▶General Purpose Type Vacuum Gauge

## Pirani Vacuum Gauge GP-G series

Constant temperature Pirani vacuum gauge which utilizes heat conductivity of gases.

Bestseller product, more than 150,000 units.



GP-1000G



GP-2001G



GP-1G with case

- Display is included as standard. Analog or digital display.
- Long time experienced sensor head WP series is used. Sensor head is fully compatible with other ULVAC Pirani vacuum gauges.
- Filament is corrosion resistant platinum (Pt).
- Various interface function according to usage : Digital output, serial communication, control output signal (set point), etc.
- For sputtering system, vacuum laminator, vacuum pump carousel system and interlock and sequence control various kind of vacuum manufacturing system, and other rough pumping systems, etc.

Model	GP-1000G	GP-2001G	GP-1GRY(A)	GP-1G	GP-1G with ca
Measurable pressure range	0.4 to 2,700Pa 3 x 10 <sup>-3</sup> to 20Torr 4 x 10 <sup>-3</sup> to 27mbar	0.4 to 3,000Pa 3 x 10 <sup>-3</sup> to 22.5Torr 4 x 10 <sup>-3</sup> to 30mbar	0.4 to 2,700Pa 3 x 10 <sup>-3</sup> to 20Torr 4 x 10 <sup>-3</sup> to 27mbar		
Pressure unit	Pa or Torr	Pa/kPa	Pa or Pa / Torr	Pa or Torr	
Accuracy	±15% (51 to 760Pa, 0.38 to 5.7Torr, 0.5 to 7.6mbar), ±30% (10 to 1,000Pa, 0.075 to 7.5Torr, 0.1 to 10mbar), ±50% (0.4 to 2,700 / 3,000Pa, 3 x 10 <sup>-3</sup> to 20Torr, 4 x 10 <sup>-3</sup> to 27/30mbar)		Within ±3% of the 100% straight scale conversion full scale		
Indication	Digital display (LCD) Mantissa portion: 2 columns/exponent Portion: 1 column	Digital display (LED) 4.5 columns	Analog display		
Measurement value output	DC 0 to 10V linear output	DC 0 to 10V linear output	DC 0 to 10mV non-linear output		
Set point	3 point (relay contact output)	3 point (open collector output)	2 points (relay contact output)	None	
Serial communication / digital output	RS232C / BCD output	None			
Power supply voltage	AC100 to 240V		AC100 to 240V		
Dimensions (display control unit)	50 x 236 x 99mm	99 x 136 x 48mm	100 x 111 x 100mm	100 x 130 x 100mm	150 x 134 x 191mm
Sensor head	WP-01 (dia. 18), WP-02 (dia. 15), WP-03 (R3/8), WP-16 (KF16), WPB-10-034 (ICF034)				
Applicable standard	CE		—		

## Ionization gauge/ XHV Gauge GI-D7 / AxTRAN

Hot cathode ionization vacuum gauge for medium to ultra / extreme high vacuum range.



GI-D7



AxTRAN



### GI series

- Medium to ultra high vacuum range.
- Glass tube and nude type sensor head is available according to your application.
- GI-D7(WIT) is for vacuum heat treatment furnace, vacuum brazing furnace, evaporator (oil diffusion pump), etc. GI-D7(WIB) is for sputtering system, evaporator (turbo molecule pump), various kind of high and ultra-high vacuum system, etc.

### AxTRAN

- Ultra high vacuum to extreme high vacuum range. Lowest range is  $10^{-11}$ Pa ( $10^{-13}$ Torr,  $10^{-13}$ mbar). Wide range measurement from  $0.5 \times 10^{-10}$  to  $1 \times 10^{-2}$ Pa ( $0.4 \times 10^{-12}$  to  $7.5 \times 10^{-5}$ Torr,  $0.5 \times 10^{-12}$  to  $1 \times 10^{-4}$ mbar).
- Bessel box energy filter reduces residual current such as soft x-rays and ESD ions, etc.
- For high-energy accelerators, ultra high and extreme high vacuum equipment, etc.

Product	(Glass type) ionization vacuum gauge		Extremely high vacuum gauge
Model	GI-D7		AxTRAN
Pressure range	WIT: $1.3 \times 10^{-5}$ to $6.7 \times 10^{-11}$ Pa, $1.0 \times 10^{-7}$ to $5 \times 10^{-3}$ Torr, $1.3 \times 10^{-7}$ to $6.7 \times 10^{-3}$ mbar WIB: $1.3 \times 10^{-6}$ to $1.3 \times 10^{-2}$ Pa, $1.0 \times 10^{-8}$ to $1.0 \times 10^{-4}$ Torr, $1.3 \times 10^{-8}$ to $1.3 \times 10^{-4}$ mbar		$0.5 \times 10^{-10}$ to $9.99 \times 10^{-3}$ Pa, $3.7 \times 10^{-12}$ to $7.5 \times 10^{-5}$ Torr, $0.5 \times 10^{-12}$ to $9.99 \times 10^{-5}$ mbar
Pressure unit	Pa or Torr		
Accuracy	$\pm 15\%$		
Display	Digital display (LED) mantissa portion: 3 columns / exponent portion: 2 columns		
Measurement value output	Mantissa portion linear output, quasi-LOG output (DC 0 to 10V)		
Set point	2 points (relay contact output)		
Serial communication	RS232C / BCD output		RS232C / BCD output (option)
Power supply	AC 100 V $\pm 10$ V		AC 85 to 240V
Dimensions (display control unit)	240 x 380 x 99 mm		
Sensor head	WIT-G1(W•dia.18/15), WIT-G8(lr•dia.18/15), WIB-G5(dia.18/15), WIB-N3(ICF070)		X-11 (ICF070)

Vacuum Gauge ▶Smartphone-Direct Gauge

Smartphone-Direct Pirani Gauge SWU10-U

Pirani vacuum gauge which can measure degree of vacuum by connecting your smartphone directly with USB cable. No AC power supply and dedicated display required.



- Direct connection with smartphone: Measure quickly, connect your smartphone (tablet or PC) via USB cable (patent pending). No other component required.
- No AC power supply required: No dedicated power supply required.
- Lightweight and compact: Size:  $\phi 46 \times 81\text{mm}$ , weight: 85g (NW16 spec), ULVAC's smallest, lightest pirani vacuum gauge.
- Excellent shock resistance: ULVAC original structure (patent number 6595945) and body protection rubber.
- Wide range measurement: Measureable pressure range from  $5 \times 10^{-2}$  to  $1 \times 10^{+5}\text{Pa}$  ( $3.75 \times 10^{-4}$  to 760Torr,  $5 \times 10^{-4}$  to 1,013mbar)
- Extensive fittings: 7 fittings available, including NW16 and R1/8.

Model	SWU10-U						
Measurable pressure range	$5 \times 10^{-2}$ to $1 \times 10^{+5}\text{Pa}$ / $3.75 \times 10^{-4}$ to 760 Torr / $5 \times 10^{-4}$ to 1,013 mbar						
Accuracy(*1)	$\pm 10\%$ ( $1 \times 10^{-1}$ to $1 \times 10^{+4}\text{Pa}$ / $7.5 \times 10^{-4}$ to 75Torr / $1 \times 10^{-3}$ to 100mbar) $\pm 20\%$ ( $5 \times 10^{-2}$ to $1 \times 10^{-1}\text{Pa}$ , $1 \times 10^{+4}$ to $1 \times 10^{+5}\text{Pa}$ / $3.75 \times 10^{-4}$ to $7.5 \times 10^{-4}\text{Torr}$ , 75 to 760Torr / $5 \times 10^{-4}$ to $1 \times 10^{-3}\text{mbar}$ , 100 to 1,013mbar)						
Repeatability	$\pm 2\%$ ( $1 \times 10^{-1}$ to $1 \times 10^{+4}\text{Pa}$ / $7.5 \times 10^{-4}$ to 75Torr / $1 \times 10^{-3}$ to 100mbar)						
Filament	Platinum (Pt)						
Burst pressure(*2)	$2 \times 10^{+5}\text{Pa(abs)}$						
Operating temperature range	10 to $40^{\circ}\text{C}$ / 50 to $104^{\circ}\text{F}$						
Operating humidity range	15 to 85% (not condensing)						
Storage temperature	-20 to 65% (not condensing)						
IP rating	IP30						
Fixing position	Free						
Power supply voltage	$\text{DC}5 \pm 5\% 350\text{mA}_{\text{MAX}}$						
I/O connector	USB microB						
Fitting	NW16	NW25	R1/8	$\phi 18$	$\phi 15$	ICF034	Sanitary
Weight	85g	88g	94g	93g	80g	80g	145g
Option	USB2.0 cable (certified product, TypeC-microB, 2.0m)(*3) Inspection certificate, calibration certificate, traceability certificate, JCSS calibration certificate						

- \*1)Value after atmospheric pressure adjustment and zero point adjustment
- \*2)Consider separately burst pressure of flange and clamp, etc.
- \*3)Select TypeC-microB OTG cable when using a commercial USB cable.

Available smartphone(*4)	
Android 6 or later	
Connector: USB TypeC	

\*4)For available smartphone models list, see ULVAC web page.

Application software "UL-MOBI"(*5)	
For smartphone: Download from Google Play	
For PC: Download from ULVAC web page	

Image of "UL-MOBI" on smartphone



Pressure value display

Trend graph display

Data logging function  
Log data is saved as CSV format.  
Sampling interval: Min. 200ms

Image of "UL-MOBI" on PC



# Process Gas Monitor (Residual Gas Analyzer)

## Basic Process Gas Monitor Qulee BGM2 series

For various kind of evaporator and vacuum furnace for quality control and yield ratio improvement.

- Interface : Ethernet
- Residual gas analysis.
- Integrated display does not always require PC for operation. Simple and easy with one touch function.
- Electron stimulated desorption (330V, 5mA) for degas.
- Preventive maintenance function for ion source, secondary electron multiplier and analyzer tube.
- For evaporator, vacuum furnace, organic EL manufacturing system, PV·FPD·semiconductor manufacturing system and other high vacuum systems.



Qulee BGM2-102

Model	BGM2-101	BGM2-201	BGM2-102	BGM2-202
Mass range	1 to 100 amu	1 to 200 amu	1 to 100 amu	1 to 200 amu
Resolution	M/ΔM=1M (10%P.H.)			
Detector	Faraday cup		EM tube /faraday cup	
Sensitivity	1 x 10 <sup>-7</sup> A/Pa, 1.33 x 10 <sup>-5</sup> A/Torr, 1 x 10 <sup>-5</sup> A/mbar		4 A/Pa, 532 A/Torr, 400 A/mbar	
Minimum detectable partial pressure	1 x 10 <sup>-8</sup> Pa, 7.5 x 10 <sup>-11</sup> Torr, 1 x 10 <sup>-10</sup> mbar		1 x 10 <sup>-12</sup> Pa, 7.5 x 10 <sup>-15</sup> Torr, 1 x 10 <sup>-14</sup> mbar	
Maximum operating pressure	1 x 10 <sup>-2</sup> Pa, 7.5 x 10 <sup>-5</sup> Torr, 1 x 10 <sup>-4</sup> mbar			
Maximum bake out temperature	120°C, 248F (when analyzer tube is connected) 250°C, 482F (without analyzer tube)			
Interface	Ethernet			
Software	Qulee QCS Ver.4.2 later (Windows 8/10/11 supported)			
Applicable standard	CE			

## High Performance Process Gas Monitor Qulee HGM2 series

For research & development equipment.

- Interface : Ethernet
- Highest sensitivity 2.5 x 10<sup>-6</sup> A/Pa (3.3 x 10<sup>-4</sup> A/Torr, 2.5 x 10<sup>-4</sup> A/mbar) .
- Measurable while baking at 250°C (482F) or below. Maximum 300°C (572F) when analyzer tube is disconnected.
- Electron stimulated desorption (330V, 5mA) for degas.
- Preventive maintenance function for ion source, secondary electron multiplier and analyzer tube.
- For thermal desorption gas analysis, residual gas analysis for extreme high and ultra high vacuum equipments, organic compound analysis and environmental analysis, etc.



Qulee HGM2-202

Model	HGM2-202		HGM2-302	
Mass range	1 to 200 amu		1 to 300 amu	
Resolution	M/ΔM=1M (10%P.H.)			
Detector	Faraday cup	EM tube	Faraday cup	EM tube
Sensitivity	2.5 x 10 <sup>-6</sup> A/Pa 3.3 x 10 <sup>-4</sup> A/Torr 2.5 x 10 <sup>-4</sup> A/mbar	4 A/Pa 532 A/Torr 400 A/mbar	2 x 10 <sup>-6</sup> A/Pa 2.6 x 10 <sup>-4</sup> A/Torr 2 x 10 <sup>-4</sup> A/mbar	4 A/Pa, 532 A/Torr 400 A/mbar
Minimum detectable partial pressure	1 x 10 <sup>-9</sup> Pa 7.5 x 10 <sup>-12</sup> Torr 1 x 10 <sup>-11</sup> mbar	1 x 10 <sup>-13</sup> Pa 7.5 x 10 <sup>-16</sup> Torr 1 x 10 <sup>-15</sup> mbar	1 x 10 <sup>-9</sup> Pa 7.5 x 10 <sup>-12</sup> Torr 1 x 10 <sup>-11</sup> mbar	1 x 10 <sup>-13</sup> Pa 7.5 x 10 <sup>-16</sup> Torr 1 x 10 <sup>-15</sup> mbar
Maximum operating pressure	1 x 10 <sup>-2</sup> Pa, 7.5 x 10 <sup>-5</sup> Torr, 1 x 10 <sup>-4</sup> mbar			
Maximum bakeout temperature	250°C, 482F (when analyzer tube is connected) 300°C, 572F (without analyzer tube)			
Interface	Ethernet			
Software	Qulee QCS Ver.4.2 later (Windows 8/10/11 supported)			
Applicable standard	CE			

## Compact Process Gas Monitor Qulee CGM2 series

For sputtering system for process control, quality control and yield ratio improvement.

- No differential pumping system required for process monitoring up to 1Pa (7.5 x 10<sup>-3</sup> Torr, 1 x 10<sup>-2</sup> mbar).
- Integrated display does not always require PC for operation. Simple and easy with one touch function.
- Electron stimulated desorption (330V, 5mA) for degas.
- Preventive maintenance function for ion source, secondary electron multiplier and analyzer tube.
- For sputtering system.



Qulee CGM2-051/101

Model	CGM2-051	CGM2-101	CGM2-052	CGM2-102
Mass range	1 to 50 amu	1 to 100 amu	1 to 50 amu	1 to 100 amu
Resolution	M/ΔM=1M (10%P.H.)			
Detector	Faraday cup		EM tube /faraday cup	
Sensitivity	1 x 10 <sup>-7</sup> A/Pa, 1.33 x 10 <sup>-5</sup> A/Torr, 1 x 10 <sup>-5</sup> A/mbar		1 x 10 <sup>-4</sup> A/Pa, 1.33 x 10 <sup>-2</sup> A/Torr, 1 x 10 <sup>-2</sup> A/mbar	
Minimum detectable partial pressure	1 x 10 <sup>-7</sup> Pa, 7.5 x 10 <sup>-10</sup> Torr, 1 x 10 <sup>-9</sup> mbar		1 x 10 <sup>-10</sup> Pa, 7.5 x 10 <sup>-13</sup> Torr, 1 x 10 <sup>-12</sup> mbar	
Maximum operating pressure	2Pa, 1.5 x 10 <sup>-2</sup> Torr, 2 x 10 <sup>-2</sup> mbar		1 x 10 <sup>-2</sup> Pa, 7.5 x 10 <sup>-5</sup> Torr, 1 x 10 <sup>-4</sup> mbar (SEM) 2Pa, 1.5 x 10 <sup>-2</sup> Torr, 2 x 10 <sup>-2</sup> mbar (FC)	
Maximum bake out temperature	120°C, 248F (when analyzer tube is connected) 250°C, 482F (without analyzer tube)			
Interface	Ethernet			
Software	Qulee QCS Ver.4.2 later (Windows 8/10/11 supported)			
Applicable standard	CE			

# Process Gas Monitor (Residual Gas Analyzer)

## Process Gas Monitor with Pumping System/ Vacuum model

## Qulee with YTP—H

For wide range of usage from process control, residual gas analysis of various vacuum equipments to R&D.



Qulee with YTP-H  
Vacuum model

- Excellent cost performance : From processing monitoring to residual gas analysis by single unit.
- BGM2-101 and 102 for 1-100amu, BGM2-201 and 202 for 1-200 amu and HGM2-302 for 1-300 amu.
- The analytical pressure can be selected from 3000 Pa, 500 Pa, 100 Pa, 10 Pa, 1 P or VLV specifications.compact design : Utilizes standard vacuum unit model desktop YTP.
- Low noise : 43dB(A) or less at Ultimate pressure.

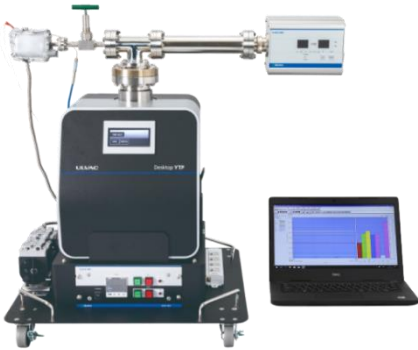
Process gas monitor	Select from BGM2-101, BGM2-102, BGM2-201, BGM2-202, HGM2-302	
Maximum operation pressure	Select from, 3,000,500,100,10,1Pa / 22.5,3.75,7.5,0.75,0.075Torr / 30,5,1.0,1.0,0.1mbar	
Gas introduction system (Vacuum type) (3000 to 1Pa, 22.5 to 0.075Torr, 30 to 0.01mbar)	Manual bellows valve (2 way), Flange : IFC070	
Pump unit desktop YTP (YTP70A-D)	Turbo Molecular Pump	70L/s (N <sub>2</sub> )
	Dry pump	20L/min
	Ultimate pressure	Below 10 <sup>-6</sup> Pa
Power supply	Single phase AC100-240V, 300W (Vacuum type)	
Software	Qulee QCS Ver.4.2 later (Windows 7/8/10/11 supported)	

\* Pumping system desktop YTP, Qulee main unit, gas inlet and other parts are packaged separately. Please refer to the assembly manual for set up.

## Process Gas Monitor with Pumping System/ Atmospheric pressure specification model

## Qulee with YTP—H

For wide range of usage from process control, residual gas analysis of various vacuum equipments to R&D.



Qulee with YTP-H  
Atmospheric pressure specification Model

- Excellent cost performance : From processing monitoring to residual gas analysis by single unit.
- BGM2-101 and 102 for 1-100amu, BGM2-201 and 202 for 1-200 amu and HGM2-302 for 1-300 amu.
- Able to measure atmospheric pressure
- Compact design : Utilizes standard vacuum unit model desktop YTP.
- Low noise : 43dB(A) or less at Ultimate pressure.

Process gas monitor	Select from BGM2-101, BGM2-102, BGM2-201, BGM2-202, HGM2-302	
Maximum operation pressure	Atmospheric pressure	
Atmospheric pressure sampling unit (atmospheric pressure)	Dry vacuum pump	DAP-6D, ultimate pressure: 6700Pa, 50Torr, 67mbar
	Control unit	APS-001
	Capillary unit	Manual bellows valve (1 way): Joint 1/4" Swagelok
Pump unit desktop YTP (YTP70A-D)	Turbo Molecular Pump	70L/s (N <sub>2</sub> )
	Dry pump	20L/min
	Ultimate pressure	Below 10 <sup>-6</sup> Pa
Power supply	Single phase AC100-240V, 300W (Vacuum type)	
Software	Qulee QCS Ver.4.2 later (Windows 7/8/10/11 supported)	

\* Pumping system desktop YTP, Qulee main unit, gas inlet and other parts are packaged separately. Please refer to the assembly manual for set up.

# Reactive Process Gas Monitor Qulee RGM2 series

For etching and CVD system for process control, quality control, yield ratio improvement and end point monitoring.



Qulee RGM2-201F

- Stable and long-time measurement in reactive gases or corrosive gases environment.
- Adoption of a magnetic closed-type ion source: Soft ionization with minimal gas deviation, long lifespan, and two filaments.
- Compact size: Integrated exhaust and control systems, allowing for vertical placement, considering the footprint.
- Outstanding maintenance: Ion source replacement can be done in approximately 10 minutes.
- For process monitoring residual gas analysis and leak test for etching system and CVD system.

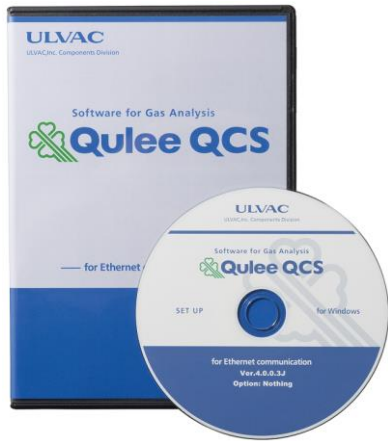
Model	RGM2-201F
Mass range	1 to 200 amu
Resolution	M/ΔM=1M (10%P.H.)
Detector	Faraday cup
Sensitivity (EM tube)	2 x 10 <sup>-6</sup> A/Pa
	2.67 x 10 <sup>-4</sup> A/Torr
	2 x 10 <sup>-4</sup> A/mbar
Minimum detectable partial pressure	1 x 10 <sup>-10</sup> Pa, 7.5 x 10 <sup>-13</sup> Torr, 1 x 10 <sup>-12</sup> mbar
Sampling pressure	0.1 to 500 Pa (adjustable depending on the selected orifice)
Total pressure measurement function	Capable
Ion source / filament	Closed ion source with magnet / V-shaped filament Ir/Y <sub>2</sub> O <sub>3</sub> (2 piece)
Maximum Baking Temperature	110±10°C (Standard Equipped with Dedicated Block-Type Heater Unit)
Interface	Ethernet
Software	Qulee QCS Ver.4.2 later (Windows 8/10/11 supported)



# Process Gas Monitor (Residual Gas Analyzer)

## Software for Gas Analysis Qulee QCS

Standard software for Qulee series.



- Standard software for all Qulee series. (Windows 8/10/11 supported)
- User-friendly with many shortcut buttons on the screen.
- Various measurement mode such as scan mode, trend mode, analog mode, sensitivity-calibration mode, etc.
- Ethernet support for up to 16 simultaneous Qulee measurements (any combination of Qulee series).
- For all Qulee series.

Model	Qulee QCS Ver.4.2
OS	Microsoft Windows 8/10/11
Interface	Ethernet
Connectable quantity	Maximum 16. Any type of Qulee series are connectable.
Supported model	Qulee BGM2 / Qulee HGM2/ Qulee CGM2 / Qulee RGM2 / Qulee with YTP-H
Recipes to save	100 (user area 70)
Measurement speed	50, 100, 200, 500, 1,000, 2,000 ms
Analog input	0 to 10V ( 2 points)
Partial pressure set point	2ch partial pressure set point (error and warning) setting (trend mode only)
PC required specifications	HDD: 2MB (measurement data excluded.), RAM: 256MB or more, display area: 1024 x 768 or more, CD-ROM Drive
	Ethernet port, CPU:Corei5 or higher,(8 units or more/Corei7 or higher)



Vacuum Pump	Vacuum Valve	Vacuum Gauge	Process Gas Monitor	Leak Detector	Power Supply (V, W)	EB Power Supply / EB Source	Deposition Controller	Thin Film Measurement	Accessories	Vacuum Transfer Robot	Cryogenic Equipment
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Leak Detector

Leak Detector HELIOT900 series

HELIOT 900 series is a leak detector which has high speed pumping capability and user-friendliness.  
The search gases are helium gas and hydrogen.



HELIOT901W1/D2



HELIOT904W2/D3/D4



HELIOT901+Cart



- High speed pumping capability 5L/sec helium in ULTRA flow mode.
- Tablet wireless remote control as standard.
- Simple and eye-friendly high-definition screen.
- Backing pump is selectable from oil rotary pump and dry scroll pump in different sizes.
- Mobile-friendly with maneuverable cart (904 series) and low height floor cart (901 series).
- Easy maintenance. Tool-free removal panel, easy access to each part and maintenance instruction movies installed.
- Aside from helium, hydrogen detection is possible in vacuum method.

Model			901W1	901D2	904W2	904D3	904D4
Body type			Portable			Mobile	
Detectable gas			<sup>4</sup> He, <sup>2</sup> H <sub>2</sub>				
Minimum detectable leak rate ( <sup>4</sup> He)			<5E-13 Pa·m <sup>3</sup> /sec, <5E-12 mbar·L/sec, <5E-12 Torr·L/sec				
Leak rate display range	<sup>4</sup> He	ULTRA	0.01E-12 to E-6 Pa·m <sup>3</sup> /sec, 0.01E-11 to E-5 mbar·L/sec, 0.01E-11 to E-5 Torr·L/sec				
		FINE	0.01E-10 to E-5 Pa·m <sup>3</sup> /sec, 0.01E- 9 to E-4 mbar·L/sec, 0.01E- 9 to E-4 Torr·L/sec				
		GROSS	0.01E- 8 to E-3 Pa·m <sup>3</sup> /sec, 0.01E- 7 to E-2 mbar·L/sec, 0.01E- 7 to E-2 Torr·L/sec				
	<sup>2</sup> H <sub>2</sub>	FINE	0.01E- 8 to E-5 Pa·m <sup>3</sup> /sec, 0.01E- 7 to E-4 mbar·L/sec, 0.01E- 7 to E-4 Torr·L/sec				
Inlet pumping speed ( <sup>4</sup> He)[L/sec]		ULTRA	5				
		FINE	1				5
Maximum connecting pressure		ULTRA	<2 Pa, <0.02 mbar, <0.015 Torr				
		FINE	<100 Pa, <1 mbar, <0.75 Torr				
		GROSS	<1,200 Pa, <12 mbar, <9 Torr				
Main pump : pumping speed [L/sec]			Turbo molecule pump :31				
Backing pump speed (50Hz/60Hz)			Oil rotary pump: 30/36 L/min, 1.8/2.2 m <sup>3</sup> /h, 1.1/1.3 cfm	Dry scroll pump: 90/108 L/min, 5.4/6.5 m <sup>3</sup> /h, 3.2/3.8 cfm	Oil rotary pump: 135/162 L/min, 8.1/9.7 m <sup>3</sup> /h, 4.8/5.7 cfm	Dry scroll pump: 250/300 L/min, 15/18 m <sup>3</sup> /h, 8.8/10.6 cfm	Dry scroll pump: 500/600 L/min, 30/36 m <sup>3</sup> /h, 17.6/21.2 cfm
Weight (including floor cart) [kg]			About 33 (about 46)	About 37 (about 50)	About 79	About 74	About 96
Dimensions W x D x H [mm] (floor cart included.)			320 x 480 (652) x 505.5 (917)			444 x 660 x 991	
Power consumption [VA]			600	500	1100	650	1150
Power supply [V]			Single phase 100 to 120 or 200 to 240				
Inlet port flange			KF25				
Start-up time [min]			<2				
External interface			RS232C, RS485, analog DC output, digital input output				
Display language			Japanese, Chinese, Korean, Chinese (simplified character), Chinese (traditional character), German, Spanish, Russian				
Controller unit			7inch tablet-type industrial computer (wireless standard :IEEE 802.11 b/g/n) (*1)				
	Operation range [m]	Cable	Cable length : 2 (standard attachment), 5 (optional)				
		Wireless	40 (*2)				
Battery lasting time [hr]			3 to 5 (*3)				
Operating temperature range [°C]			10 to 40 (non condensation.)				
Applicable standard			CE, IP30			CE	

\*1) Applicable radio law. 1) Tablet: Telec, CE, FCC. 2) Main unit: Telec, CE, FCC, IC, C-TICK. 3) "Wired operation spec" that doesn't emit radio waves is also available (tablet controller has wireless radio on/off function). \*2) May change depending on operating environment. \*3) May change depending on communication condition, brightness, volume, etc. \*4) Be careful about inrush current. Check if specification is sufficient when using drum reel.

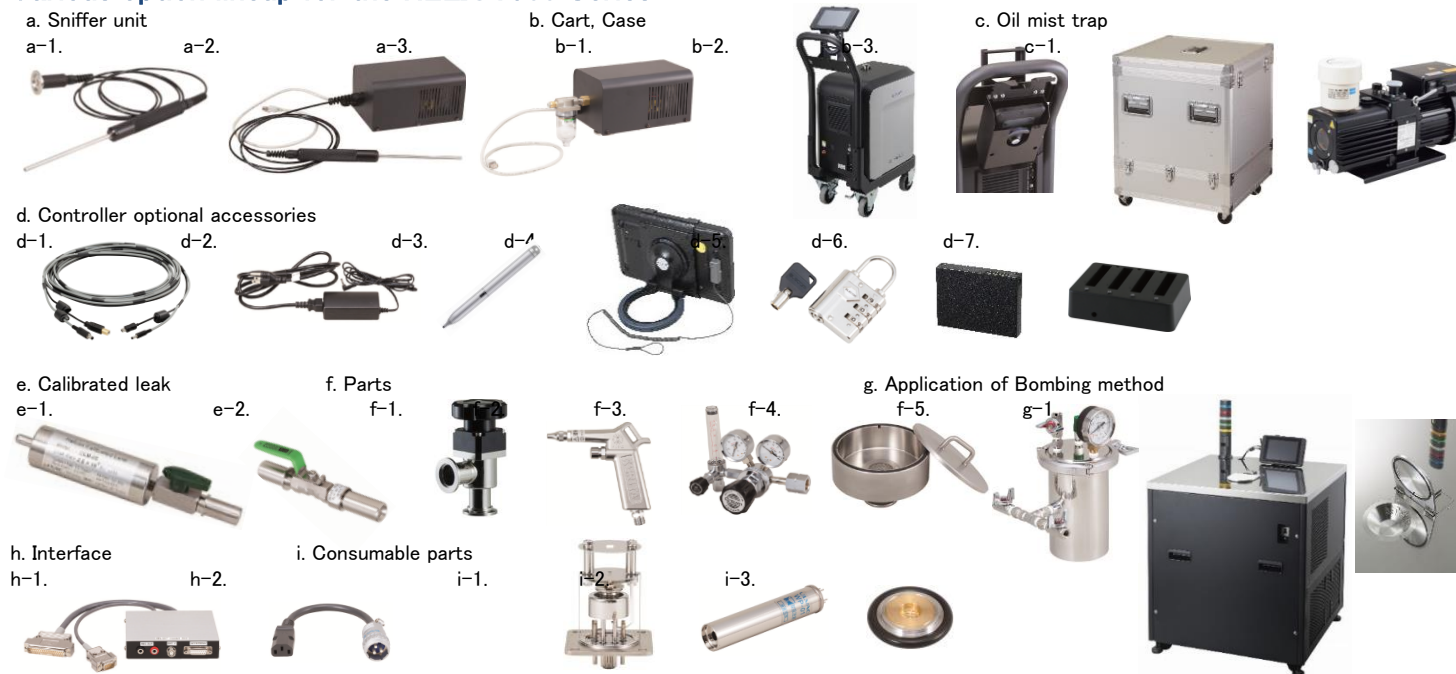
Sniffer

Model	AS9	BS9	BT9
Detectable gas	<sup>4</sup> He		
Leak rate display range	0.01E-8 to E-5 Pa·m <sup>3</sup> /sec, 0.01E-7 to E-4 mbar·L/sec, 0.01E-7 to E-4 Torr·L/sec		0.01E-7 to E-3 Pa·m <sup>3</sup> /sec, 0.01E-6 to E-2 mbar·L/sec, 0.01E-6 to E-2 Torr·L/sec
Flow rate [SLM]	<0.03		About 3
Sniffing inlet port	Handy probe		dia. 6mm hose joint
Tube [m]	1 to 10		

# Leak Detector

## Optional accessories for HELIOT900 series

### Various option lineup for the HELIOT900 Series



a. Sniffer unit	
a-1	AS unit
a-2	BS unit
a-3	BT unit
b. Cart, Case	
b-1	Low height cart for 901 series.
b-2	Controller storage box. *Low height cart is necessary to fix this box in case of 901 series.
b-3	Carrying case for 901 series *901 series with low height cart is not stored in this case.
c. Oil mist trap	
c-1	Oil mist trap for 904W2.
d. Controller optional accessories	
d-1	Controller cable set 5m
d-2	Charger for the controller (input: 100 to 240V)
d-3	Touch pen for the controller
d-4	Alarm security wire set including mounting bracket to the HELIOT, excluding lock.
d-5	Dial combination lock including master key
d-6	Battery for the controller
d-7	Battery charger

e. Calibrated leak	
e-1	Calibrated leak membrane type: E-7, E-8, E-9, E-10 [ $\text{Pa} \cdot \text{m}^3/\text{sec}$ ]
e-2	Calibrated leak channel type: E-4, E-5, E-6 [ $\text{Pa} \cdot \text{m}^3/\text{sec}$ ], Vacuum method or sniffer method.
f. Parts	
f-1	Manual angle type valve: KF25-KF25
f-2	Helium spray gun
f-3	Helium regulator (applicable only for Japanese domestic helium cylinder)
f-4	Test chamber: dia. 96mm x H30mm inside dimension
f-5	Bombing tank: dia. 95.5mm x H160mm inside dimension. Pressure range < 0.5MPaG
g. Application of Bombing method: for closed container	
g-1	Console unit
h. Interface	
	I/O connector set : Rec. Out, EXT.I/O
h-1	Signal conversion unit for the HELIOT300 series.
h-2	Power supply conversion cable: for the HELIOT700 / 710 series and HELIOT300 series.
i. Consumable parts	
i-1	Ion source
i-2	Pirani vacuum gauge sensor head
i-3	Micro separator: for Sniffer-BS unit and -BT unit

## Integration type Leak Detector HELIOT ZERO

Leak detector specially designed for system integration.



- Analyzer and control unit can be separated up to 30 meters.
- Analyzer unit can be mounted in any orientation.
- Small footprint.
- Sniffer method (optional).

Model	HELIOT ZERO
Detectable gas	$^4\text{He}$
Vacuum method detection range	E-12 to E-3 $\text{Pa} \cdot \text{m}^3/\text{sec}$ E-11 to E-2 $\text{Torr} \cdot \text{L}/\text{sec}$ E-11 to E-2 $\text{mbar} \cdot \text{L}/\text{sec}$
Sniffer method detected range	E-8 to E-3 $\text{Pa} \cdot \text{m}^3/\text{sec}$ E-7 to E-2 $\text{Torr} \cdot \text{L}/\text{sec}$ E-7 to E-2 $\text{mbar} \cdot \text{L}/\text{sec}$
Test port / fore line port	KF16
Language	Japanese, English, Chinese (simplified character)
Power supply [V] / power consumption [W]	Single phase AC90 to 240 (50/60Hz) / 700
Weight	Analysis unit + Test port unit [kg] Approx. 7.4 Power supply unit + Display unit [kg] Approx. 10.5
Cable length between analyzer unit and power supply unit [m]	Max. 10
Cable length between power supply unit and display unit [m]	Max. 20
Applicable standard	CE, IP30:Power supply unit, IP20:Analyzer unit, IP65:Display unit

# Power Supply (DC/RF) ▶DC Power Supply

## High Power DC Power Supply DC series

10kW / 20kW for sputtering system



DC-10/20

- High reliability design based on long time experienced ULVAC know-how.
- Stable process is ensured by excellent arc handling by ULVAC who is also vacuum process equipment supplier and has full knowledge about plasma processes.
- Extremely low ark energy by utilizing an optional high-speed arc shutoff circuit. It contributes to high productivity and improves manufacturing yield.
- 800V and 1000V are available. High-impedance load resistance.
- 400V class input corresponding model is also lined up.

Model		DC-10-AM	DC-10-H-AM	DC-10-4-AM	DC-20	DC-20-H-AM	DC-20-4-AM	
Input specification	Rated input voltage	3-Phase 187 to 229VAC			3-Phase AC342 to 440V	3-Phase 187 to 229VAC		3-Phase AC342 to 440V
	Input capacity	13.5kVA or less				25kVA or less		
Output specification	Maximum rated power	10kW				20kW		
	Rated current	25A	18A	25A	50A	40A	50A	
	Rated voltage	-800V	-1000V	-800V	-800V	-1000V	-800V	
	Abnormal discharge control	Shutoff by inverter stop or high-speed arc shutoff circuit*1 when abnormal discharge is detected						
Control	Control method	Constant power control (P control)/constant current control (I control)/constant voltage control (V control)						
	Control precision	Constant power control (P Control) : Below ±0.5% of the rated output or ±1% of the set value, whichever is larger. constant current control (I Control) : Below ±1% of the rated output or ±2% of the set value, whichever is larger. constant voltage control (V Control) : Below ±1% of the rated output or ±2% of the set value, whichever is larger.						
	Control compensation range	Constant power control, 10 to 100% of rated power value						
	Parallel operation	Up to 12units can be controlled by master/slave communication*2						
	External interface	analog/digital,RS-232C or 485						
Cooling method		Forced air-cooling						
Dimension W x D x H		483mm x 630mm x 133mm (excluding protrusions)						
Weight		29kg				36kg		
Applicable standard		CE/ SEMI F47/ RoHS						

## High Power DC Power Supply DC-30-H

30kW high-impedance DC power supply

- Extremely low ark energy by utilizing an optional high-speed arc shutoff circuit. It contributes to high productivity and improves manufacturing yield.
- 1200V output with high-impedance load resistance.
- EtherCAT communication is available.

Model		DC-30-44H-E
Input specifications	Input voltage	3 phase AC 396 to 484V
	Input capacity	41.5kVA or less
Output specifications	Rated power	30kW
	Rated current	55A
	Rated voltage	-1200V
	Ignition voltage	-1500V
Control	Abnormal discharge control	Stop the inverter or shutoff with high-speed arc shutoff circuit when abnormal discharge is detected.
	Control method	Rated power control (P Control ) Rated current control (I Control ) Rated voltage control (V Control )
	Control precision	P Control: Less than $\pm 0.5\%$ of the rated output or $\pm 1\%$ of the set value, whichever is larger. I Control: Less than $\pm 1\%$ of the rated output or $\pm 2\%$ of the set value, whichever is larger. V Control: Less than $\pm 1\%$ of the rated output or $\pm 2\%$ of the set value, whichever is larger.
	Control guarantee scope	10 to 100% of rated power value
	External interface	RS-232C or 485, EtherCAT
Parallel operation		Maximum up to 12 units
Cooling method		Forced air cooled
Dimensions W x D x H		483 x 650 x 177mm (excluding protrusions)
Weight		45kg
Applicable standard		CE/ SEMI F47/ RoHS

EtherCAT



DC-30-44H-E

High Power DC Power Supply DC series

10kW / 20kW for sputtering system



DC-10-D/20-D

- High reliability design based on long time experienced ULVAC know-how.
- Stable process is ensured by excellent arc handling by ULVAC who is also vacuum process equipment supplier and has full knowledge about plasma processes.
- Extremely low ark energy by utilizing an optional high-speed arc shutoff circuit. It contributes to high productivity and improves manufacturing yield.
- 800V and 1000V are available. High-impedance load resistance.
- 400V class input corresponding model is also lined up.

Model		DC-10-D	DC-10-HD	DC-20-D	DC-20-HD
Input specification	Rated input voltage	3-Phase 187 to 229VAC		3-Phase 187 to 229VAC	
	Input capacity	13.5kVA or less		25kVA or less	
Output specification	Maximum rated power	10kW		20kW	
	Rated current	25A	18A	50A	40A
	Rated voltage	-800V	-1000V	-800V	-1000V
	Abnormal discharge control	Shutoff by inverter stop or high-speed arc shutoff circuit*1 when abnormal discharge is detected			
Control	Control method	Constant power control (P control)/constant current control (I control)/constant voltage control (V control)			
	Control precision	Constant power control (P Control):Below ±0.5% of the rated output or ±1% of the set value, whichever is larger. constant current control (I Control):Below ±1% of the rated output or ±2% of the set value, whichever is larger. constant voltage control (V Control):Below ±1% of the rated output or ±2% of the set value, whichever is larger.			
	Control compensation range	Constant power control, 10 to 100% of rated power value			
	Parallel operation	Up to 12units can be controlled by master/slave communication*2			
	External interface	analog/digital,RS-232C or 485			
Cooling method		Forced air-cooling			
Dimension W x D x H		483mm x 630mm x 133mm (excluding protrusions)			
Weight		29kg		36kg	
Applicable standard		CE/ SEMI F47/ RoHS			

ULVAC's DC power supply makes it possible 4 options



High speed ARC handling

Would you like to improve the efficiency of pre-sputtering processes and Improvement of processes that are difficult to maintain discharge due to interruption of abnormal discharge

High performance RAMP

Problems with transient phenomena are improved by changing the way Ignition is applied before the start of discharge, instead of the conventional RAMP operation after the start of discharge.

SACR

Superior performance ARC handling

ARC cut-off time is not cut off for a set time, but an era where the power supply judges according to the load situation.

“Change the vacuum process with power Supply”

High Control accuracy

Realization of high reproducibility that suppresses variations in the output of the power supply for delicate processes and the guaranteed wide range of output required when processing multiple processes



Power Supply (DC/RF) ▶DC Power Supply

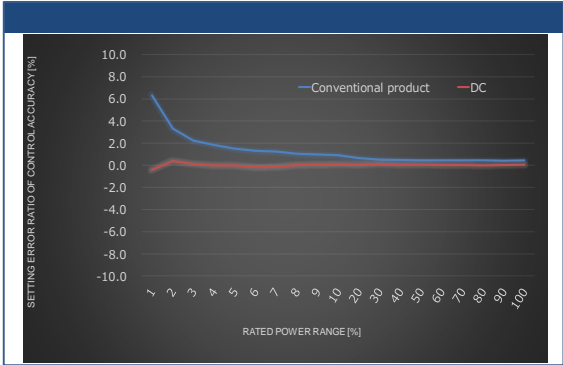
Low Power DC Power Supply DC series

2kW/4kW for sputtering system



DC-2/4

- Highly accurate output characteristics in the range of 1% to 100% rated power.
- Higher quality sputtering process is ensured by excellent repeatability.
- High reliability design based on long time experienced ULVAC know-how.



Model		DC-2	DC-4
Input specification	Rated input voltage	3phase AC180 to 242V	
	Input capacity	3.5kVA or less	6.2kVA or less
Output specifications	Rated power	2kW	4kW
	Rated current	5A	10A
	Rated voltage	-800V	
	Ignition voltage	-1200V	
	Abnormal discharge control	Shut-off by resonant circuit or inverter stop when abnormal discharge is detected.	
Control	Control method	Constant power control (P control)/constant current control (I control)/constant voltage control (V control)	
	Control precision	±1% of the set value	
	Control guarantee scope	1 to 100% of rated power value	
	External interface	Analog/Digital,RS-232C or 485	
Parallel operation		None	
Cooling method		Forced air cooled	
Dimensions W x D x H		241x610x133mm (excluding protrusions)	
Weight		15kg	
Applicable standard		CE	

Low Power DC Power Supply DCS series

500W / 2kW / 4kW for sputtering system

- It provides a stable process with high reliability performance proved by more than 20 years experience.
- Excellent repetitive and repeatable output ensures higher quality sputtering processes.



DCS0052B

Model		DCS0052B
Input specifications	Input voltage	Single phase AC95 to 121V/AC190 to 242V
	Input capacity	1kVA
Output specifications	Maximum rated power	500W
	Rated current	1.25A
	Rated voltage	-800V
	Abnormal discharge control	Stop the Inverter when abnormal discharge is detected.
Control	Control method	Rated Power Control (P Control) / Rated Current Control (I Control) / Rated Voltage Control (V Control)
	Control precision	Rated power control (P Control) : Less than ±2% of the rated power value.
		Rated current control (I Control) : Less than ±1% of the rated current value.
		Rated voltage control (V Control) : Less than ±1% of the rated voltage value.
	Control guarantee scope	10% to 100% of the rated output value
Parallel operation		None
Cooling method		Forced air cooled
Dimensions W x D x H		240 x 450 x 99mm (excluding protrusions)
Weight		9kg



## Abnormal Discharge Prevention Unit **A2K series**

A2K series is the accessory of DC power supply which neutralize the charge built up on the cathode (target) by charging positive voltage pulse to DC power output in the reactive sputtering processes.



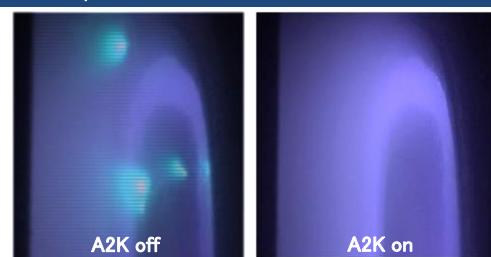
A2KH-25



A2K-20K/40K

- High reliability design based on long time experienced ULVAC know-how.
- Adding A2K series to the existing DC power supply improves productivity and throughput.
- Long time experienced ULVAC arc handling technology minimizes arc energy.

Comparison arc conditions on the cathode surface



Model		A2KH-25	A2K-20K	A2K-40K
Control electrical power input specifications	Input voltage	Single phase AC90 to 110V	Single phase AC90 to 264V	
	Input capacity	100VA	400VA	
	Maximum operating voltage	-800V		
Input specifications	Maximum operating current	25A	50A	100A
	Input structure	MS3106B 22-2P	One quick connection connector	Two quick connection connectors
Output specifications	Oscillation frequency	When pulse range is 5 $\mu$ s: 2, 5, 10, 15, 20kHz When pulse range is 10 $\mu$ s: 1, 2.5, 5, 7.5, 10kHz	1k to 50kHz	
	Reverse pulse range	5 $\mu$ s/10 $\mu$ s (Internal Switch Switching)	3 to 18 $\mu$ s (Setting range limited by oscillation frequency)	
	Output structure	MS3106B 22-2S	One-touch Connector	
Parallel operation		None	Maximum up to 6 units (with same model only)	
Cooling method		Forced air cooled		
External dimensions W x D x H		238 x 450 x 149mm (excluding protrusions)	483 x 630 x 177mm (excluding protrusions)	
Weight		16kg	30kg	45kg
Applicable standard		—	CE	

## Bipolar unit for dual cathode **MFU series**

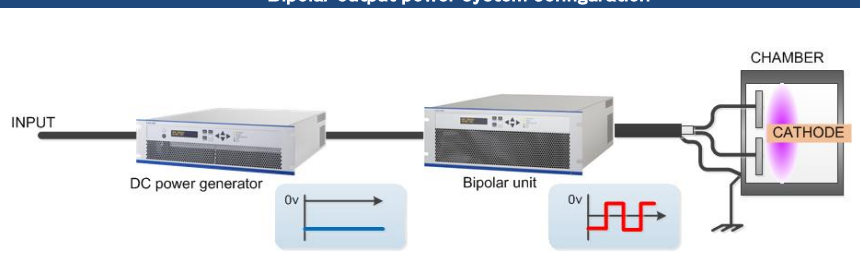
MFU series is designed for bipolar output power system for dual cathode.



MFU-20K

- High reliability design based on long time experienced ULVAC know-how.
- Wide range oscillation frequency, 10k to 100kHz, supports various processes.
- Square wave makes duty cycle changeable and power supply to each cathode adjustable for more stable processes.

Bipolar output power system configuration



Model		MFU-20K
Control power input	Input voltage	Single phase AC 90 to 264V
	Input capacity	400VA
Input specifications	Operating voltage	0 to -1000V
	Ignition voltage	-1200V
	Maximum operating current	50A
Output specifications	Maximum voltage	1000V (RMS) (oscillation frequency limited when output voltage is over 800V)
	Ignition voltage	DC -1200V
	Maximum current	50A
	Oscillation frequency	10k to 100kHz (output current and voltage limited when oscillation frequency is 60kHz or more)
	Duty cycle	10 to 90% (setting range limited by oscillation frequency)
Parallel operation		Maximum up to 6 units
Cooling method		Forced air cooled
Dimensions W x D x H		483 x 630 x 177mm (excluding protrusions)
Weight		29kg
Applicable standard		CE

DC Pulse Power Supply DC-Pulse series

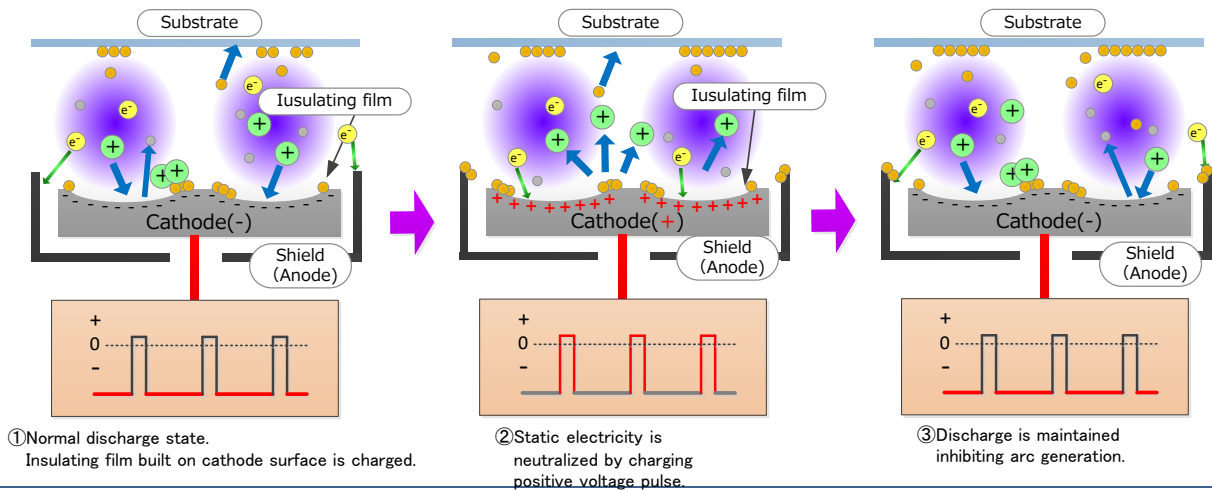
DC pulse power supply which neutralize the charge built up on the cathode (target) by charging positive voltage pulse to DC power output in the reactive sputtering processes.



DC-5-P/10-P

- High reliability design based on long time experienced ULVAC know-how.
- High throughput process is available because of high power input by suppressing abnormal discharge.

Principle of abnormal discharge suppression in reactive sputtering



Model		DC-5-P	DC-10-P
Input specifications	Input voltage	3 phase AC187 to 229V	
	Input capacity	8kVA	13.5kVA
Output specifications	Maximum rated power	5kW	10kW
	Rated current	12.5A	25A
	Rated voltage	650V (Oscillation frequency more than 155kHz ) / 800V (Oscillation frequency less than150kHz )	
	Ignition voltage	1500V	
	Oscillation frequency	5k to 250kHz	
	Reverse pulse range	0.4 μ to 5 μ s (Setting range limited by oscillation frequency)	
Control	Control method	Rated electric power control (P Control) / Rated current control (I Control) / Rated voltage control (V Control)	
	Control precision	Less than ±0.5% of rated output or ±1% of the set value, whichever is larger.	
	Control guarantee scope	10 to 100% of rated electric power value.	
Parallel operation		Maximum up to 6 units (with same model only)	
Cooling method		Forced air cooled	
Dimensions W x D x H		483 x 630 x 133mm (excluding protrusions)	
Weight		29kg	36kg
Applicable standard		CE	

RF Power Supply / Matching Box RFS-N series

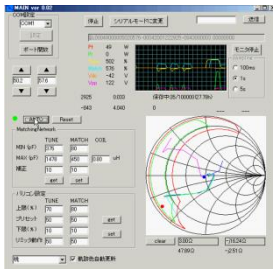
High frequency power supply for plasma generation in LCD and Semiconductor manufacturing systems.



RFS-1305N/1310N

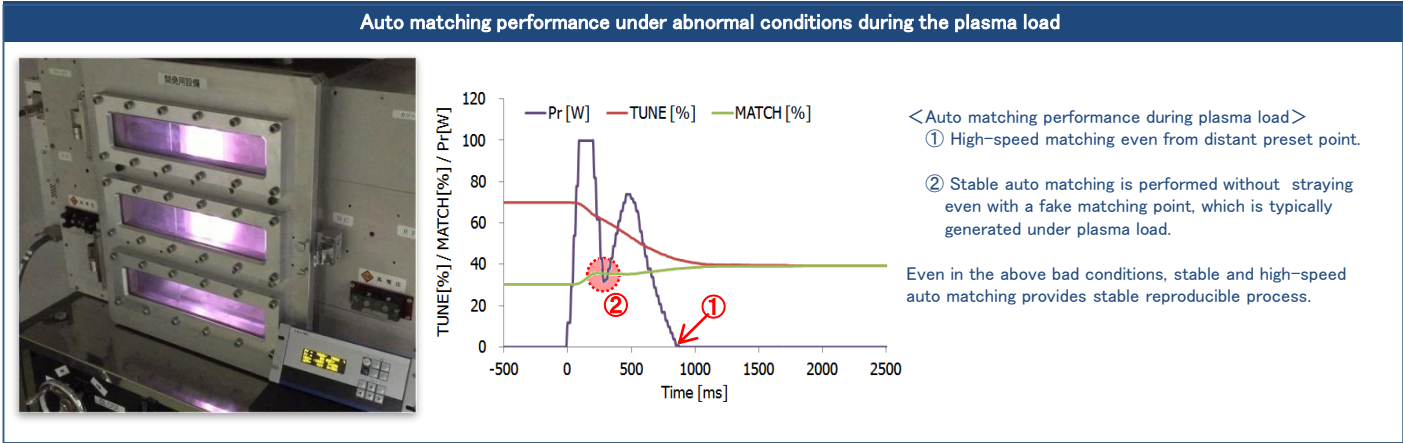


RFS-1330N/1350N



Matching Assistant Tool

- 0.5kW, 1kW, 3kW, 5kW at 13.56MHz.
- High reliable design based on long time experienced ULVAC know-how.
- Simple configuration with the built-in auto-matching controller.
- Stable process is committed by stable auto-matching function which tracks the plasma unique impedance fluctuation through ULVAC original algorithm.
- Matching conditions can be monitored by the optional matching assistant tools.



RF Power Supply

Model		RFS-1305N	RFS-1310N	RFS-1330N	RFS-1350N
Input specification	Input voltage	AC180 to 242V, single phase		AC180 to 242V, three phase	
	Input capacity	1.2kVA	1.8kVA	5kVA	8kVA
Output specification	Oscillating frequency	13.56MHz			
	Rate travelling wave power	500W (under 50 Ω load)	1kW (under 50 Ω load)	3kW (under 50 Ω load)	5kW (under 50 Ω load)
	Maximum reflected wave power	100W		500W	
	Harmonic distortion ratio	-35dB or less ( Rate output time 50 Ω Loading time )			
Control	Control accuracy	Rated output ±2% or less			
	Guaranteed control range	10 % to 100 % of rated power value			
Cooling method		Forced air cooled		Water cooled (4L / min)	Water cooled (6L / min)
Dimensions W x D x H		240 x 495 x 150mm (excluding protrusions)		480 x 495 x 150mm (excluding protrusions)	
Weight		11kg		23kg	
Applicable standard		CE			

Matching box

Model	MBX-1305N	MBX-1310N	MBX-1330N	MBX-1350N
Permissible input power	10 to 500W	10 to 1000W	30 to 3000W	50 to 5000W
Permissible output current	30A		80A	120A
Permissible output voltage	2.5kVpp		5kVpp	10kVpp
Cooling method	Forced air cooled		Water cooled (2L / min)	
Dimensions W x D x H	375 x 250 x 120mm (excluding protrusions)		375 x 250 x 170mm (excluding protrusions)	450 x 500 x 248mm (excluding protrusions)
Weight	8kg		10kg	21kg
Applicable standard	CE			

# Power Supply (DC/RF) ▶ RF Power Supply

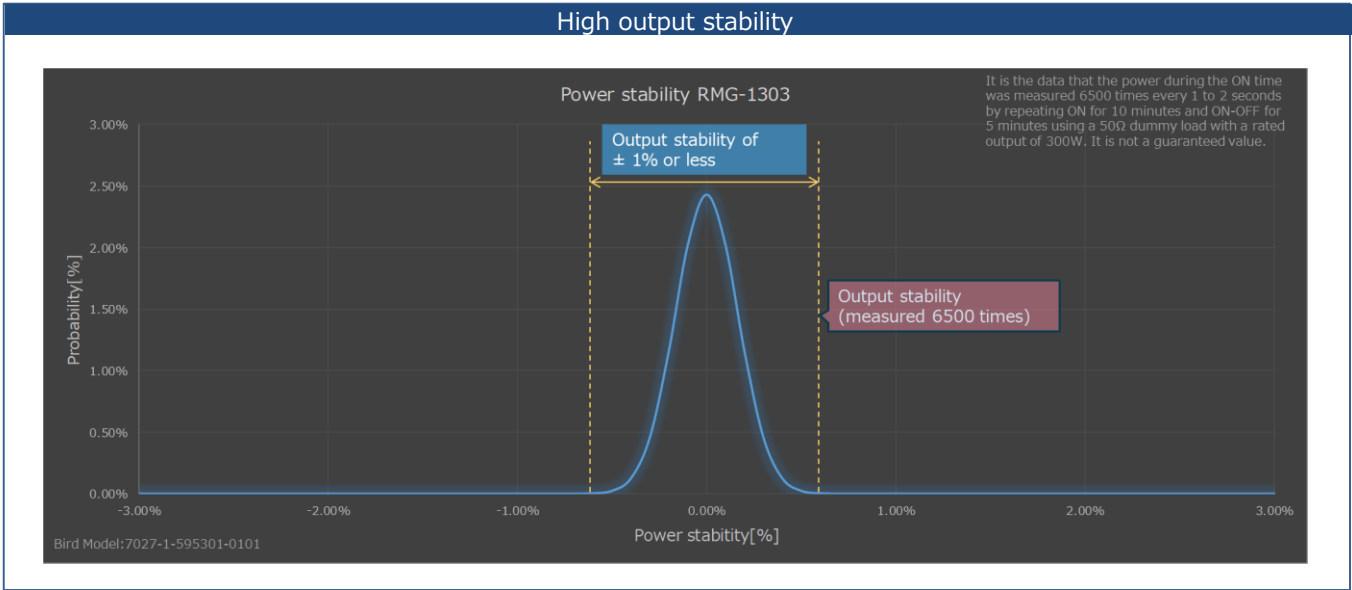
## Matching unit integrated High-Frequency Power Supply **RMG series**

High-frequency power supply for plasma generation used in electronic components and semiconductor manufacturing equipment



RMG-1303

- This is an RF power supply with an integrated matching unit of 13.56MHz and 300W output for plasma processes such as RF sputtering and plasma CVD etching.
- High reliable design based on long time experienced ULVAC know-how.
- Simple configuration with the built-in auto-matching controller.
- By integrating the matching unit and RF power supply, we have achieved miniaturization and weight reduction.
- It can be controlled with low output, and can be used in a wide range of fields from research and development applications to mass production equipment.



### ■ RF Power Supply

Model		Part of RF Power Supply
Input	Input Voltage	Single phase AC100~220V
	Input Capacity	700VA
Output	Frequency	13.56MHz
	Rated Power	300W(50 $\Omega$ load)
	Maximum Reflected Power	80W
	Harmonic distortion ratio	<-35dB (Full power output 50 $\Omega$ load)
Control	Control accuracy	Less than $\pm 2W$ or $\pm 1\%$ of the set value, whichever is larger.
	Guaranteed control range	1 % to 100 % of rated power value
Cooling		Forced air cooled
Dimensions WxDxH		200x200x350mm (Include Matching BOX)
Weight		10kg
Applicable standard		CE

### ■ Matching Box

Model		Part of Matching Box
Permissible input power		300W
Permissible output current		10A
Permissible output voltage		2.5kVpp
Output Option		N·HN·M·DIN-7/16

RF Power Supply Option **MEX-N series**

Matching box switching unit for RFS-N series



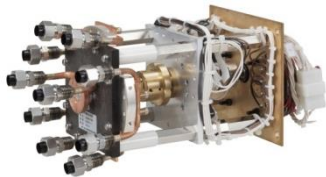
MEX2N-1k

- Switching for multiple matching boxes.
- Not for simultaneous discharge. Using this unit reduces quantity of power supplies and leads to cost down.
- Various cathodes with different impedance are selectable because individual matching box is used to individual cathode.

Capacity	Qty. of matching box which is switchable by the matching box switching unit						
	2 units	3 units	4 units	5 units	6 units	7 units	8 units
500,1kW	MEX2N-1k	MEX3N-1k	MEX4N-1k	MEX5N-1k	MEX6N-1k	MEX7N-1k	MEX8N-1k
3kW	MEX2N-3k	MEX3N-3k	MEX4N-3k	MEX5N-3k	MEX6N-3k	MEX7N-3k	MEX8N-3k
5kW	MEX2N-5k	MEX3N-5k	MEX4N-5k	-	-	-	-

RF Power Supply Option **EXN series**

Switching unit for multiple cathodes



EXN4M-70W

- Switching for matching box output.
- Greatly contributes to cost reduction for the various systems as it is not necessary to install matching box per cathodes.
- Manual and motor driving type are provided as switching method. A water cooled type is also available for higher power.
- Useable as a switching unit for DC power supply and DC pulse power supply.
- Since only single matching box is used with this unit, it is not available to mutual loads exceeding matching range.

Switching points		Air cooled (1kW or less)		Water cooled (3kW)	
		Manual	Motor driven	Manual	Motor driven
2 points	Model	EXN2T-40A	EXN2M-40A	EXN2T-70W	EXN2M-70W
3 points		EXN3T-40A	EXN3M-40A	EXN3T-70W	EXN3M-70W
4 points		EXN4T-40A	EXN4M-40A	EXN4T-70W	EXN4M-70W

RF Power Supply Option **PHS-N series**

Output phase control of multiple RF power supplies.



PHS-04N

- Phase control of maximum 4 or 8 units of RF power supplies.
- It provides stable process with very small variation by adjusting differences occurs between cathodes by phase shift function.

Model		PHS-04N	PHS-08N
Input specifications	Input voltage	Single phase AC100 to 240V	
	Input capacity	70VA	
Output specifications	Output channel	4	8
	Oscillation frequency	13.56MHz ±0.05%	
	Phase setting scope	0 to 360°	
Dimensions W x D x H		480 x 192 x 49mm (excluding protrusions)	

RF Power Supply Option **EXO-13**

Output phase synchronization of multiple RF power supplies.



EXO-13

- Phase synchronization of maximum 4 units of RF power supplies.
- No phase shift function.

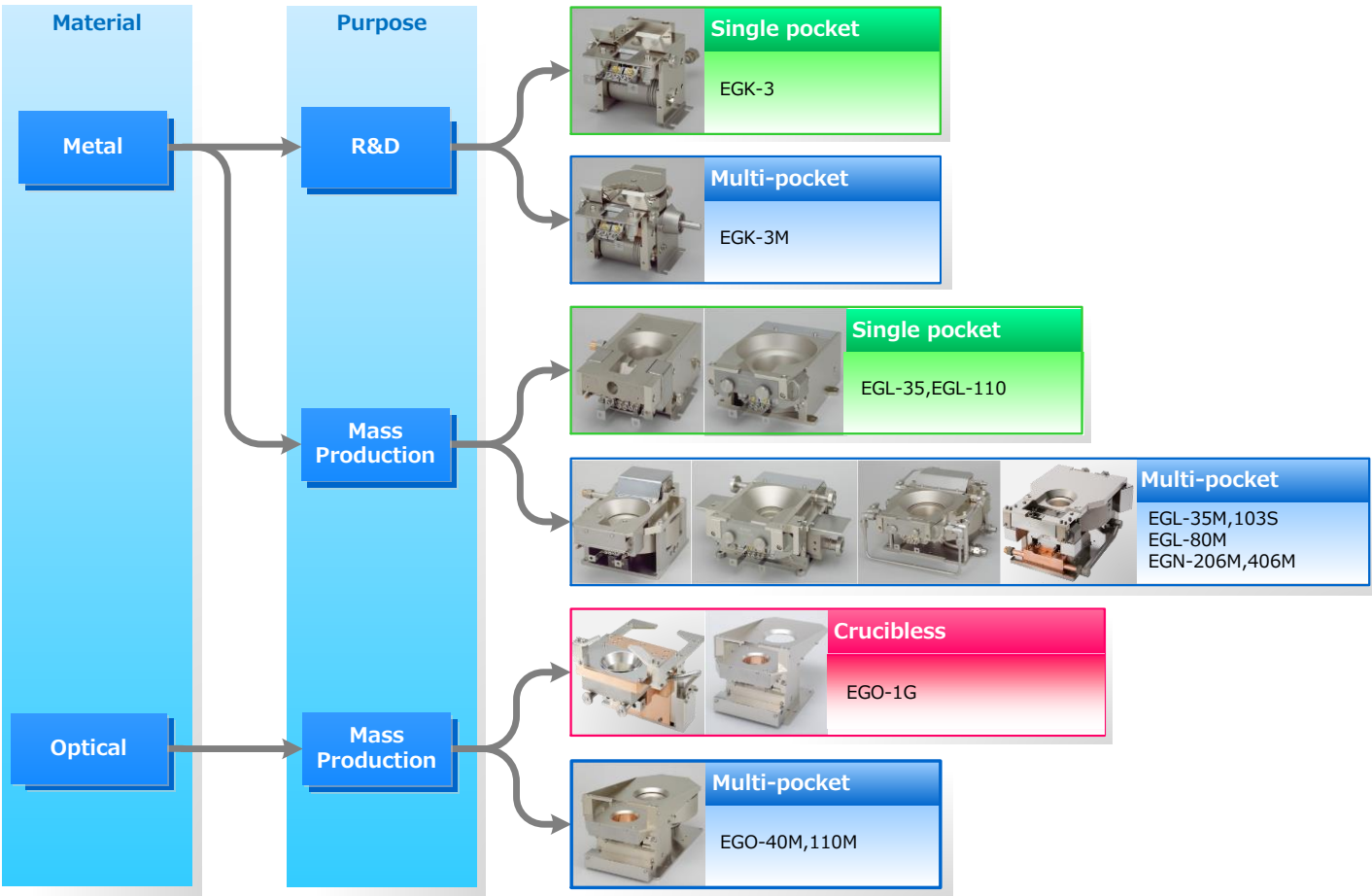
Model		EXO-13
Input specifications	Input voltage	Single phase AC90 to 110V
	Input capacity	10VA or less
Output specifications	Oscillation frequency	13.56MHz ±0.05%
Dimensions W x D x H		145 x 110 x 44mm (excluding protrusions)



# EB Power Supply / Electron Beam Source ▶Selection Guide

Electron beam source with a long-life filament by having the structure to prevent pollution from evaporation materials.

EGK series with small volume pocket for experiment purposes. EGL and EGN series with small medium to large volume pocket are for mass production purposes. EGO and EGP series are for optical applications.



■EB source selection table based on the qty. of pockets (for metal film)

Qty. of pockets	Pocket volume				
	3cc	10cc	20cc	40cc	110cc
1	EGK-3			EGL-35	EGL-110
3		EGL-103S			
4	EGK-3M	EGL-35M (10cc x2) (40cc x2)		EGL-35M (10cc x2) (40cc x2)	EGL-80M
6			EGN-206M	EGN-406M	
Power Supply	HPS-510S	HPS-1000N			HPS-1600F

■EB source selection table based on qty. of pockets (for optical film)

Qty. of pockets	Pocket volume			
	10cc	40cc	110cc	—
0				EGO-1G
4	EGO-40M (10cc x2)	EGO-40M (10cc x2) (40cc x2)	EGO-110M	
Power Supply	HPS-1000N			

■EB source selection table based on EB power supply system

EB power supply system		Number of deposition source	Recommended electron beam source	Electron beam source controller
Capacity	Model			
5kW	HPS-510S	1 source	EGK-3/3M, EGL-35/35M	None (The source controller is equipped in the power supply)
10kW	HPS-1000N-100	1 source	EGL-35/35M, EGL-103S, EGN-206M/406M	EGC-10GS S-TYPE
	HPS-1000N-200	2 sources		
	HPS-1000N-G100	1 source	EGO-1G, EGO-40M, EGO-110M	EGC-10GS G-TYPE
	HPS-1000N-G200	2 sources		
16kW	HPS-1600F-S100	1 source	EGL-110	EGC-16S
	HPS-1600F-S200	2 sources		
	HPS-1600F-S101	1 source with high-power	EGL-80M	EGC-16H

\*) EB power supply system model decides depend on which model of the source controller use.

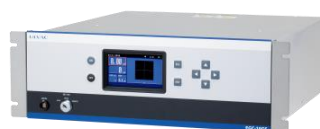


## High Function EB Power Supply HPS-N series

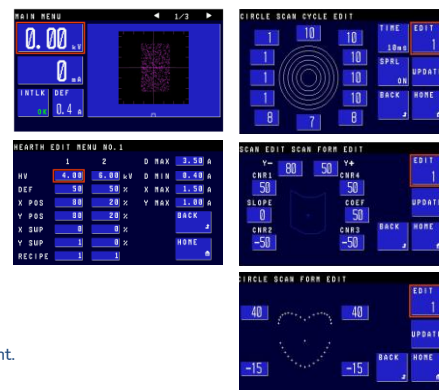
6kW/10 kW EB power supply designed with stabilized circuit and improved performance.



HPS-1000N



EGC-10GS



- Usable for both optical and metal film by using highly-functional EB source controller.
- Using graphic user interface assists to multi-functional and complicated operation and it leads to productivity improvement.
- Stable deposition is ensured by excellent arc handling by ULVAC who is also vacuum process equipment supplier and has full knowledge about deposition processes.

### EB power supply system specifications

Model		HPS-1000N-100	HPS-1000N-200
Input specification	Input voltage	3 phase AC190 to 231V	
	Input capacity	14kVA	15kVA
Output specifications	Rated output power	10kW	
	Voltage range	-4k to -10kV	
	Ripple rate	±2% or lower at rated output	
	Beam current	0 to 1000mA	
Cooling method		Forced air cooled	
Dimensions W x D x H		494 x 701 x 712mm (excluding protrusions)	
Weight		120kg	145kg
Applicable standard		CE	

### EB source controller specifications

Model		EGC-10GS G-TYPE (for optical film)	EGC-10GS S-TYPE (for metal film)
Input specifications		Supplied from EB power supply	
X shaft coil output specifications	Variable range	0 to ±1.5A	-0.4 to -3.5A
	Voltage range	±24V	
	Frequency	10 to 800Hz	0.1 to 5Hz
Y shaft coil output specifications	Variable range	0 to ±1.5A	0 to ±1.2A
	Voltage range	±24V	
	Frequency	10 to 800Hz	0.1 to 22Hz
Deflection coil output specifications	Variable range	-0.4 to -3.5A	
	Voltage range	+24V	
Dimensions W x D x H		480 x 499 x 149mm (excluding protrusions)	
Weight		11.5kg	
Applicable standard		CE	

## EB Power Supply HPS series

5kW/16kW for electron beam source.



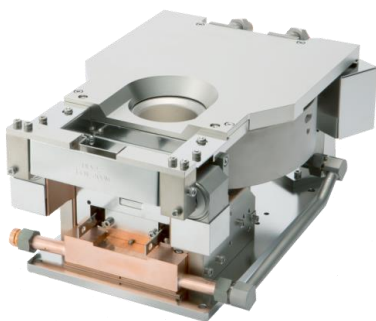
HPS-1600F

- Stable process is ensured with high quality and high-reliability proven through more than 15 years experience.
- Stable deposition is ensured by excellent arc handling by ULVAC who is also vacuum process equipment supplier and has full knowledge about deposition processes.

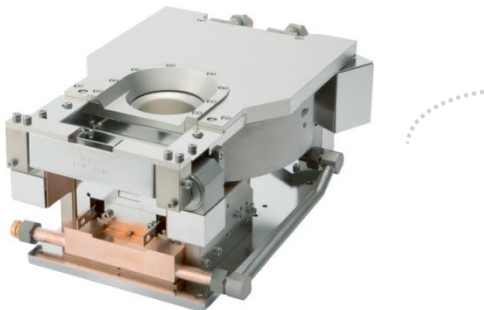
Model		HPS-510S	HPS-1600F -S100	HPS-1600F -S200	HPS-1600F -S101
Input specification	Input voltage	3 phase AC190 to 231V			
	Input capacity	7kVA	21kVA	22kVA	21kVA
Output specification	Rated out power	5kW	16kW		
	Voltage range	-4k to -10kV			
	Ripple ratio	Less than $\pm 2\%$ at rated output			
	Beam current	0 to 500mA	0 to 1600mA		
Cooling method		Forced air cooled			
Dimensions W x D x H	Power supply	480 x 620 x 300mm (excluding protrusions)	500 x 700 x 710mm (excluding protrusions)		
	Source controller		480 x 480 x 149mm (excluding protrusions)		
Weight	Power supply	50kg	113kg	136kg	113kg
	Source controller		20kg		17kg

EB Source for Metal Film **EGN-206M/406M**

EB deposition source with full flat top configuration without any structural object above the hearth cover.



EGN-206M/406M



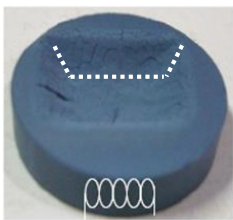
EGN-206M/406M with health cover shield

- By changing a part of EB source, the ribbon-shaped beam suitable for metal deposition or spot-shaped beam suitable for sublime substances/oxides and compounds deposition is selectable.
- Built-in electronic reflection trap mechanism suppresses temperature increase on the substrate which may become critical problem for evaporation process.
- Using the optional hearth cover shield makes maintenance time short and improves productivity.

Result of beam form optimization (ITO)



Ribbon Beam  
(Poor)



Spot Beam  
(Excellent)



Hearth cover shield

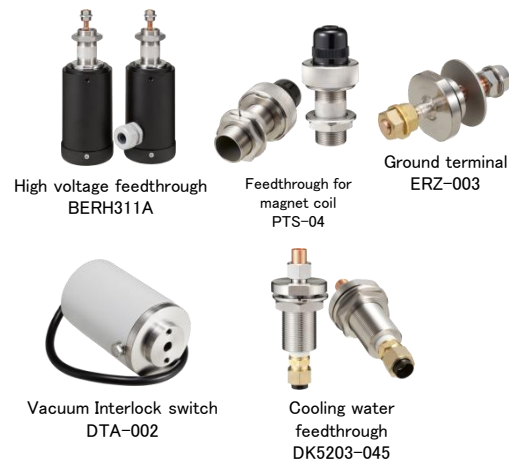
Model		EGN-206M	EGN-406M
Beam deflection angle		270°	
Qty of pocket		6	
Pocket capacity		20cc	40cc
Pocket dimensions Top x Bottom x Depth		Φ 42 x Φ 32 x 19mm	Φ 50 x Φ 41 x 25mm
Cooling water flow rate	Pocket	10 L/min	
	Hearth cover	2 L/min	
Dimensions W x D x H		214 x 343 x 144mm (excluding protrusions)	
Weight		28kg	
Effective evaporation angle		More than 100°	
Deposition speed		1.6 μm/min (Ribbon beam, Al, 8kW, 40cc pocket, 250mm from health cover)	
Maximum acceleration voltage		-10kV	
Maximum emission current		800mA	1000mA
EB power supply system		HPS-1000N-100/200	

■Optional accessories

Accessory	Model	Required qty.	Remarks
High voltage feedthrough	BERH311A	2	
Feedthrough for magnet coil	PTS-004	2	For coil wiring , For hearth positioner
Ground terminal	ERZ-003	1	
Vacuum interlock switch	DTA-002	1	
Cooling water feedthrough	DK5203-045	4	Φ 10

EB Source for Metal Film **EGL / EGK series**

High reliable EB source designed based on ULVAC long time experienced technologies.



- Various line-up from R&D to mass production.
- Unique water cooling mechanism reduces contamination from pocket to the evaporation material and so high-grade deposition process is ensured.

Model	EGK-3	EGK-3M	EGL-103S	EGL-35	EGL-35M	EGL-110	EGL-80M
Beam deflection angle	225°		270°				
Qty. of pocket	1	4	3	1	4	1	4
Pocket capacity	2.6cc	2.9cc	10cc	40cc	10cc x 2 / 40cc x 2	110cc	110cc x 4
Cooling water flow rate	8 L/min		10 L/min		19 L/min		20 L/min
	1 L/min		2 L/min	–	2 L/min	–	4 L/min
Dimensions W x D x H	110 x 207 x 126mm	140 x 207 x 126mm	313 x 250 x 108mm	110 x 206 x 79mm	170 x 240 x 156mm	136 x 220 x 90mm	265 x 318 x 168mm
Weight	4kg	5kg	16kg	10kg	18kg	15kg	30kg
Maximum acceleration voltage	–10kV						
Maximum emission current	500mA		600mA	1,000mA		1600mA	
Power supply system	HPS-510S, HPS-1000N	HPS-510S, HPS-1000N, HPS-1600F	HPS-1000N, HPS-1600F		HPS-510S, HPS-1000N, HPS-1600F	HPS-1000N, HPS-1600F	HPS-1600F (Hi power spec)

## ■Optional accessories

Accessory	Model	EGK-3	EGK-3M	EGL-103S	EGL-35	EGL-35M	EGL-110	EGL-80M
High voltage feedthrough	BERH311A	2	2	(*)1	2	2	2	2
Current terminal	PTS-004	1	1	(*)1	1	2	2	1(*)2
Ground terminal	ERZ-003	1	1	(*)1	1	1	1	1
Vacuum checker	DTA-002	1	1	(*)1	1	1	1	1
Cooling water terminal	DK5203-045	Φ x2 Φ 10 x2	Φ 6 x2 Φ 10 x2	(*)1	Φ 10 x2	Φ 6 x2 Φ 10 x2	Φ 12 x2	Φ 6.35 x2 Φ 12.7 x2

\*1) Ultra-high vacuum specification is necessary. Please contact us separately.

\*2) The current terminal for the hearth positioner is PTS-004. However, 3p-16A is used in the case of the current terminal for coil driving.

EB Source for Optical Film **EGO series**

High reliable EB source designed based on ULVAC long time experienced technologies.

- High performance deflection coil makes sweep performance high and deposition process stable and uniform.



EGO-1G

EGO-40M



EGO-110M

Model	EGO-1G	EGO-40M	EGO-110M
Beam deflection angle	270°		
Qty. of pocket	0	4	4
Pocket capacity	–	10cc x2 / 40cc x2	110cc
Cooling water flow rate	Pocket	10 L/min	19 L/min
	Coil	2 L/min	2 L/min
Dimensions W x D x H	168 x 285 x 174mm	170 x 309x174mm	232 x 368 x 174mm
Weight	10kg	18kg	30kg
Power supply system	HPS-1000N-G100/G200		

## ■Optional accessories

Accessory	Model	EGO-1G	EGO-40M	EGO-110M
High voltage terminal	BERH311A	2	2	2
Current terminal	PTS-004	1	2	2
Ground Terminal	ERZ-003	1	1	1
Vacuum Checker	DTA-002	1	1	1
Cooling water terminal	DK5203-045	Φ 10 x2	Φ 10 x2	Φ 10 x2 / Φ 12.7 x2

Vacuum Pump

Vacuum Valve

Vacuum Gauge

Process Gas Monitor

Leak Detector

Power Supply (DC/RF)

EB Power Supply / EB Source

Deposition Controller

Thin Film Measurement

Accessories

Vacuum Transfer Robot

Cryogenic Equipment

Quartz Crystal Deposition Controller **CRTM-R1**

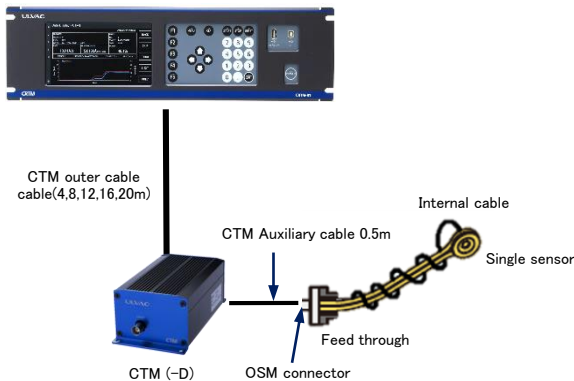
ULVAC has developed the new quartz crystal deposition controllers based on our longtime experience and technologies. Contributes to improved quality and reliability in vapor deposition processes.



- Excellent rate stability and resolution make it suitable for low rate control.
- Ability value (CI value) measurement function improves crystal anomaly detection.
- Simultaneous vapor deposition control of up to 8 sources is possible. (add option)
- lineup of Deposition monitor "CRTM-R1-EL" optimized for organic film deposition applications.

Model		CRTM-R1(-EL)
Frequency	Measurement Range	4.00~3.00MHz@4MHz 5.00~3.50MHz@5MHz 6.00~4.50MHz@6MHz
	Measurement Resolution	1mHz
	Display Resolution	1mHz
Deposition rate	Measurement Range	0.000~999.9 Å/s (0~99.99nm/s)
	Measurement Resolution	0.0028 Å/s @4MHz 0.0018 Å/s @5MHz 0.0012 Å/s @6MHz
	Display Resolution	0.001 Å/s
Film thickness	Measurement Range	0.000~9999k Å (0~999.9µm)
	Measurement Resolution	0.0028 Å @4MHz 0.0018 Å @5MHz 0.0012 Å @6MHz
	Display Resolution	0.001k Å
Number of sensors that can be attached		Single sensor:2 (Max.8) Multi-sensor:2 (Max.8)
Simultaneous measurement & control		2 (Max.8)
Sampling rate		100msec
Number of multilayer		99
Number of process programs		99
Number of deposition programs		999
Dimensions W×D×H		480×320×130 mm

Example for single sensor connection



\* When using CRTM-R1, requires options such as CTM(-D) ,cables and CRTS sensor.

Crystal Oscillation type Deposition Controller **CRTM-6000G**

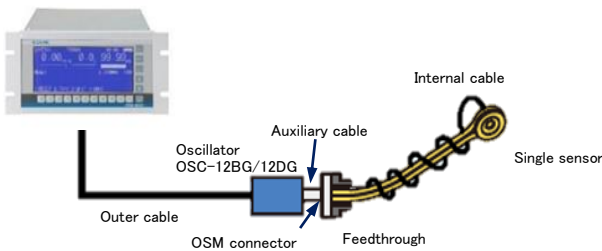
Deposition controller with excellent cost / performance features. Wide deposition control range for single as well as multilayer films.



- Two sensors can be switched for deposition control.  
(The simultaneous measurement cannot be done. It is a switch type.)
- Excellent response is obtained with a sampling rate of 125 ms.
- Up to 99 deposition programs can be stored with battery backup.
- Memory of the controller can record up to 30 process sequences.

Model		CRTM-6000G
Frequency	Measurement Range	3.0~5.01MHz @5MHz 4.0~6.01MHz @6MHz
	Measurement Resolution	24mHz
	Display Resolution	0.001MHz
Deposition rate	Measurement Range	0.000~999.9 Å/s (0~99.99nm/s)
	Measurement Resolution	0.041 Å/s @5MHz 0.029 Å/s @6MHz
	Display Resolution	0.1 Å/s
Thickness	Measurement Range	0 ~ 999.9 k Å
	Measurement Resolution	0.041 Å : 5MHz, 0.029 Å : 6MHz
	Display Resolution	0.001k Å : 0 ~ 9.999k Å 0.01k Å : 10 ~ 99.99k Å 0.1k Å : 100 ~ 999.9k Å
Number of sensors that can be attached		Single sensor : 2(The simultaneous measurement cannot be done. It is a switch type. ), Multi sensor : 1
Simultaneous measurement & control		1
Sampling rate		125msec
Number of multilayer		99 layer
Number of process programs		30
Number of deposition programs		99
Dimensions W×D×H		240×350×99 mm

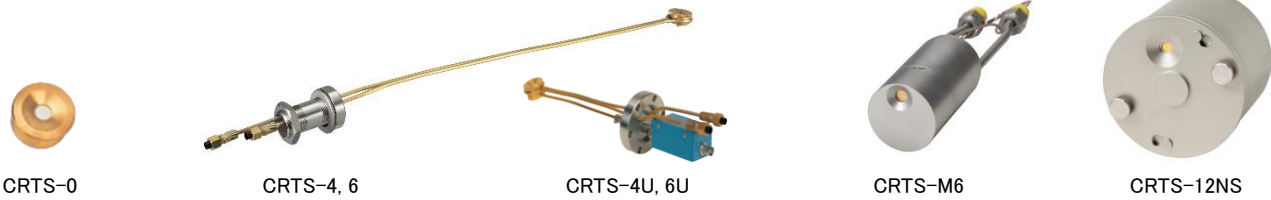
Example for single sensor connection



\* When using CRTM-6000G, requires options such as Oscillator, cables and CRTS sensor.

Deposition Controller Sensor **CRTS series**

Various line-up for various deposition processes.



- Single sensor
- To be selected depends on deposition condition such as with or without baking, temperature range, etc.
  - Compact sensor head makes installation in the chamber easy.
  - Long life time oscillator is available.
  - Specified sensor length and pipe shape are available.









- Multi-sensor
- Multiple crystals, 6 or 12. Crystal is exchangeable by its holder.
  - High reliability with ULVAC original driving system with vacuum motor.
  - Crystal is automatically switched by detecting abnormal crystal oscillation (end of life).

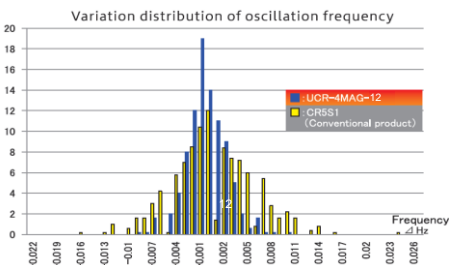
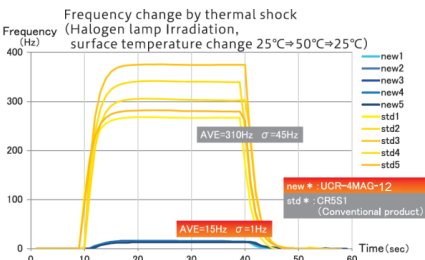
Model	Single sensor						Multi-sensor	
	CRTS-0		CRTS-4	CRTS-6	CRTS-4U	CRTS-6U	CRTS-M6	CRTS-12NS
Process	Deposition in 80°C or less	+Water Cooling Jacket Deposition in 300°C or less	Deposition in 100°C or less	Deposition in 200°C or less	Ultra-high vacuum deposition in 100°C or less	Ultra-high vacuum deposition in 200°C or less	Continuous deposition for thick film 350°C	
Qty. of crystals	1						6	12
Crystal frequency	4MHz, 5MHz (6MHz. Contact us or further information)							
Cooling water pipe	Length	—	100 to 800mm				—	
	Diameter	—	6mm	4mm	6mm	4mm	6mm	1/4 inch
	Capacity	—	400 cc/min	200 cc/min	400 cc/min	200 cc/min	400 cc/min	1 L/min
	Connector	—	3/8 inch	1/4 inch	3/8 inch	1/4 inch	3/8 inch	1/4VCO

Quartz Crystal **UCR series**

ULVAC’s Quartz crystal “UCR series” for quartz crystal type deposition controller has excellent temperature characteristics and enable stable measurement. The lineup includes 4MHz silver electrode, 5MHz gold/silver electrode and 6MHz gold electrode, allowing you to select the optimal product for your application.

- Excellent temperature characteristics during deposition
- Small fluctuation and change by thermal shock during shutter opening/closing.
- Small and stable frequency fluctuation
- Excellent rate measurement stability
- The new 12-piece package enables batch replacement of quartz crystals when using ULVAC multi-sensors

	UCR-6MAU-12	UCR-5MAU-12	UCR-5MAG-12	UCR-4MAG-12
Appearance				
Frequency	6MHz	5MHz	5MHz	4MHz
Electrode	Au	Au	Ag	Ag
Surface finish	Standard			Mirror finish
Diameter	φ14mm	φ12.4mm		
Case	Carousel type case (12pcs)			
Recommended Use	Metal, Optical film deposition			Organic, Metal, Optical
Surface pattern				





## Spectroscopic Ellipsometer **UNECS series**

UNECS series is Spectroscopic Ellipsometer which measures thin film thickness and refractive index with high speed and high precision. Unique measurement method makes high speed measurement and compact size design.



UNECS-1M



UNECS-Portable



UNECS-1500M

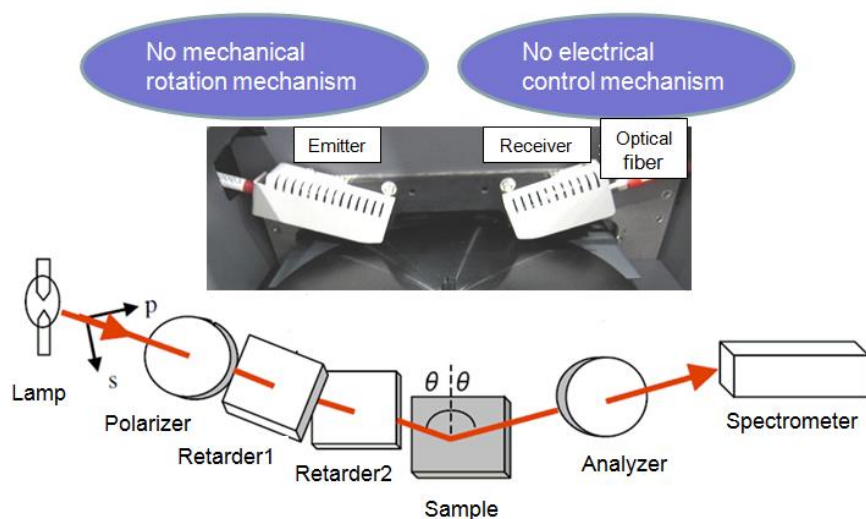


UNECS-1500A/2000A



UNECS-3000A

- Unique measurement method which does not have a rotation mechanism makes measurement speed extremely high in 20ms.
- Wavelength of standard type from 530nm to 750nm and visible spectroscopy type from 380nm to 760nm.
- The emitter and receiver sensor consists of only optical elements which does not include any rotating mechanism. It makes weight and design light and compact, and periodical maintenance cycle very low.
- Various mode available from unique portable, manual stage and auto stage type. A built-in type for vacuum environment is also available.



Configuration of emitter and receiver sensor

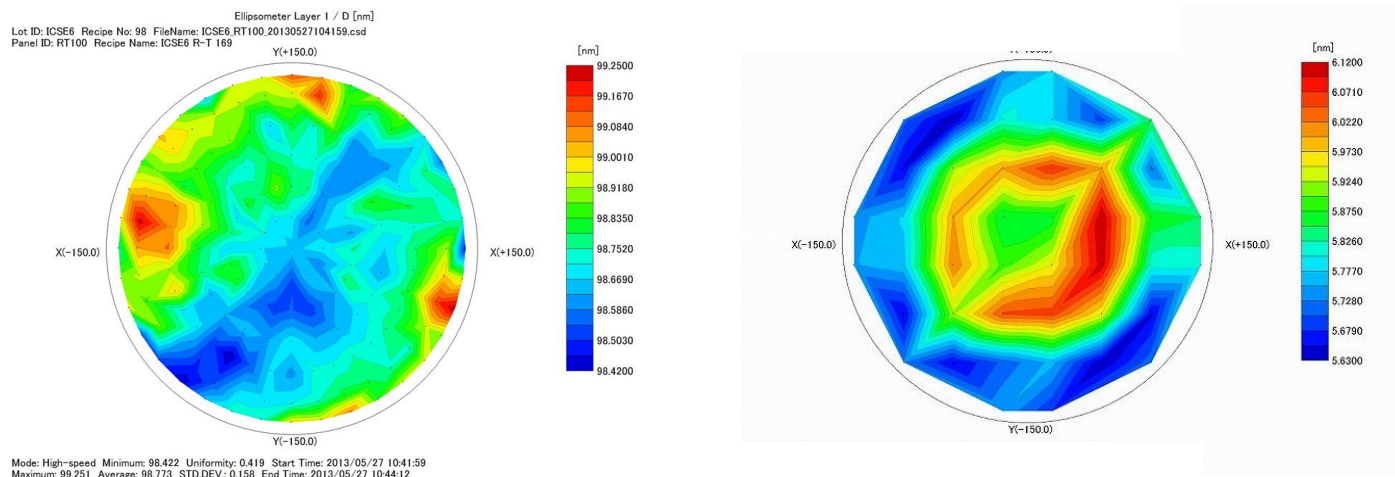
Emitter and receiver unit are composed by fixed optical elements.

- **Ultra high-speed measurement (Min.20ms~)**
- **Compact design**
- **Maintenance free (Emitter and Receiver)**



Spectroscopic Ellipsometer **UNECS series**

■ With high-speed mapping measurement, film thickness distribution can be evaluated in a short time



169 points measurement for SiO<sub>2</sub>\_100nm film on Φ300mm wafer

44 points measurement for HfO<sub>2</sub>\_5nm film on Φ300mm wafer

➡ Only 133 sec

Model		UNECS-Portable	UNECS-1500M	UNECS-1500A	UNECS-2000A	UNECS-3000A
Measurement method		Spectroscopic ellipsometry (spectral ellipsometry)				
Measureable film		Transparent film or semitransparent film				
Wavelength range		530 to 750nm or 380 to 760nm				
Light source		Halogen lamp or xenon lamp				
Spot diameter		Φ 1mm or Φ 0.3mm				
Multilayer film measurement		Maximum 6 layers (film thickness) Simultaneous analysis of film thickness and optical parameter (N,K) is only the top layer				
Incidence angle		70°				
Film thickness repeatability		0.1nm				
Film thickness measurement range		1nm to 2 μ m				
Scanning time		20ms to 3000ms (configurable)				
Calculation time		300ms				
Sample stage		Approx. Φ 150mm (detachable)	Φ 150mm		Φ 200mm	Φ 300mm
Stage moving range	R	—	100mm: manual	0 to 75mm: programmable (resolution 0.1mm)	0 to 100mm: programmable (resolution 0.1mm)	0 to 150mm: programmable (resolution 0.1mm)
	θ	—	360° : manual	0 to 359.9° : programmable (resolution 0.1° )		
Automatic multiple point measurement		—		200 points (optional 2,000 points)		2,000 points
Focus (Z- axis) adjustment		Manual		Automatic		
Maximum sample thickness		10mm		30mm		
Maximum sample weight		10kg				
Measurement・analysis function		①Ψ (λ) and Δ (λ) measurement ②film thickness (D), refractive index (N), calculated value of extinction coefficient (K)				
Mapping display		—		2D color map display (Optional: 3D display)		
Control and analyzing PC		Laptop type, OS Windows 7				
Dimensions	Main unit	220 x 268 x 244mm	300 x 400 x 384mm	400 x 525 x 370mm		450 x 620 x 370mm
W x D x H	Controller	—	—	204 x 500 x 509mm		
Weight	Main unit	2.2kg	10.3kg	24kg		31kg
		Stage: 1.3kg	—	Controller: 19kg		
Utility	Power	AC100 /200V Max 3A 50/60Hz		AC100 /200V Max 6A 50/60Hz		
	Vacuum	—		75kPa or less (necessary when using vacuum chuck)		
Applicable standard		CE		—		CE

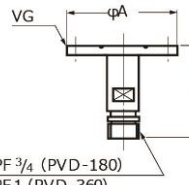
# Accessories ▶ Vacuum parts such as piping, bellows, etc.

## Vacuum parts such as piping, bellows, etc.

Various kinds of optional accessories are available.

Unit: mm

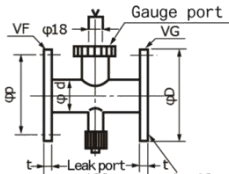
### Rotation type suction piping with flange



■ Material Stainless Steel, Gasket (FPM)

Model	Applicable pumps	A	B	C
RF-1	PVD-180	dia. 80	72	315
RF-2	PVD-180 with TMX		235	478
RF-3	PVD-360	dia. 90	72	315
RF-5	PVD-360 with TMX		285	528

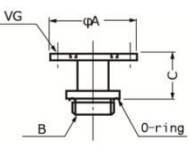
### Short piping with gauge port



■ Material Stainless Steel, Gasket (FPM)

Model	Applicable pumps	dia. D	dia. d	dia. p	t
TP-20	PVD-180 (B)	80	27.2	60	8
TP-25	PVD-360 (B)	90	34.0	70	8
TP-40	VD301, VD401	105	48.6	85	10
TP-50	VD601, VD901	120	60.5	100	10

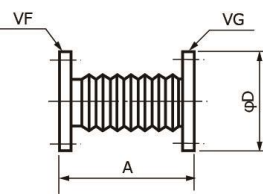
### Rotation type exhaust piping with flange



■ Material Stainless Steel, Gasket (FPM)

Model	Applicable pumps	A	B	C
RF-7	PVD-180	dia. 80	PF3/4"	50
RF-8	PVD-360	dia. 90	PF1"	80
RF-9	PVD-180 with TMX	dia. 80	PF1 1/2"	50
RF-10	PVD-360 with TMX	dia. 90		

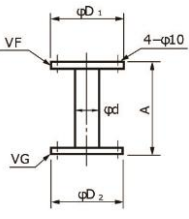
### Bellows joints BJ series



■ Material Stainless Steel, Gasket (FPM)

Model	A	B
BJ-25A	65	90
BJ-40A	90	105
BJ-50A	105	120
BJ-80A	110	160
BJ-100A	110	185
BJ-150A	100	235

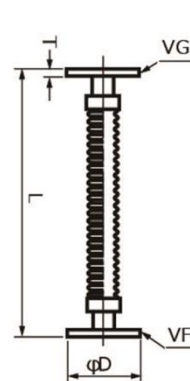
### I Piping



■ Material Stainless Steel, Gasket (FPM)

Model	dia. D <sub>1</sub>	dia. D <sub>2</sub>	dia. d	A
I-VF20xVG20	80	90	27.2	100
I-VF20xVG25		90		
I-VF20xVG40		105		
I-VF20xVG50		120		
I-VF25xVG25	90	90	34.0	100
I-VF25xVG40		105		
I-VF25xVG50		120		
I-VF40xVG40	105	105	48.6	100
I-VF40xVG50		120		
I-VF50xVG50	120	120	60.5	100

### Flexible hose

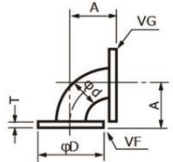


JIS standard vacuum flange model

### Material Stainless Steel JIS standard vacuum flange model

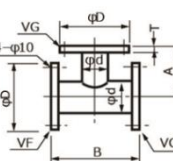
Model	D	L	T
VFH-20-200	80	200	8
VFH-20-500		500	
VFH-20-1000		1000	
VFH-25-200	90	200	8
VFH-25-500		500	
VFH-25-1000		1000	
VFH-40-500	105	500	10
VFH-40-1000		1000	
VFH-40-2000		2000	
VFH-50-500	120	500	10
VFH-50-1000		1000	
VFH-50-2000		2000	

### L piping / T piping



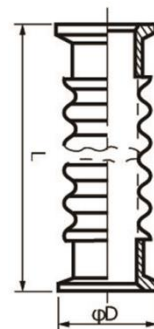
■ L piping Material Stainless Steel, Gasket (FPM)

Model	dia. D	dia. d	A	T
L-20	80	27.2	60	8
L-25	90	34.0	65	8
L-40	105	48.6	80	10
L-50	120	60.5	90	10



■ T piping Material Stainless Steel, Gasket (FPM)

Model	dia. D	dia. d	A	B
T-20	80	27.2	50	100
T-25	90	34.0	55	100
T-40	105	48.6	60	130
T-50	120	60.5	60	150



ISO standard KF flange model

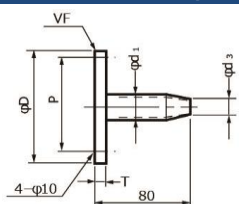
### ISO standard KF flange model

Model	D	L
KFH-20-200	40	200
KFH-20-500		500
KFH-20-1000		1000
KFH-25-200	40	200
KFH-25-500		500
KFH-25-1000		1000
KFH-40-500	55	500
KFH-40-1000		1000
KFH-40-2000		2000
KFH-50-500	75	500
KFH-50-1000		1000
KFH-50-2000		2000

## Vacuum parts such as piping, bellows, etc.

Unit: mm

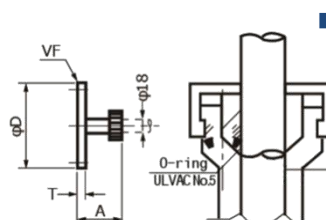
### Flange with suction piping



■Material Stainless Steel

Model	P	dia. D	T	dia. D1 external diameter	dia. D2 Internal diameter	dia. d3	Connecting Rubber hose
VF20x15A	60	80	8	21.7	16.1	18	dia. 15 x dia. 36
VF20x20A				27.2	21.6	24	dia. 18 x dia. 42
VF20x25A				34.0	27.6	30	dia. 25 x dia. 55
VF25x15A	70	90	8	21.7	16.1	18	dia. 15 x dia. 36
VF25x20A				27.2	21.6	24	dia. 18 x dia. 42
VF25x25A				34.0	27.6	30	dia. 25 x dia. 55
VF40x15A	80	105	10	21.7	16.1	18	dia. 15 x dia. 36
VF40x20A				27.2	21.6	24	dia. 18 x dia. 42
VF40x25A				34.0	27.6	30	dia. 25 x dia. 55
VF50x15A	100	120	10	21.7	16.1	18	dia. 15 x dia. 36
VF50x20A				27.2	21.6	24	dia. 18 x dia. 42
VF50x25A				34.0	27.6	30	dia. 25 x dia. 55

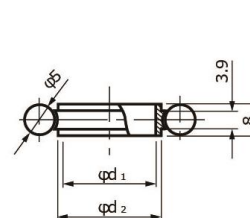
### Flange with gauge port



■Material Stainless Steel, Gasket (FPM)

Model	dia. D	A	T
GF-20	80	60	8
GF-25	90	60	8
GF-40	105	62	10
GF-50	120	62	10
GF-80	160	64	12
GF-100	185	64	12

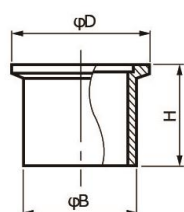
### O-Ring seat



■Material Stainless Steel, Gasket (FPM)

Model	Nominal diameter
KBR-10	KF10
KBR-16	KF16
KBR-25	KF25
KBR-40	KF40
KBR-50	KF50

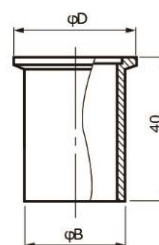
### Coupling ( Short )



■Material Stainless Steel

Model	Nominal diameter	dia. B	dia. D	H
KSC-10	KF10	15	30	16
KSC-16	KF16	20	30	16
KSC-25	KF25	30	40	20
KSC-40	KF40	45	55	20
KSC-50	KF50	56	75	20

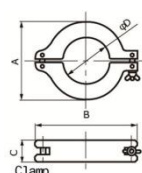
### Coupling ( Long )



■Material Stainless Steel

Model	Nominal diameter	dia. B	dia. D
KLC-10	KF10	15	30
KLC-16	KF16	20	30
KLC-25	KF25	30	40
KLC-40	KF40	45	55

### Clamp

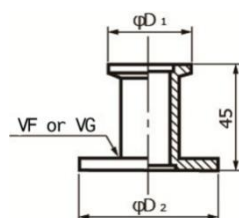


■Material Aluminum Alloy

Model	Nominal diameter
KQC-16	KF10/16
KQC-25	KF25
KQC-40	KF40
KQC-50	KF50

### Quick coupling connection adapter

■Material Stainless Steel

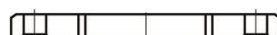


Model	D1	D2	D1 Part	D2 Part
KCG-10	30	80	KF10	VG20
KCG-16	30	80	KF16	VG20
KCG-25	40	90	KF25	VG25
KCG-40	55	105	KF40	VG40
KCG-50	75	120	KF50	VG50
KCF-10	30	80	KF10	VF20
KCF-16	30	80	KF16	VF20
KCF-25	40	90	KF25	VF25
KCF-40	55	105	KF40	VF40
KCF-50	75	120	KF50	VF50

### Vacuum flange

■Material Stainless Steel

Nominal diameter		External diameter of connecting pipe	Q' ty of bolt hole	Bolt size
10	3/8B	17.3	4	M8
20	1/2B	27.2	4	M8
25	1B	34	4	M8
40	1-1/2B	48.6	4	M8
50	2B	60.5	4	M8
65	2-1/2B	76.3	4	M10
80	3B	89.1	4	M10
100	4B	114.3	8	M10
125	5B	139.8	8	M10
150	6B	165.2	8	M10
200	8B	216.3	8	M12
250	10B	267.4	12	M12
300	12B	318.5	12	M12
350	14B	355.6	12	M12
400	16B	406.4	12	M16
450	18B	457.2	12	M16
500	20B	508.0	12	M16
550	22B	558.8	12	M16



Flat surface seated



Groove seated

# Vacuum Transfer Robot

## Vacuum Transfer Robot ELEC / COVOT series

Clean and high reliable vacuum transfer robot.



ELEC-RZ



COVOT-LC



COVOT-6

- Various models are available for different kind of vacuum systems.
- Various kinds of arms are available to meet specification of vacuum systems.
- Highly rigid arm and reliable actuator makes wafer transfer stable.
- Model ELEC-RZ and COVOT are for high vacuum application, up to  $1 \times 10^{-6}$ Pa /  $1.0 \times 10^{-8}$ mbar /  $7.5 \times 10^{-9}$ Torr.



Teaching pendant

Arm specification table

Arm model	Standard arm				Dedicated Arm	
	252	271	325	419	424	FRV
Maximum distance (mm)*1	700	760	880	1040	1050	740
Minimum rotation diameter (mm)*1	606	644	802	940	964	600
Number of hands	1 or 2				1 or 2	1
Outline*2						
ELEC-RZ	○	○	○	○	○	n/a
COVOT-LC	○	○	○	n/a	n/a	○
COVOT-6	n/a	n/a	n/a	n/a	n/a	○

\*1) \*2) When optional ULVAC standard hand(s) for 300mm is used. Contact us for requirement of other hand.

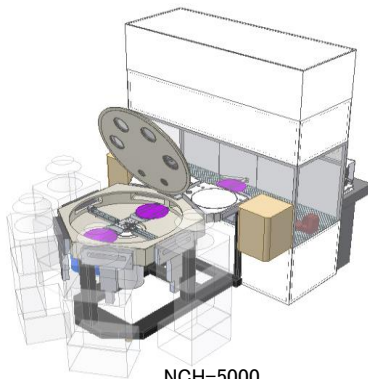
Model		ELEC-RZ	COVOT-LC	COVOT-6
Pressure range		$1.0 \times 10^{-6}$ Pa	$1.0 \times 10^{-6}$ Pa	$1.0 \times 10^{-1}$ Pa
	Atmospheric pressure to:	$1.0 \times 10^{-8}$ mbar	$1.0 \times 10^{-8}$ mbar	$1.0 \times 10^{-8}$ mbar
		$7.5 \times 10^{-9}$ Torr	$7.5 \times 10^{-9}$ Torr	$7.5 \times 10^{-4}$ Torr
Wafer size		200mm / 300mm	200mm / 300mm	300mm
Number of handling wafer		1 or 2	1 or 2	4
Maximum reachable distance		See above arm specification table		
Rotation angle		$\pm 210^\circ$	$-15^\circ$ to $375^\circ$	$360^\circ$ end less
Z axis stroke		50mm	None	110mm
Minimum rotation diameter		See above arm specification table		
Transportable weight (including pick up)		1kg	1kg	1kg
Speed	R axis	Max 2.5 sec / full stroke	Max 2.5 sec / full stroke	Max 1.5 sec / full stroke
	$\theta$ axis	Max 3.0 sec / $180^\circ$	Max 2.5 sec / $180^\circ$	Max 2.0 sec / $180^\circ$
	Z axis	Max 1.5 sec / 20mm	—	Max 1.5 sec / 20mm
Repetition position precision	R axis	$\pm 0.1$ mm	$\pm 0.2$ mm	$\pm 0.2$ mm
	$\theta$ axis	$\pm 0.2$ mm	$\pm 0.2$ mm	$\pm 0.2$ mm
	Z axis	$\pm 0.2$ mm	—	$\pm 0.2$ mm
Vacuum seal		Magnetic fluid seal	Contact seal	Contact seal
Teaching pendant		Included	Option	Included
Controller		Separately shipped	Internally equipped	Separately shipped

## Platform NCH series

A vacuum transport platform for  $\Phi 200$ mm / 300mm wafers.



NCH-4000



NCH-5000

- For 4 to 8 connection ports.
- Equipped with 25 slot cassette lifting type load lock chamber.
- Vacuum pumps and gauges are available as option.

Wafer size	200mm, 300mm
Connection ports	4 to 8 ports
Standard transfer robot	ELEC-RZ (option: COVOT)
Load lock	25 slot cassettes lifting type (in-line type available)
Vacuum pump and gauge	Option

LN2 Generator EMP series



EMP-20W

ModelEMP-07A / EMP-07W		
LN <sub>2</sub> Production Capacity	8L / day (60Hz) 6L / day (50Hz)	
Air processing Capacity	5.2m <sup>3</sup> / day	
	EMP-07A	EMP-07W
LN <sub>2</sub> Production Capacity	8L / day (60Hz) 、 6L / day (50Hz)	
LN <sub>2</sub> Storage Capacity	40L	
Dimensions (W×D×H)	600 × 750 × 1628mm	
Weight	Approx.220kg	Approx.230kg
Power Supply	AC100V Single phase Approx.1.2/1.4kW (50 / 60Hz) Breaking capacity 20A	
Cooling Water	Not needed (Air cooled)	Entrance:5 to 35℃ Flow rate:2to5L/min Pressure:<0.8MPa Water quality: Tap water equivalent

Nitrogen gas generator:GN-10i

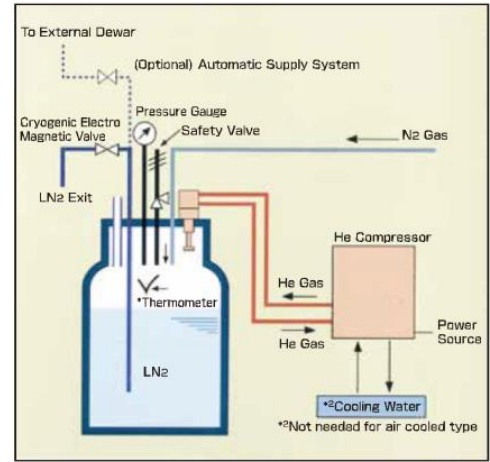
ModelEMP-20W	
LN <sub>2</sub> Production Capacity	20L / day (60Hz) 19L / day (50Hz)
Air processing Capacity	13.0m <sup>3</sup> / day
	EMP-20W
LN <sub>2</sub> Production Capacity	20L / day (60Hz)、 19L / day (50Hz)
LN <sub>2</sub> Storage Capacity	80L
Dimensions (W×D×H)	930 × × 740 × 1661mm
Weight	Approx.340kg
Power Supply	AC200V Three phase Approx.3.3 / 4.1kW (50Hz / 60Hz) Breaking capacity 30A
Cooling Water	Entrance:10 to 30℃ Flow rate:3to6L / min Pressure:<0.8MPa Water quality:Tap water equivalent

Nitrogen gas generator:GN-15i

Typical Usage

- Vacuum Evacuation Device LN<sub>2</sub> Cold Trap
- Material Analyzing Device
- Electron Microscope EDS(EDX) Detector
- Cryopreservation Container (Biological・Sample)

Flow Diagram inside EMP



\* A thermometer is needed in some cases.

ModelEMP-14A / EMP-14W		
LN <sub>2</sub> Production Capacity	14L / day (60Hz) 14L / day (50Hz)	
Air processing Capacity	9.1m <sup>3</sup> / day	
	EMP-14A	EMP-14W
LN <sub>2</sub> Production Capacity	14L / day (60Hz)、 14L / day (50Hz)	
LN <sub>2</sub> Storage Capacity	40L	
Dimensions (W×D×H)	600 × × 750 × 1688mm	
Weight	Approx.235kg	Approx.230kg
Power Supply	AC200V Three phase Approx.1.7 / 2.0kW (50Hz / 60Hz) Breaking capacity 20A	AC200V Three phase Approx.1.6 / 1.9kW (50Hz / 60Hz) Breaking capacity 20A
Cooling Water	Not needed (Air cooled)	Entrance:5 to 35℃ Flow rate:2to6L / min Pressure:<0.8MPa Water quality: Tap water equivalent

Nitrogen gas generator:GN-10i

ModelMP-300K	
LN <sub>2</sub> Production Capacity	30L / day (60Hz) 28L / day (50Hz)
Air processing Capacity	19.4 m <sup>3</sup> / day
	MP-300K
LN <sub>2</sub> Production Capacity	30L / day (60Hz)、 28L / day (50Hz)
LN <sub>2</sub> Storage Capacity	100L
Dimensions (W×D×H)	1050 × × 740 × × 1795mm
Weight	Approx.430kg
Power Supply	AC190~220V (50Hz) Three phase AC200~230V (60Hz) Three phase Approx.4.3 / 5.2kW (50Hz / 60Hz) Breaking capacity 30A
Cooling Water	Entrance:10 to 30℃ Flow rate:5to12L / min Pressure:<0.8MPa Water quality:Tap water equivalent

Nitrogen gas generator:GN-20i

OPERATING PRECAUTIONS

- When installing EMP in a room without appropriate size windows, a ventilating fan of above 1,000 m<sup>3</sup>/h (2,000 m<sup>3</sup>/h or above for EMP-20W) must be furnished to prevent oxygen shortage. It is recommended to install an oxygen alarm as well.
- LN<sub>2</sub> is ultra low temperature liquefied gas. Always handle with care.
- Touching LN<sub>2</sub> or cryogenic part like LN<sub>2</sub> exit may result in low temperature burns. Make sure to wear protective gloves such as leather gloves.
- EMP must not be operated in organic solvent atmosphere.
- Maintenance is necessary according to the time used.







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