

## Glass float module GFM Series



### GLASS FLOAT MODULE

# Floating

Full line up



# Revolution in manufacturing lines to achieve

Innovation in the glass conveying; a clean, non-contact and damage-free process achieved advanced **CKD Glass Float Module, GFM Series**

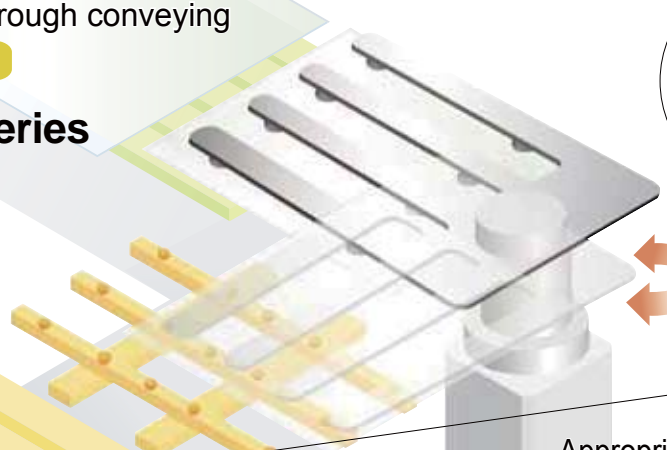
Using new materials, a high quality floating system is achieved, dramatically reducing air consumption, and suppressing static electricity and particle generations.

This product is appropriate for different applications matching normal and precise circuit board floating, including glass board conveying to inspection processes.

2-Appropriate for rough conveying

High floating rail

**GFM-T Series**



Appropriate for alignment process.

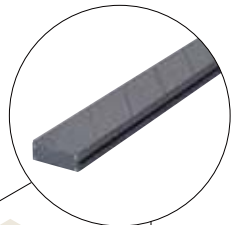
Alignment floating pad

**GFM-A**

Appropriate for high accuracy transport, loader and unloader processes.

Floating rail (standard type)

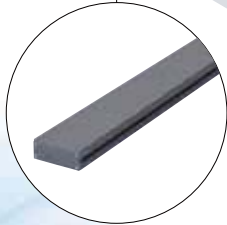
**GFM-RS Series**



Appropriate for conveying process

Floating rail (general purpose type)

**GFM-RF Series**



Floating system, glass float module

**GFM Series**

Appropriate for different processes

Precise floating stage

**GFM-P**



# defect-free and high yield production

## Stable high precise floating without contacting

Adopting new porous materials achieved stable floating and reduction of air consumption.  
(excluding GFM-T)

## Prevents workpieces from electrostatic discharge

Static electricity is suppressed with a new antistatic material.  
(excluding GFM-T)

## Class 10 level is achieved\*

Limit the particle of floating air by new porous material  
\* Our original test for GFM Series equals to JIS B 9920 class 4, and its measured value includes particle diameter larger than 0.5  $\mu\text{m}$ .  
(excluding GFM-T)






## Appropriate for sensitive inspection.

Adopting black body eliminates scattered reflection and improves visibility of workpiece.

## Great variety of applications

Proposing the best pneumatic components for floating.

## GFM Series products

Series variation	Applications	Floating [ $\mu\text{m}$ ]	Air consumption $\ell/\text{min}$ (abs) (0.1MPa)*1					Page
			0	5	10	15	20	
<b>GFM-A</b> 	Positioning	10 $\mu\text{m}$ and over*2		3	10			1
<b>GFM-T Series</b> 	Rough conveying	250 $\mu\text{m}$ and over*2					100 or less	7
<b>GFM-RF Series</b> 	Conveying	250 $\mu\text{m}$ and over*2				15	20	11
<b>GFM-RS Series</b> 	Loader and unloader	150 $\mu\text{m}$ and over*2				15	20	11
<b>GFM-P</b> 	Processes	30 $\mu\text{m}$ *3		2	3			19

\*1 Use this as reference for air consumption.

\*2 Use this as reference for floating amount.

\*3 Value depends on positive pressure and negative pressure flow rate.



Floating system/glass float module

# Alignment floating pad **GFM-A**

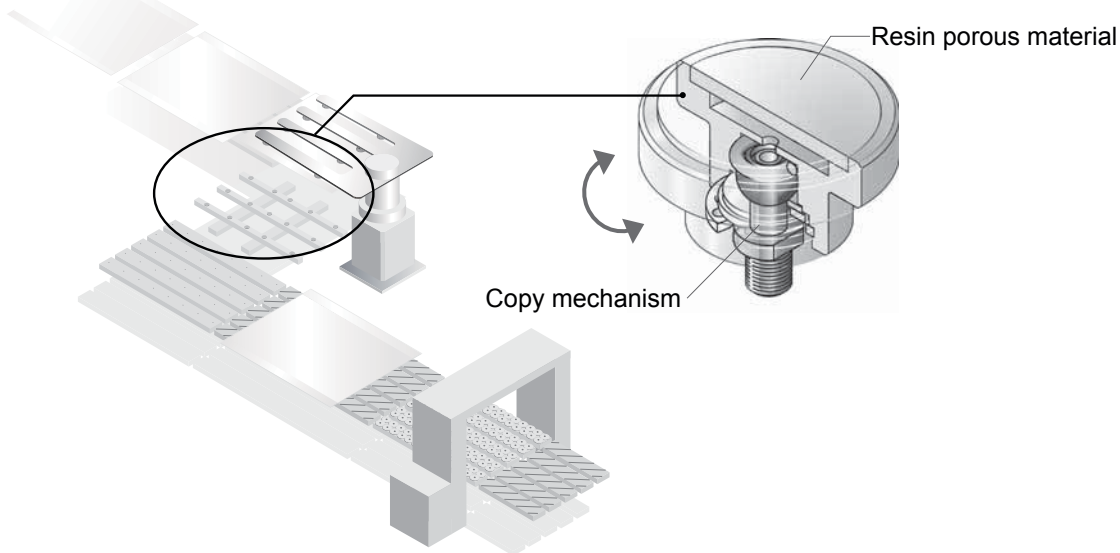
Head swinging type freely handles deflections.

● Reference floating: 10 μm and over ● Main applications: Alignment



The new resin porous material and CKD's original copy mechanism enables deflections to be aligned.

■ CKD original "resin porous material + copy mechanism" are provided. (PAT.P)



■ Small air consumption

Due to a porous material, the air consumption reduced to 1/2\*.

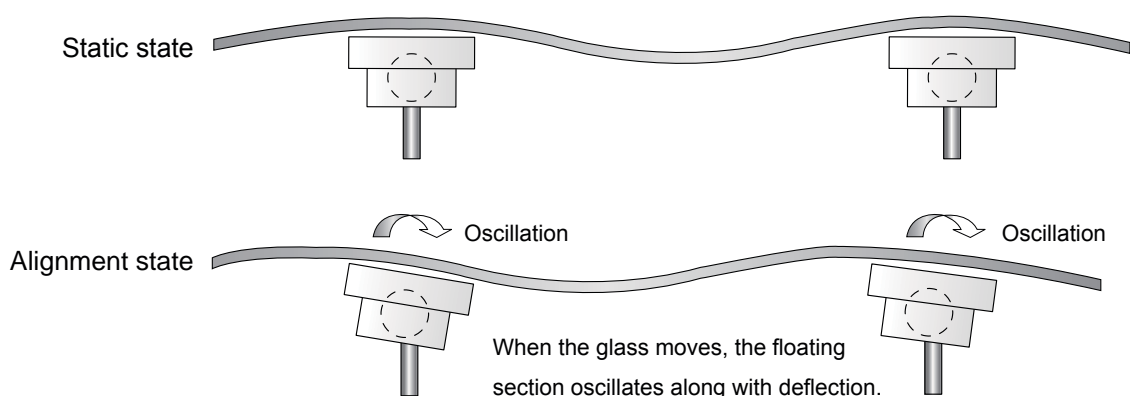
\* Based on CKD test of GFM-A

■ Antistatic

Static electricity is suppressed by antistatic resin porous material.

■ Freely handle deflections

Non-contact floating is possible while tracking deflections on large glass substrates. (Image)



## Specifications

Descriptions		GFM-A
Working fluid		Clean compressed air (grade 1.1.1 to 1.6.2)
Working pressure	Floating	80 to 200
	kPa Suction	-90 to -60
Ambient temperature °C		5 to 40
Temperature for transport and storage °C		-10 to 60
Mounting orientation		Porous material surface facing up only
Load Note 1	N	1 to 5
Air consumption Note 1 ℓ/min.		10 or less
Suction holding force	N	5 or less (suction surface vertical)
Port size		M5
Weight	g	Approx. 15

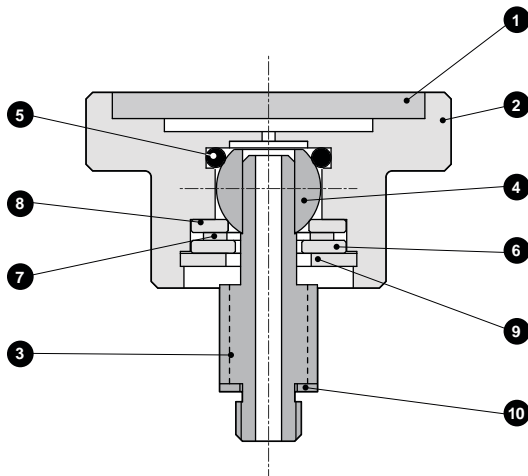
Note 1: This value applies at supply air pressure 100kPa.

## How to order

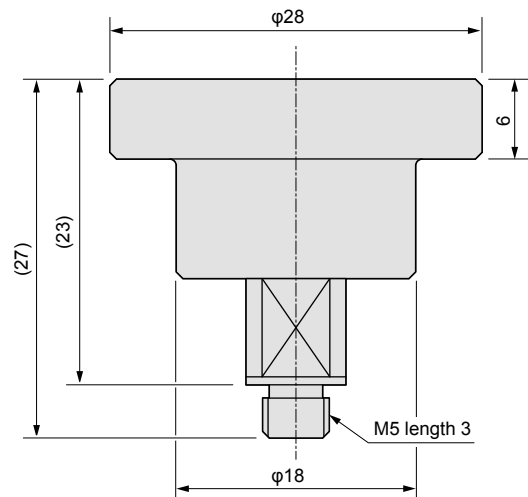


Model no.

## Internal structure and parts list

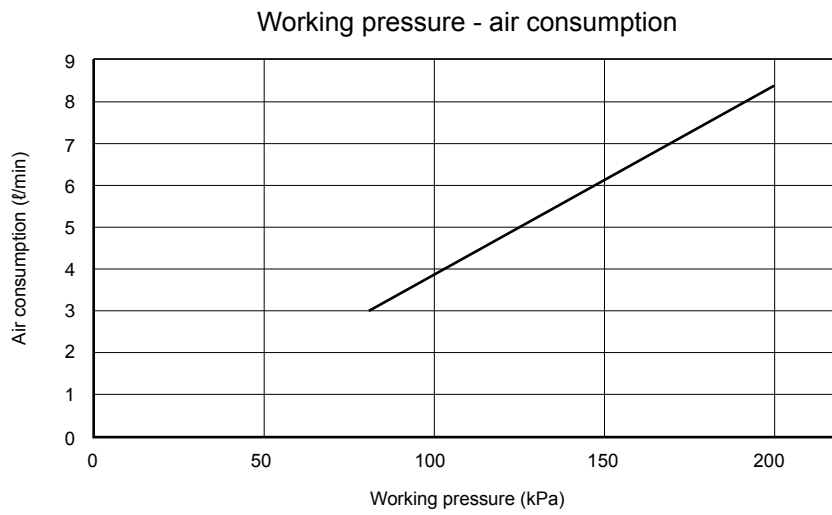
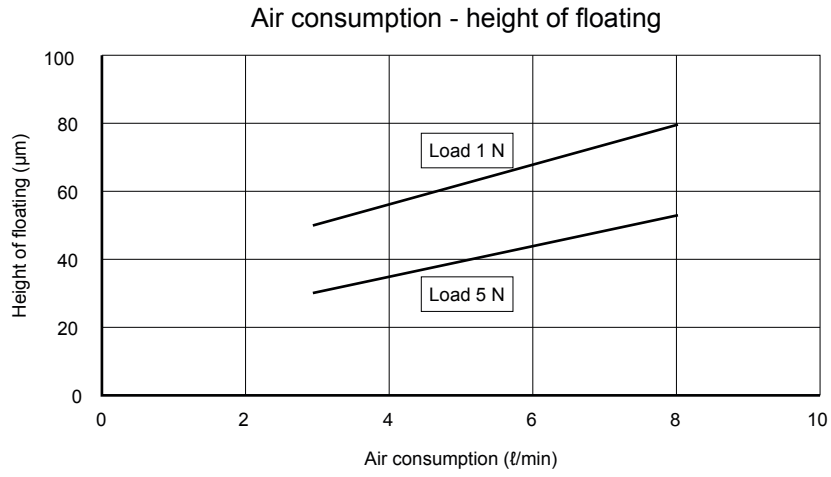


## Dimensions



No.	Parts name	Material	Remarks
1	Porous material	Polyphenylene sulfide	With carbon fiber
2	Body	Polyphenylene sulfide	With carbon fiber
3	Shaft	Stainless steel	
4	Steel ball	Stainless steel	
5	O ring	Nitrile rubber	
6	Metal washer	Stainless steel	
7	Wave washer	Stainless steel	
8	Metal washer	Iron steel	Electroless nickeling
9	C type snap ring for hole	Stainless steel	
10	Gasket	Nitrile rubber, steel	

## 1 Height of floating (reference data)

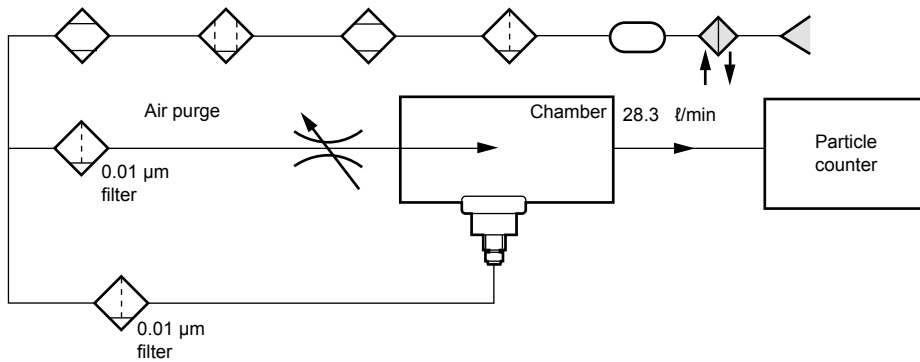


**2 Dust generation (reference data)**

[Measuring method]

- ① Install test sample on chamber.
- ② Supply air.
- ③ Measure the quantity of particles generated when air is flown continuously.

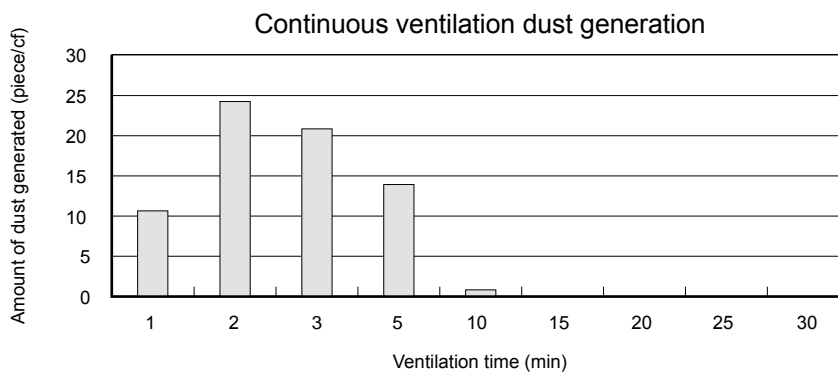
[Test circuit]



[Measuring instrument]

- Particle counter : Laser dust monitor
- Minimum measurable particle diameter: 0.1 μm
- Suction rate : 28.3 l/min

[Results]



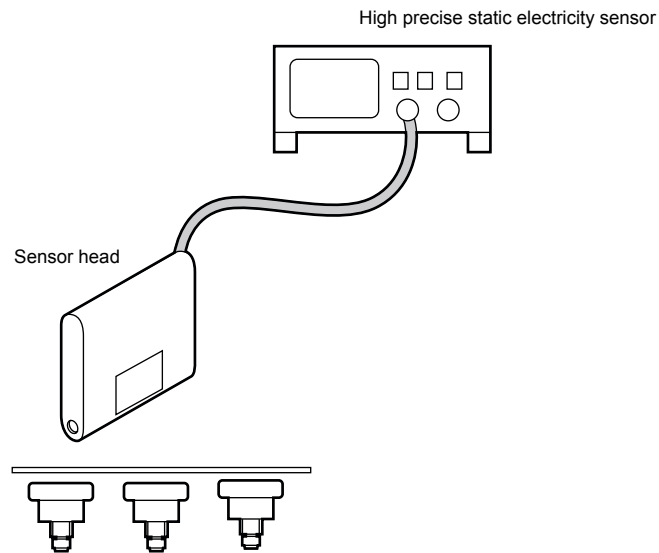
Note: Amount of dust generation includes larger than 0.5 μm particle diameter

## 3 Change of static electricity amount (reference data)

### [Measuring method]

- ① Install sensor head at the center of glass.
- ② Measure the static electricity amount (voltage) while air supplying.

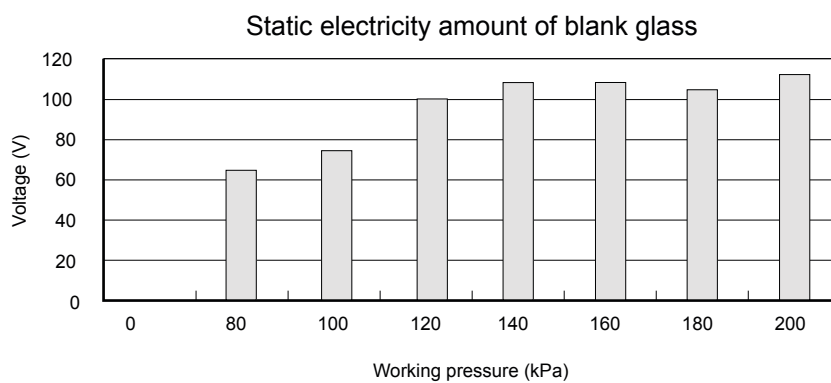
### [Test circuit]



### [Measuring instrument]

Static electricity amount measurement: high precise static electricity measure (non-contact type)

### [Results]





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MEMO

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Floating system, glass float module

# High floating rail **GFM-T** Series

- Floating amount: more than 250  $\mu\text{m}$
- Main purpose: high floating transport



Unique design which takes advantage of know how about air pressure technology through long experience enables high floating non-contact transportation.

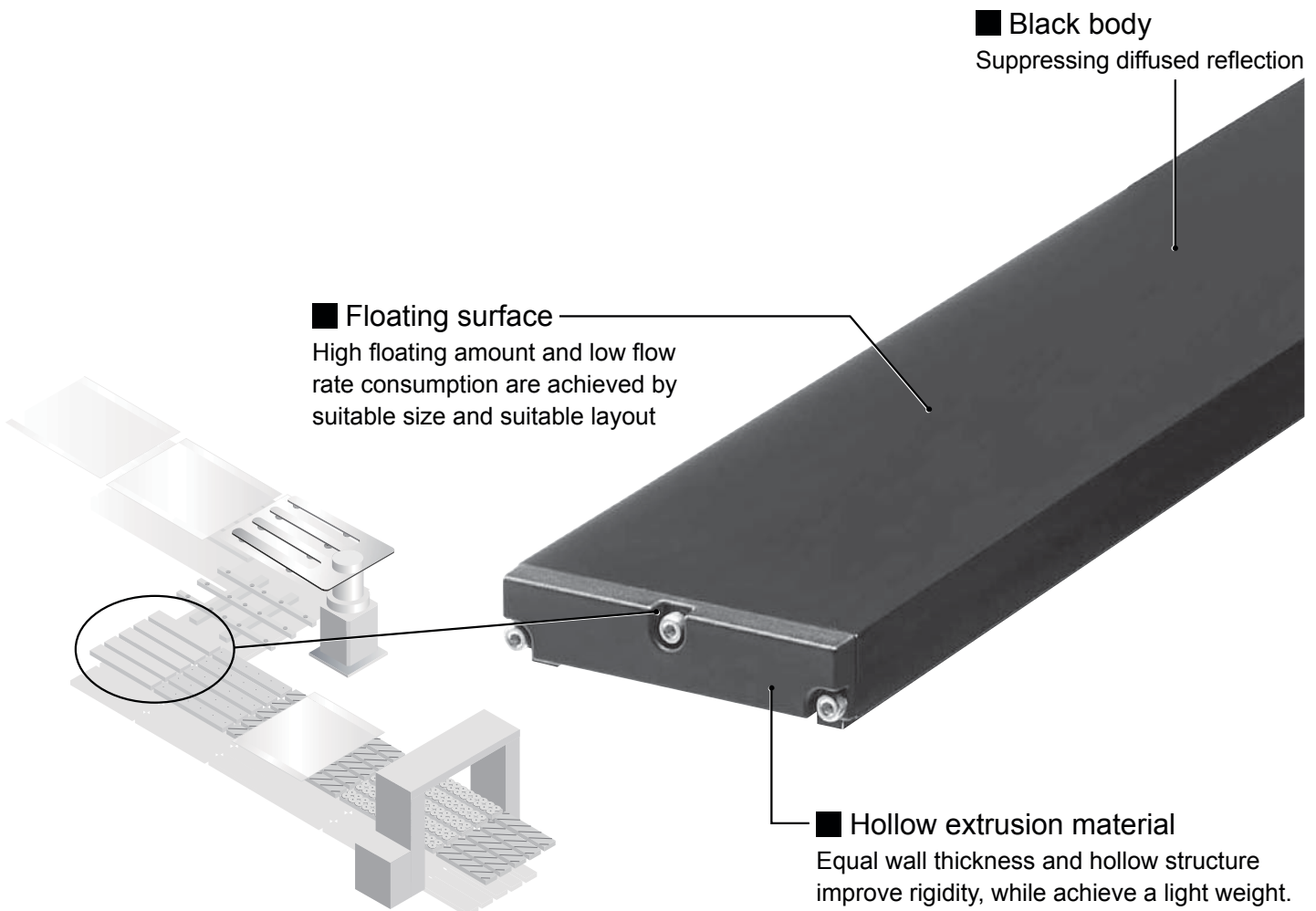
## ■ CKD original design

Fluid technology accumulated over the years by CKD is applied.  
High floating amount is achieved with low consuming flow rate

## ■ Easy installation

Saved steps on installation by bracket-less direct piping and direct mounting structure.

It helps to reduce installation man hour for long distance transporting line.



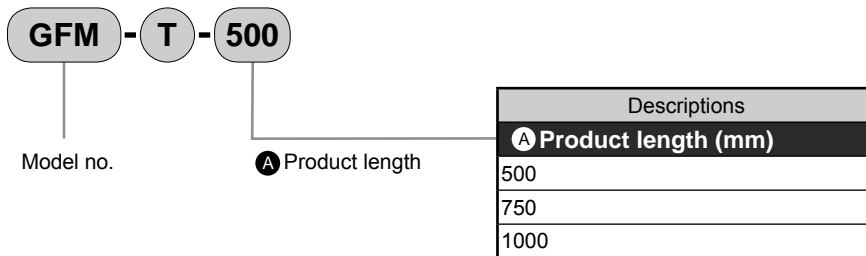
## Specifications

Descriptions	GFM-T-500	GFM-T-750	GFM-T-1000
Product size (L×W×H) mm	500 × 100 × 25	750 × 100 × 25	1000 × 100 × 25
Working fluid	Clean compressed air (grade 1.6.2)		
Operating ambient temperature °C	5 to 40		
Temperature for transport and storage °C	-10 to 60		
Working pressure (positive pressure) MPa	0 to 0.2		
Air consumption Note 1 l/min	100 or less		
Height of floating Note 2 μm	250 or more		
Weight kg	Approx. 1.7	Approx. 2.5	Approx. 3.3

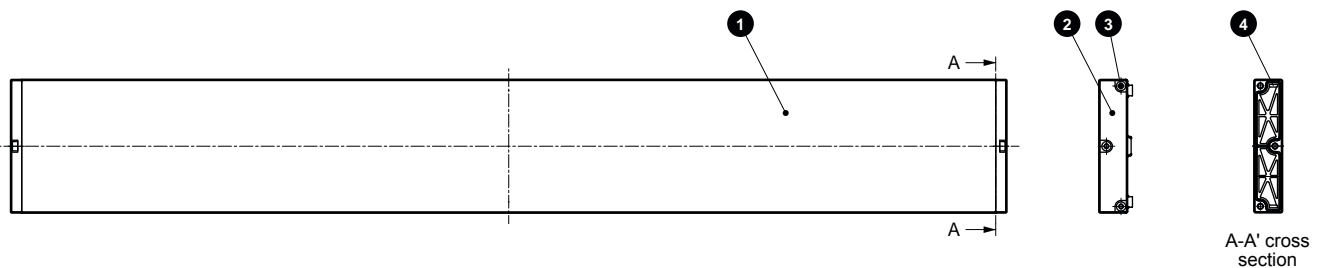
Note 1: This indicates the air consumption flow when 0.1 MPa supply.

Note 2: 0.1 MPa supply. This is the value for when a 0.7 mm thick glass is floating. Use this as reference for floating height.

## How to order



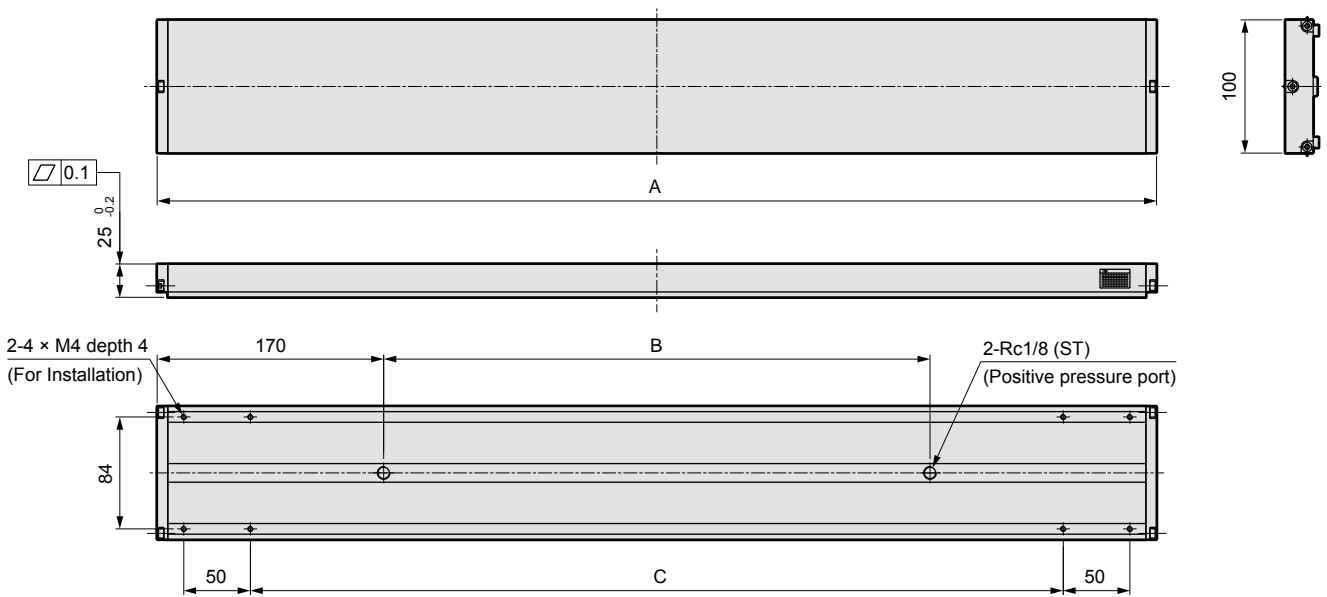
## Appearance and parts list



No.	Parts name	Material	Remarks
1	Body	Aluminum alloy	Black alumite *
2	Lid	Polyamide with glass fiber	
3	Hexagon socket head cap screw	Stainless steel	
4	Gasket	Nitrile butylene rubber	

\* Sometimes white stripes appear in the product's appearances. They are generated during production process, and they have no influence on product's performance.

## Dimensions



## Technical data

- Height of floating

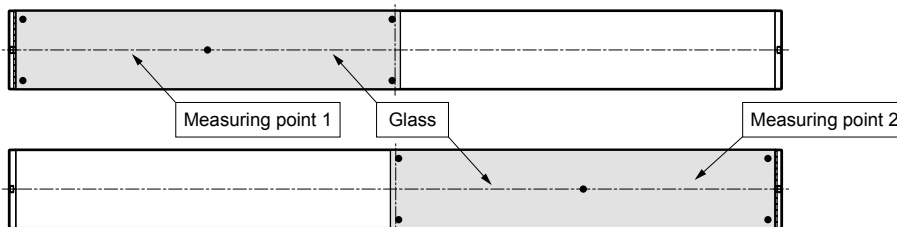
### [Measuring method]

- ① Set the glass surface when inlet air pressure is zero as base point (zero).
- ② Supply air and float the glass, then measure the displacement amount.

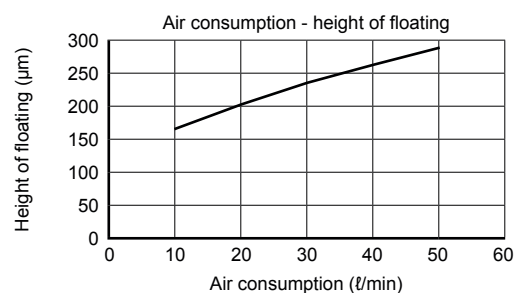
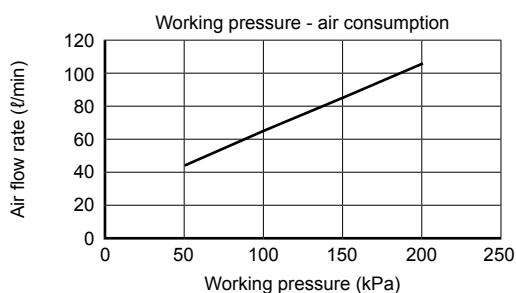
Sample : GFM-T-1000

Height of floating: The minimum value of displacement amounts among 10 measuring points (refer below for the measuring points)

Glass size : t0.7 × 100 × 500



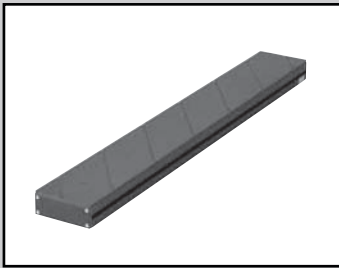
### [Results]



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MEMO

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Floating system/glass float module

# Floating rail **GFM-R<sup>F</sup>** Series

- Floating: 150 μm and over
- Main applications: transport

Custom order



The new carbon graphite porous material and CKD's original design enables highly accurate floating transport.

## ■ CKD original design (PAT.P)

Fluid technology accumulated over the years by CKD is applied.  
A floating surface that floats accurately is realized.

## ■ Antistatic

Using porous carbon graphite prevents static electricity.  
Floating air entering porous material flows slowly and keeps the workpiece from being charged.

## ■ Stable floating

By incorporating porous material and optimally positioning the air path, stable floating is possible over a wide area.

## ■ Low particle occurrence

Particles in floating air are suppressed by using porous carbon graphite.

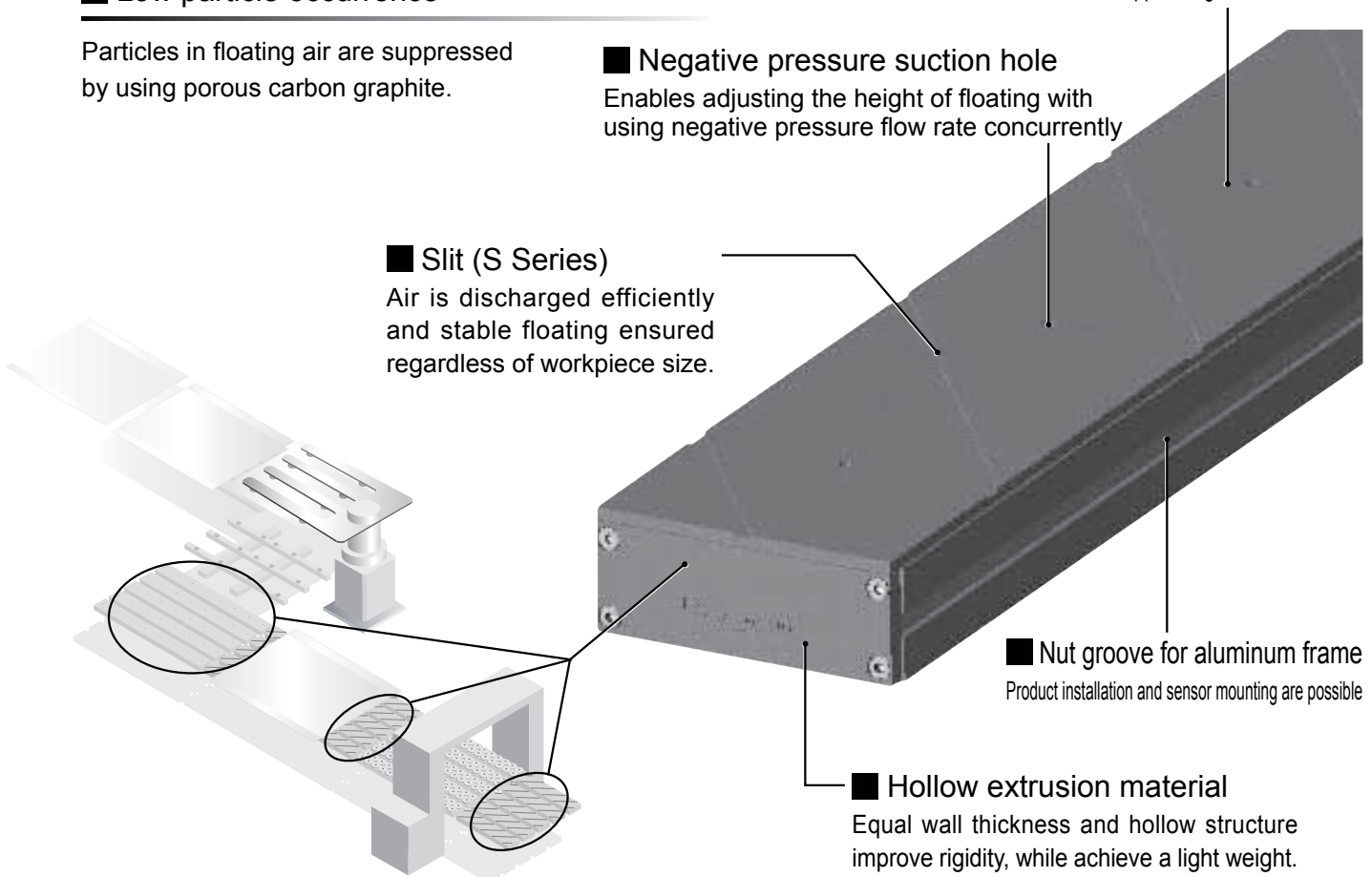
■ Negative pressure suction hole  
Enables adjusting the height of floating with using negative pressure flow rate concurrently

■ Black body  
Suppressing diffused reflection

■ Slit (S Series)  
Air is discharged efficiently and stable floating ensured regardless of workpiece size.

■ Nut groove for aluminum frame  
Product installation and sensor mounting are possible

■ Hollow extrusion material  
Equal wall thickness and hollow structure improve rigidity, while achieve a light weight.



### Specifications

Descriptions	GFM-RS-500	GFM-RS-750	GFM-RS-1000
	GFM-RF-500	GFM-RF-750	GFM-RF-1000
Product size (L×W×H) mm	501 × 102 × 40	751 × 102 × 40	1001 × 102 × 40
Floating surface size (L × W) mm	500 × 100	750 × 100	1000 × 100
Working fluid	Clean compressed air (grade 1.1.1 to 1.6.2)		
Operating ambient temperature °C	5 to 40		
Temperature for transport and storage °C	-10 to 60		
Working pressure	0 to 0.2		
	-50 to 0		
Air consumption Note 1 l/min	Approx. 12	Approx. 18	Approx. 24
Height of floating Note 2 μm	Approx. 150 (GFM-RS)/approx. 250 (GFM-RF)		
Weight kg	Approx. 1.8	Approx. 2.7	Approx. 3.6

Note 1: This indicates the air consumption flow when 0.1 MPa supply. Air consumption varies with the workpiece state and required floating rate. Use this as a guide for calculating the flow rate.

Note 2: 0.1 MPa supply. This is the value for when a 0.7 mm thick glass is floating. Use this as reference for floating height.

### How to order

**GFM - RS - 500**

Model no.

**A** Form of surface

**B** Floating surface length

Symbol	Descriptions
<b>A Form of surface</b>	
RS	With slit
RF	Without slit
<b>B Floating surface length (mm)</b>	
500	
750	
1000	

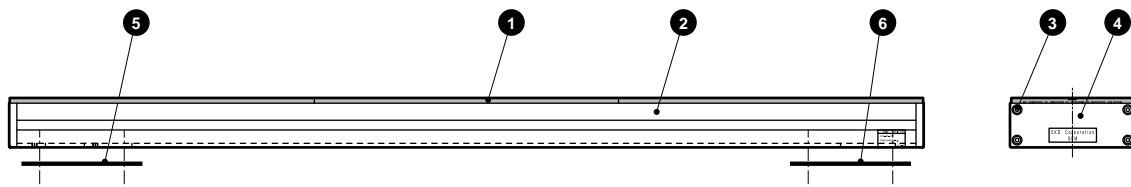
\* Sometimes white stripes appear in the product's appearances. They are generated during production process, and they have no influence on product's performance.

### Bracket kit discrete model No.

**GFM - R - B**

\* Refer to page 14 for the details of bracket kit.

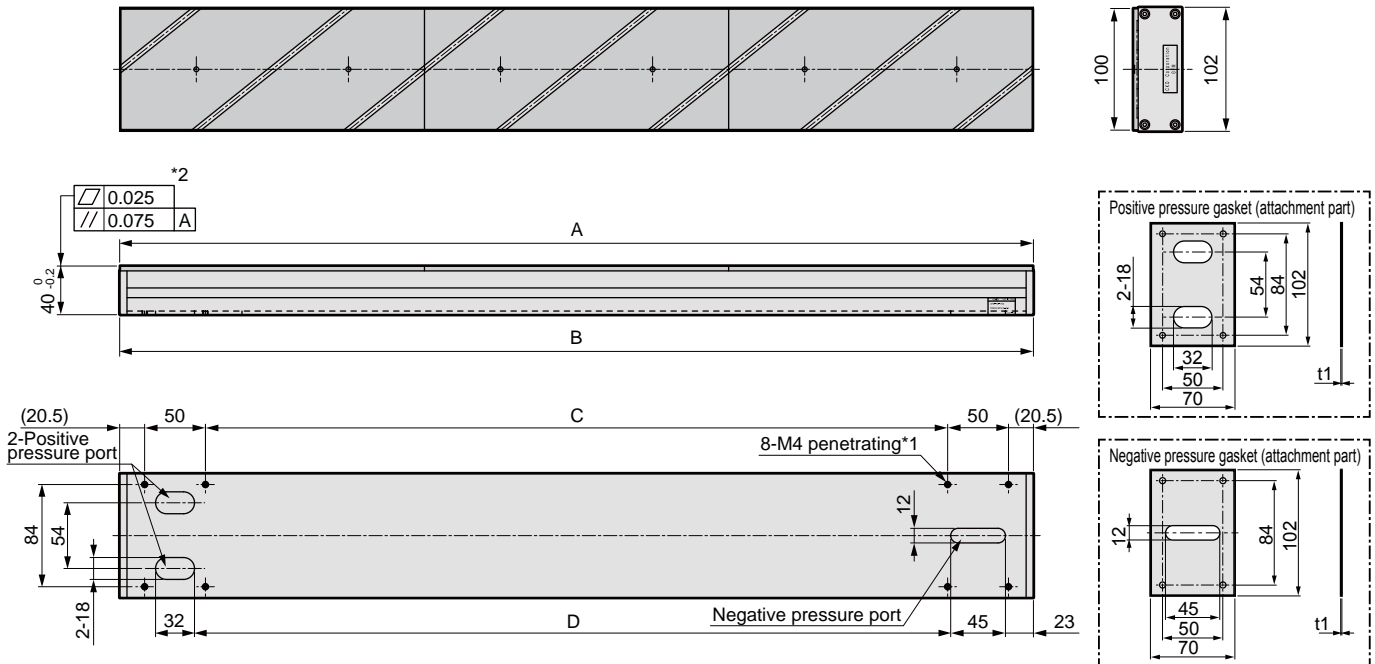
### Appearance and parts list



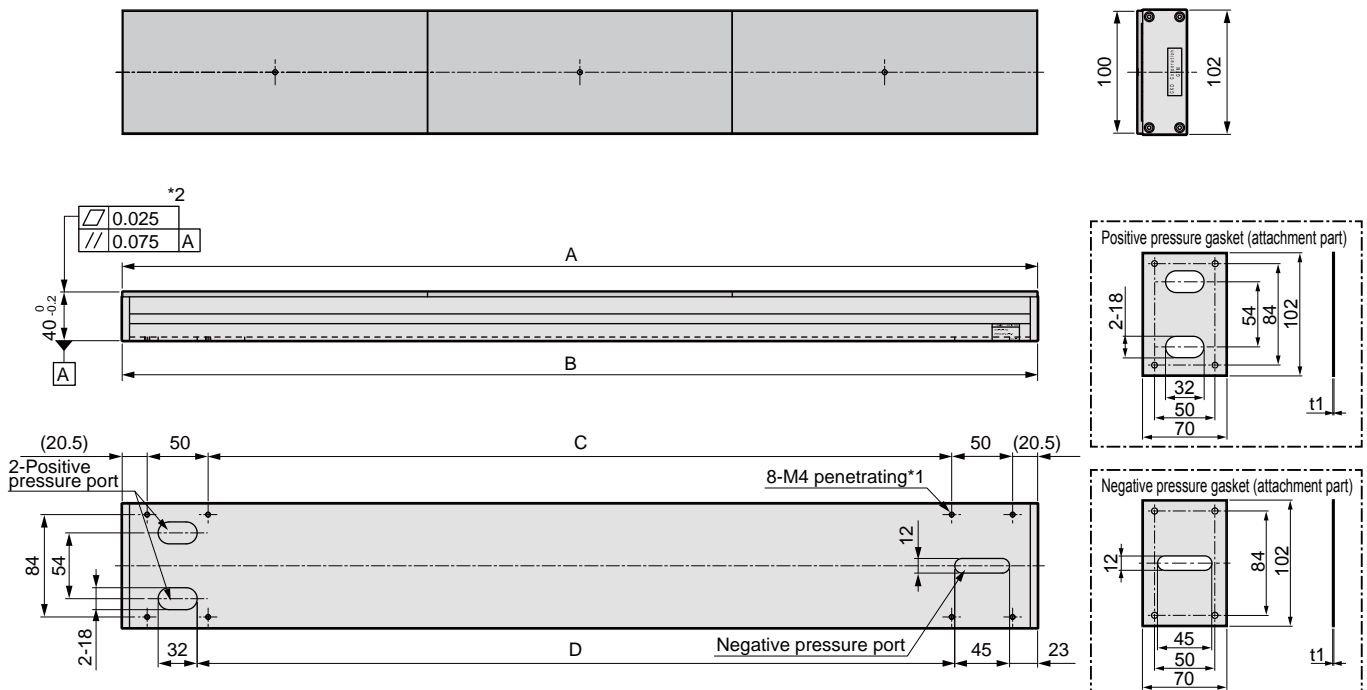
No.	Parts name	Material	Remarks
1	Porous material	Carbon graphite	
2	Base	Aluminum alloy	Black alumite treatment *
3	Hexagon socket head cap screw	Stainless steel	
4	Lid	ABS resin	
5	Positive pressure gasket	NBR	Accessories
6	Negative pressure gasket	NBR	Accessories

## Dimensions

### ● With slit GFM-RS



### ● Without slit GFM-RF



\*1: Pass through the positive pressure port

\*2: Value measured at 25°C constant temperature. Accuracy varies in an atmosphere other than 25°C.  
Flatness 0.05 mm, 0.1 mm parallelism for GFM-R\*-1000.

Model no.	A	B	C	D
GFM-R*-500	500	501	360	371.5
GFM-R*-750	750	751	610	621.5
GFM-R*-1000	1000	1001	860	871.5

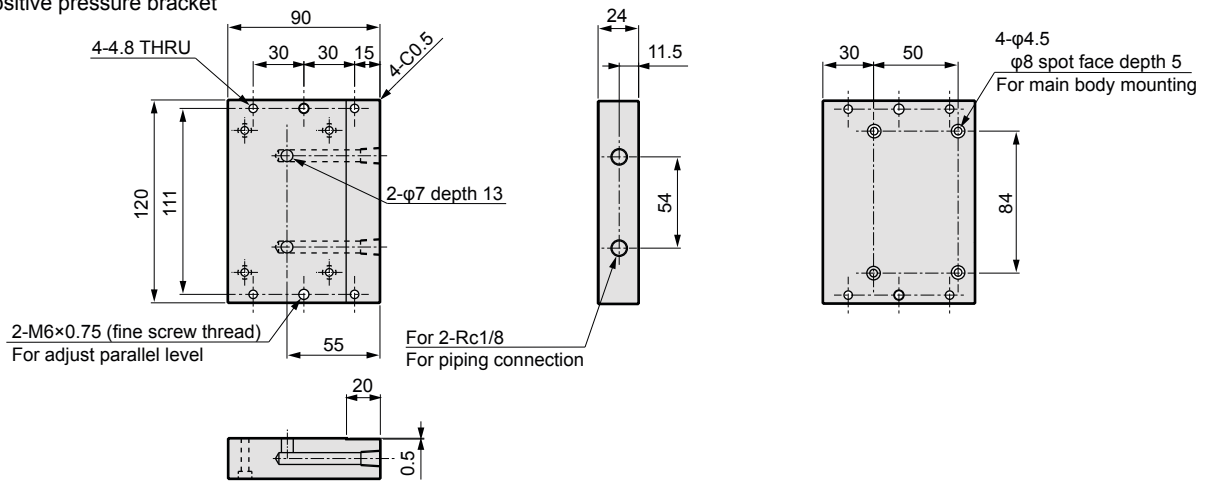


### Dimensions (bracket kit)

● Model no.: GFM-R-B

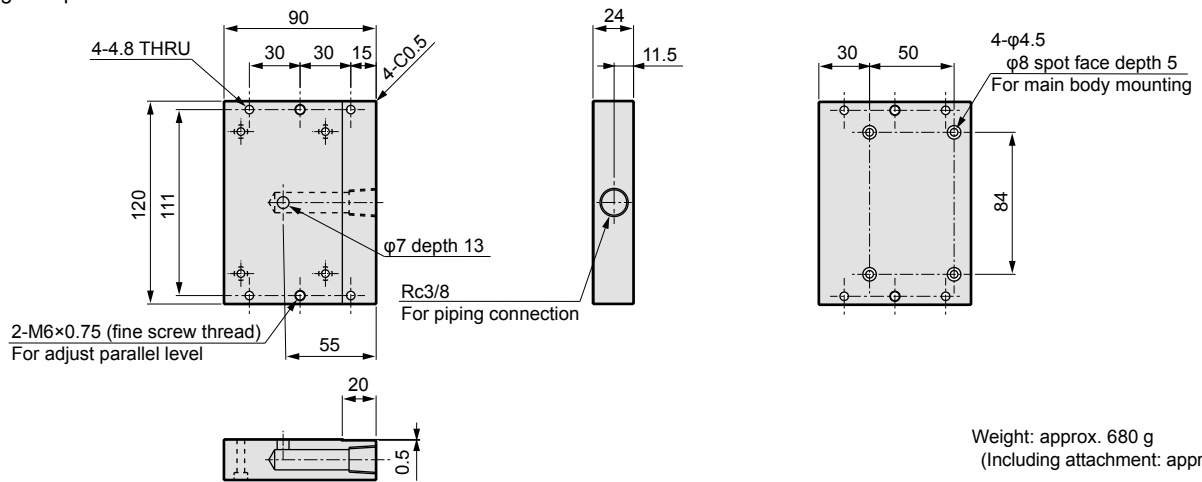
(Contents of kit: positive pressure bracket, negative pressure bracket, hexagon socket head cap bolt × 8, gasket for screws × 8)

• Positive pressure bracket



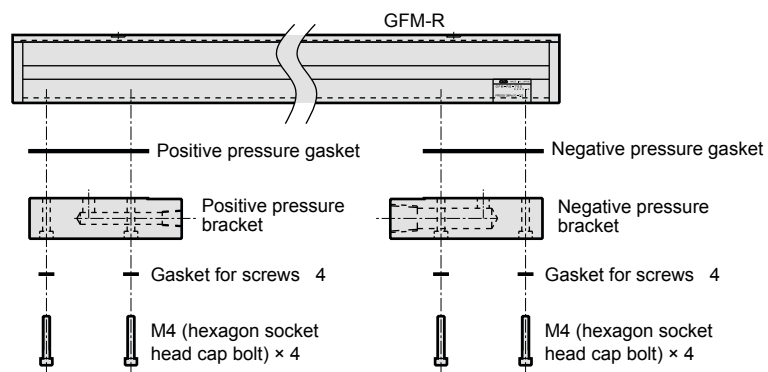
Weight: approx. 680 g  
(Including attachment: approx. 20 g)

• Negative pressure bracket



Weight: approx. 680 g  
(Including attachment: approx. 20 g)

• Examples of bracket kit mounting



### 1 Height of floating

#### [Measuring method]

- ① Set the glass surface when inlet air pressure is zero as base point (zero point).
- ② Float the glass, then measure the displacement amount.

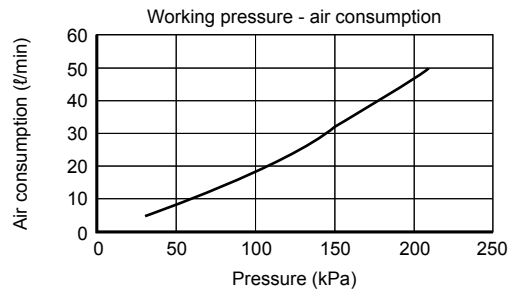
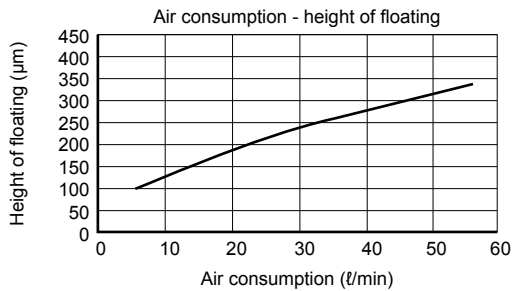
Height of float : The minimum value of displacement amounts among 18 measuring points  
(Refer to measurement method of floating flatness for 18 measurement points)

Glass size : t0.7 × 100 × 400

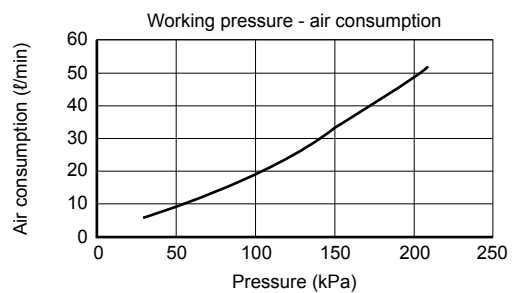
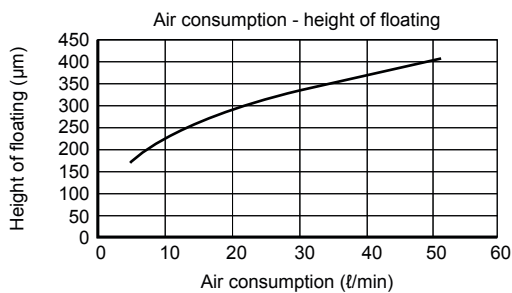
#### [Results]

Negative pressure condition: 0 kPa

■ With slit type (GFM-RS-750)

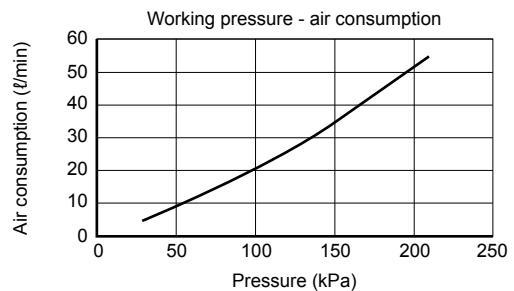
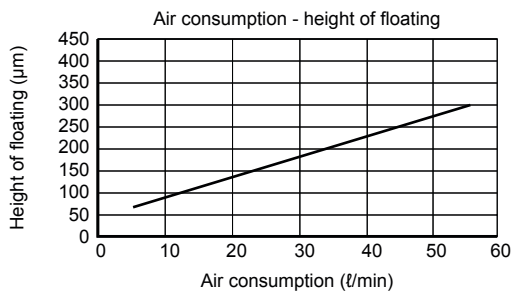


■ Without slit type (GFM-RF-750)

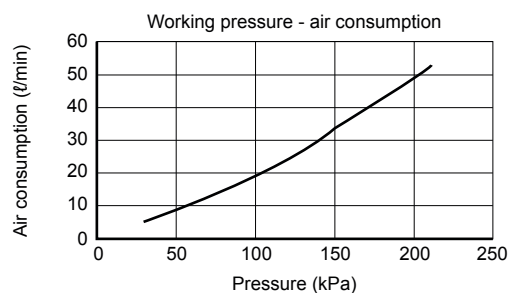
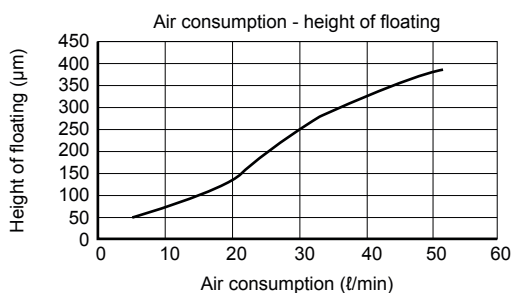


Negative pressure condition: -0.8 kPa

■ With slit type (GFM-RS-750)



■ Without slit type (GFM-RF-750)



**2 Flatness of floating**

[Measuring method]

- ① Set the glass surface when inlet air pressure is zero as base point (zero point).
- ② Float the glass, then measure the displacement amount.
- ③ Measure at 9 points when the glass is at position A.
- ④ Measure at 9 points when the glass is at position B.

Flatness of float: (max-min) value of displacement amounts among 18 measuring points

Glass size : t0.7-100 × 400



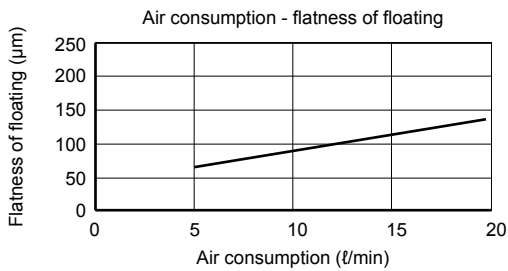
[Measuring instrument]

Laser displacement meter: specular type (for transparent body measurement)

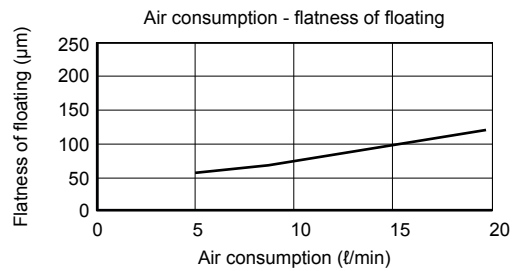
[Results]

■ With slit type (GFM-RS-750)

Negative pressure condition: 0 kPa

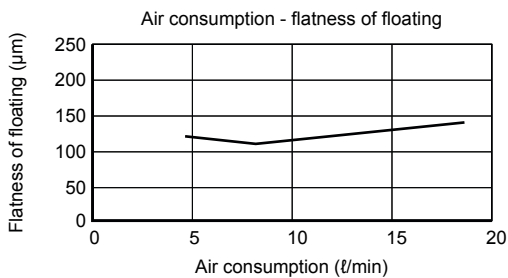


Negative pressure condition: -0.8 kPa

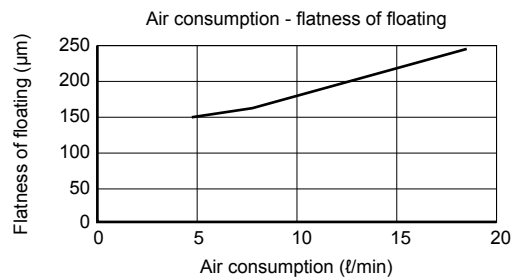


■ Without slit type (GFM-RS-750)

Negative pressure condition: 0 kPa



Negative pressure condition: -0.8 kPa

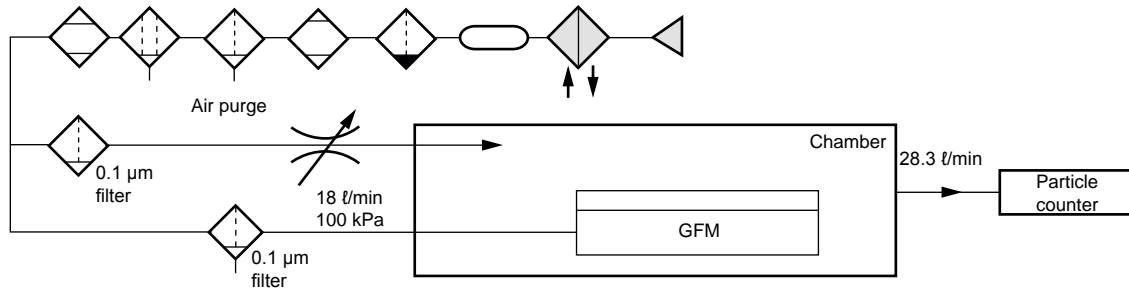


## 3 Amount of dust generated

### [Measuring method]

- ① Install test sample inside the acryl made chamber.
- ② Supplies 100 kPa (18 - 20 l/min) air
- ③ Measure the quantity of particles generated when air is flown continuously.

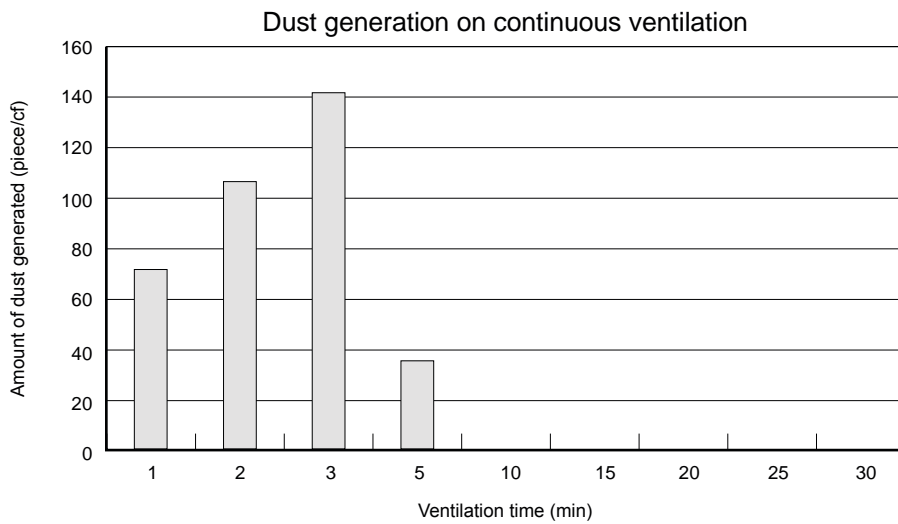
### [Test circuit]



### [Measuring instrument]

Particle counter	: Laser dust monitor
Min. measurable particle diameter	: 0.1 μm
Suction rate	: 28.3 l/min

### [Results]



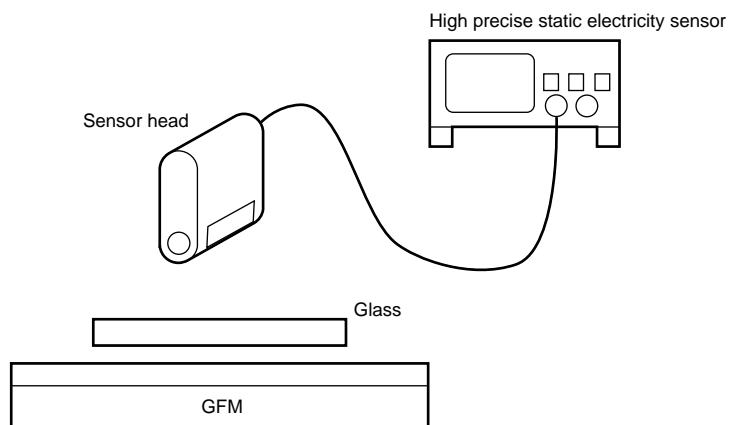
Note: Amount of dust generation includes larger than 0.5 μm particle diameter

**4 Static electricity change amount (with slit)**

[Measuring method]

- ① Install sensor head at the center of glass.
- ② Measure the value of static electricity amount (voltage) while air supplying.

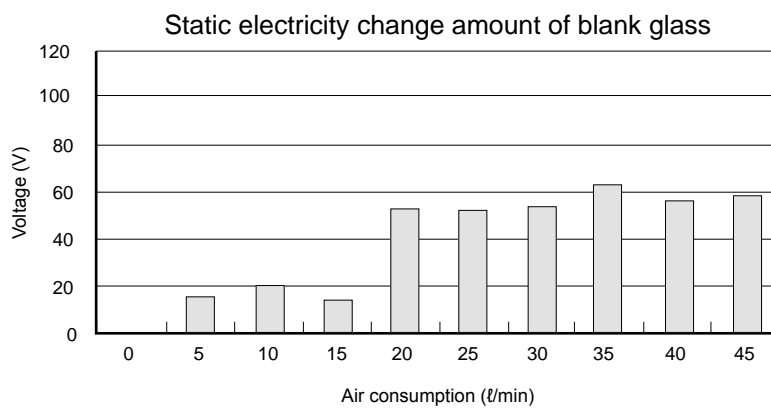
[Test circuit]

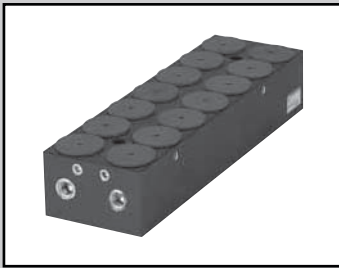


[Measuring instrument]

Static electricity amount measurement: high precise static electricity measure (non-contact type)

[Results]





Floating system/glass float module

# Precise floating stage GFM-P

● Floating rate:  $30 \pm 6 \mu\text{m}$  ● Main applications: Various inspection processes, work processes

Custom order

RoHS

The new carbon graphite porous material and CKD's original design enables highly accurate floating.

## ■ CKD original design (PAT.P)

Fluid technology accumulated over the years by CKD is applied. Floating surface is shaped for highly accurate floating.

## ■ High accuracy

Extra-precise machining ensures superb flatness and parallelism.

## ■ High floating accuracy

Highly accurate floating is enabled by using positive pressure and negative pressure flow.

## ■ Antistatic

Using carbon graphite prevents static electricity. Floating air entering porous material flows slowly and keeps the workpiece from being charged.

## ■ Low particle occurrence

By adopting porous carbon graphite, particles in the floating air are suppressed.

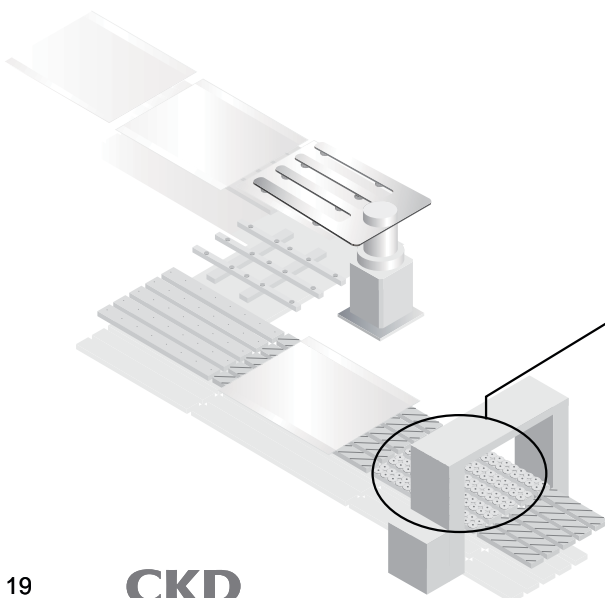
## ■ Negative pressure suction hole

Highly accurate floating is enabled by using positive pressure and negative pressure flow.

## ■ Black body

Suppressing diffused reflection

■ Top surface installation to facilitate installation



## Specifications

Descriptions		GFM-P
Product size (L x W x H) mm		250 x 76 x 50
Floating surface size (L x W) mm		250 x 76
Working fluid		Clean compressed air (grade 1.1.1 to 1.6.2)
Ambient temperature range °C		5 to 40
Temperature for transport and storage °C		-10 to 60
Working pressure	Positive pressure MPa	0 to 0.2
	Negative pressure kPa	-50 to 0
Floating flatness Note 1 μm		12 μm or less (30 μm floating)
Air consumption Note 2 ℓ/min.		Approx. 2 to 3
Floating height Note 3 μm		Approx. 70
Weight kg		Approx. 2.2

Note 1: The difference of the floating surface's MAX-MIN is indicated. Supply flow rate conditions vary with the workpiece state and the user's working conditions. Use this as a guide for floating flatness.

Note 2: This indicates the air consumption when 0.1MPa supply. Air consumption varies with the workpiece state and required floating rate. Use this as a guide for calculating the flow rate.

Note 3: When 0.1MPa is supplied. This is the value for when a 0.7 mm thick glass is floating. Use this as reference for floating height.

## How to order

**GFM - P**

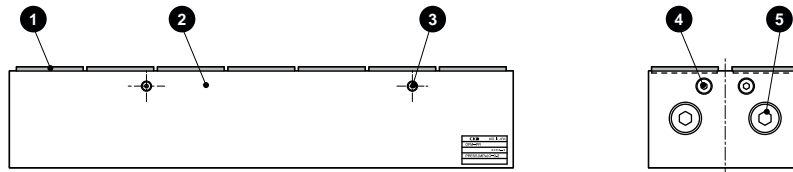
Model no.

## Bracket kit discrete model No.

**GFM - P - B**

\* Refer to page 21 for the details of bracket kit.

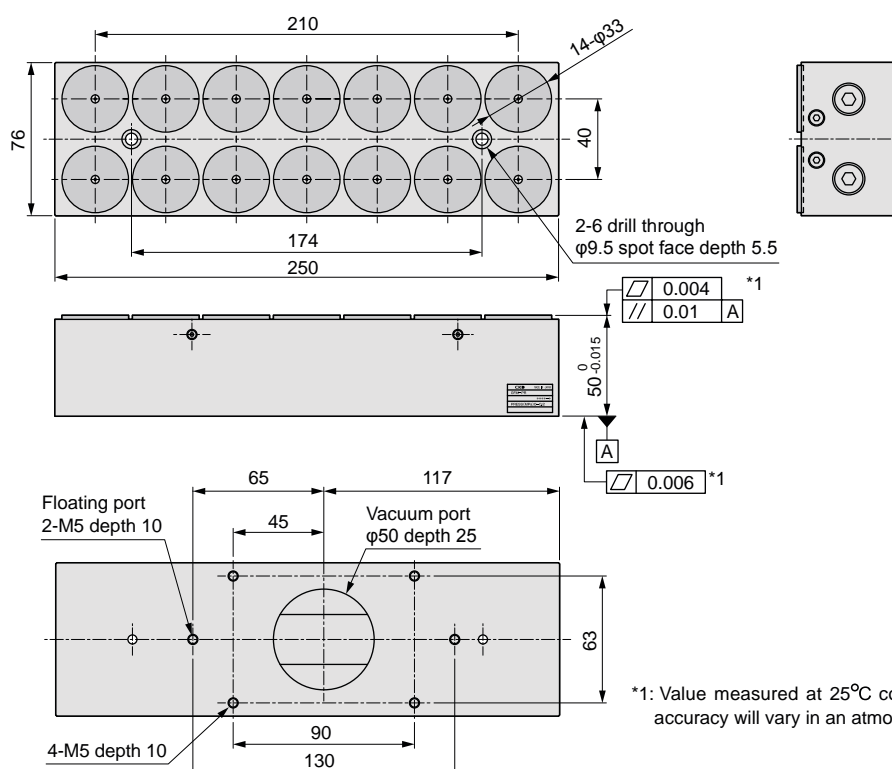
## Appearance and parts list



No.	Parts name	Material	Remarks
1	Porous material	Carbon graphite	
2	Base	Aluminum alloy	Black alumite treatment*
3	Hexagon socket set screw	Stainless steel	
4	Hexagon socket set screw	Stainless steel	
5	Hexagon socket set screw	Stainless steel	

\* Sometimes white stripes appear in the product's appearances. They are generated during production process, and they have no influence on product's performance.

## Dimensions

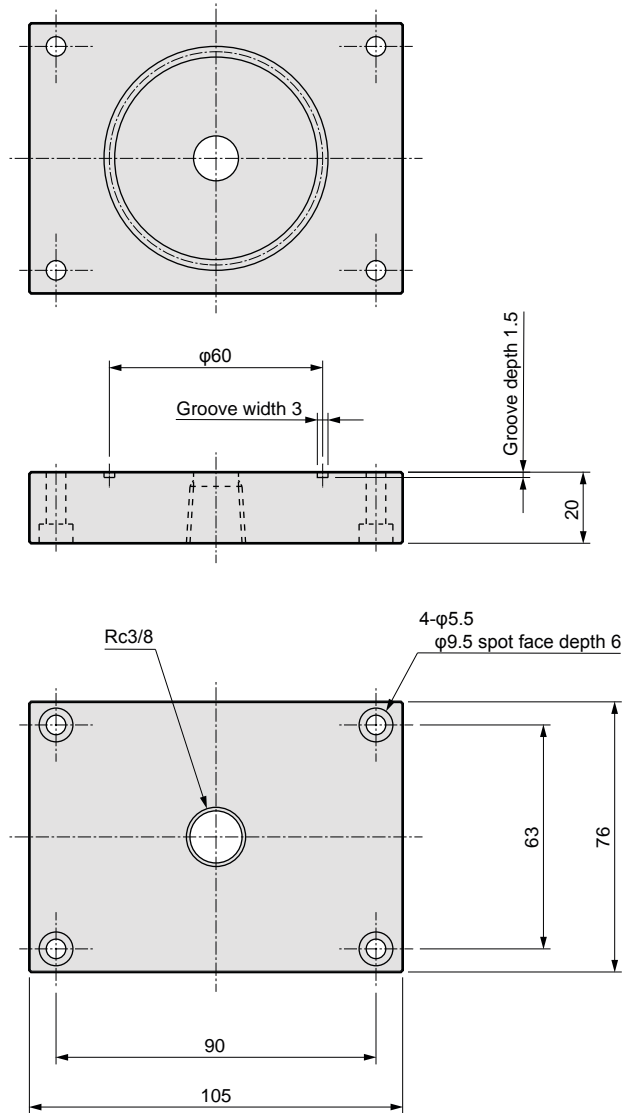


\*1: Value measured at 25°C constant temperature room. The accuracy will vary in an atmosphere that deviates from 25°C.

## Dimensions (bracket kit)

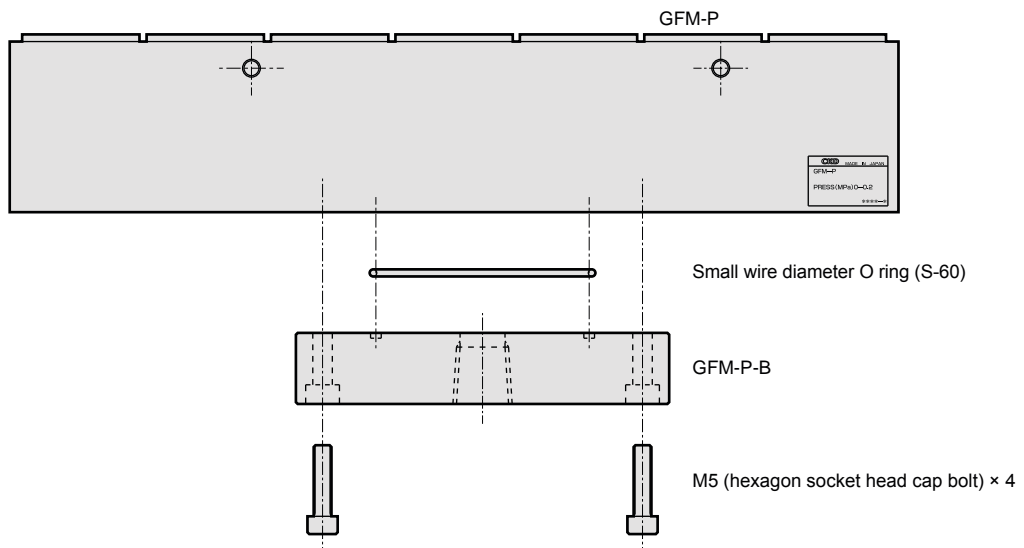
● Model no.: GFM-P-B

(Contents of kit: bracket, O ring × 1, hexagon socket head cap bolt × 4)



Weight: Approx. 430 g  
(Including attachment: approx. 20 g)

● Examples of bracket kit mounting





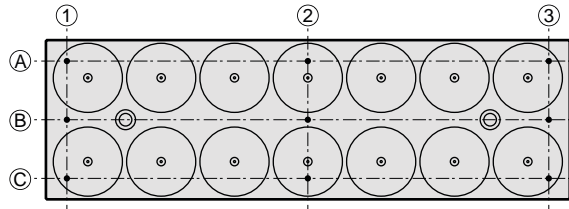
**1 Height of floating, flatness of floating 1**

[Measuring method]

- ① Set the glass surface when inlet air pressure is zero as base point (zero point).
- ② Float the glass, then measure the displacement amount.

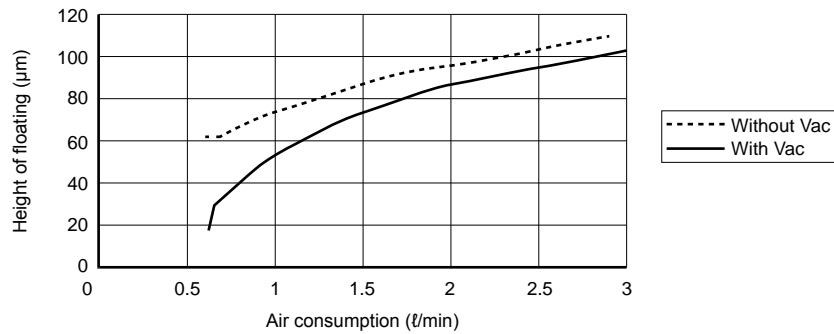
Height of floating: The mean value of displacement amounts among 9 measuring points

Glass size : t0.7 × 76 × 250

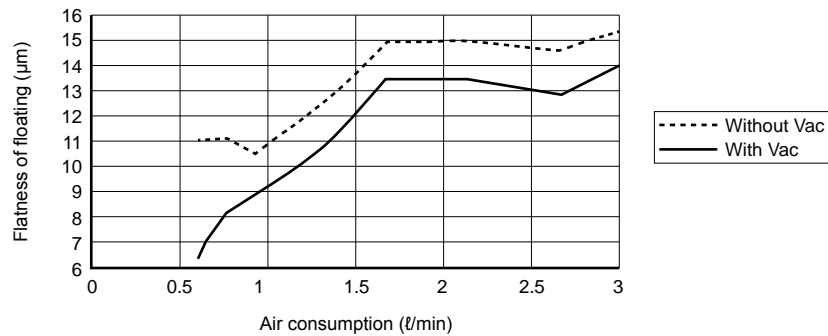


[Results]

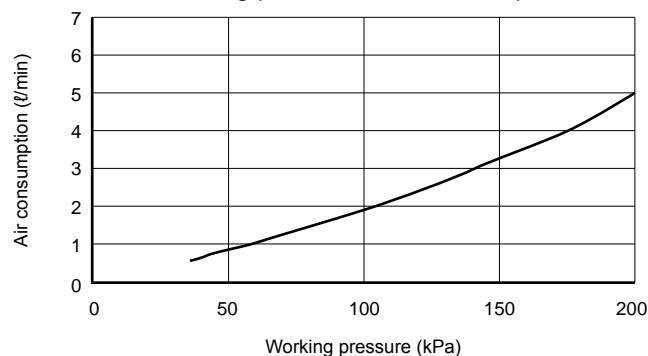
Air consumption - height of floating



Air consumption - flatness of floating



Working pressure - air consumption



### 2 Flatness of floating 2

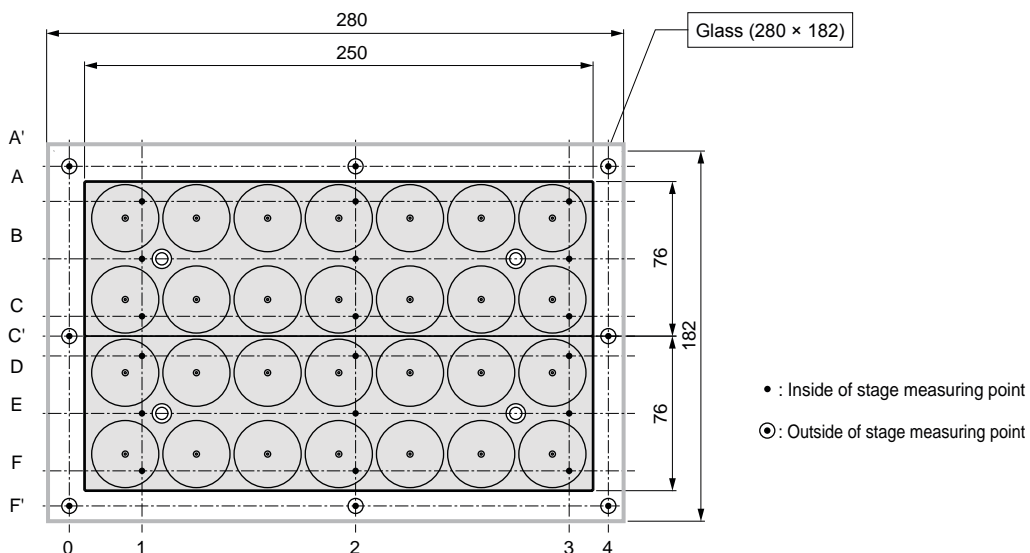
#### [Measuring method]

- ① Set the glass surface when inlet air pressure is zero as base point (zero point).
- ② Float the glass, then measure the displacement amount.

Condition 1: Enlarge glass size than that of precise floating stage by 15mm

Glass size : t0.7 × 280 × 182

Floating stage layout: No gap between stages



#### [Results]

	0	1	2	3	4
A'	18.0		26.5		23.0
A		25.5	25.9	22.1	
B		25.0	27.2	24.8	
C		25.8	27.9	26.2	
C'	21.8				25.0
D		26.1	24.9	27.9	
E		23.8	25.6	23.6	
F		20.4	24.7	20.0	
F'	9.7		20.0		13.9

(Unit: μm)

Target height of floating	(μm)	20
Positive pressure	(kPa)	50
Positive pressure flow rate	(ℓ/min)	1.6
Negative pressure flow rate	(ℓ/min)	6.5
Height of floating MAX	(μm)	27.9
Height of floating MIN	(μm)	20.0
Average height of floating	(μm)	24.9
Flatness of floating	(μm)	7.9

\* It omits data of measuring point outside of floating stage

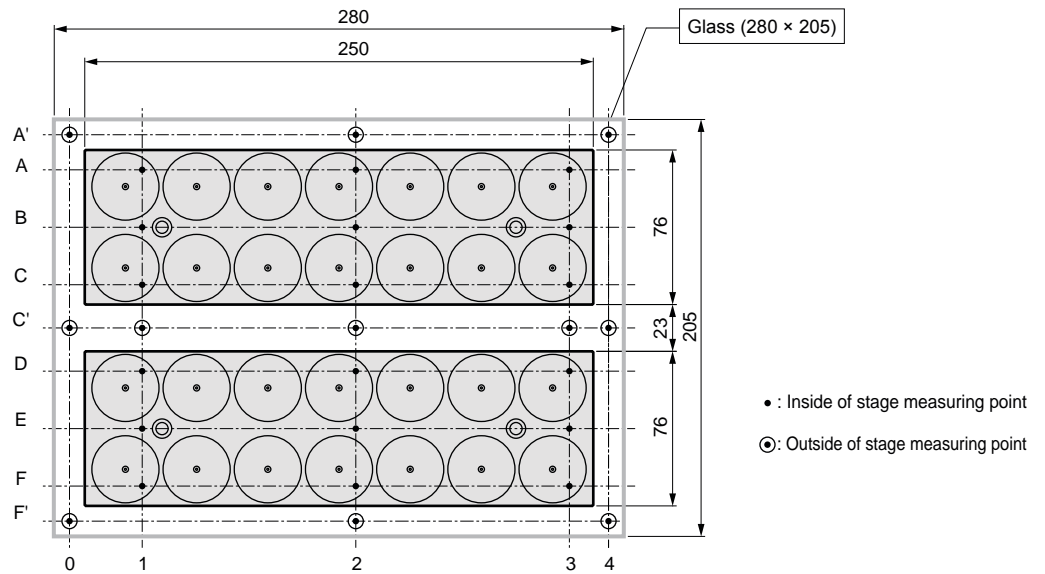
**3** Parallelism of floating 3

[Measuring method]

- ① Set the glass surface when inlet air pressure is zero as base point (zero point).
- ② Float the glass, then measure the displacement amount.

Condition 2: Make 23 mm gap between floating stages, in condition 1

Glass size : t0.7 × 280 × 205  
 Floating stage layout: 23 mm gap between stages



[Results]

	0	1	2	3	4
A'	18.1		22.7		18.9
A		26.8	26.9	23.5	
B		26.0	27.2	25.0	
C		25.6	27.0	26.8	
C'	21.8	23.9	26.0	25.8	24.3
D		25.4	28.4	27.7	
E		23.7	25.3	25.0	
F		22.3	23.0	22.7	
F'	14.8		18.3		12.8

(Unit: μm)

Target height of floating	(μm)	20
Positive pressure	(kPa)	50
Positive pressure flow rate	(l/min)	1.6
Negative pressure flow rate	(l/min)	6.3
Height of floating MAX	(μm)	28.4
Height of floating MIN	(μm)	22.3
Average height of floating	(μm)	25.5
Flatness of floating	(μm)	6.1

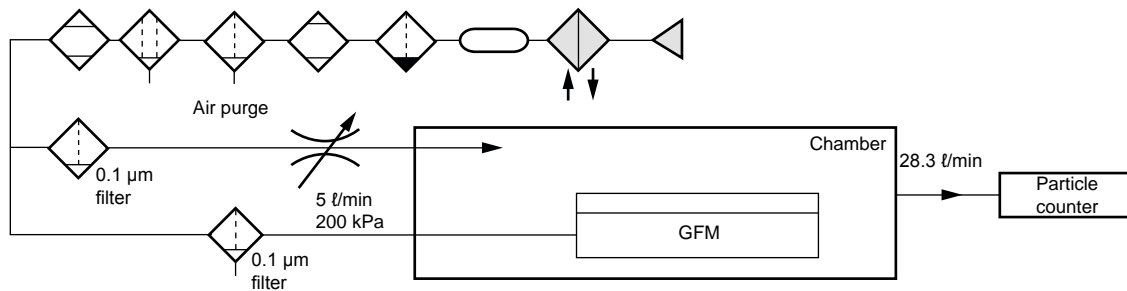
\* It omits data of measuring point outside of floating stage

## 4 Amount of dust generated

### [Measuring method]

- ① Install test sample inside the acryl made chamber.
- ② Supplies 200 kPa (about 5 l/min) air
- ③ Measure the quantity of particles generated when air is flown continuously.

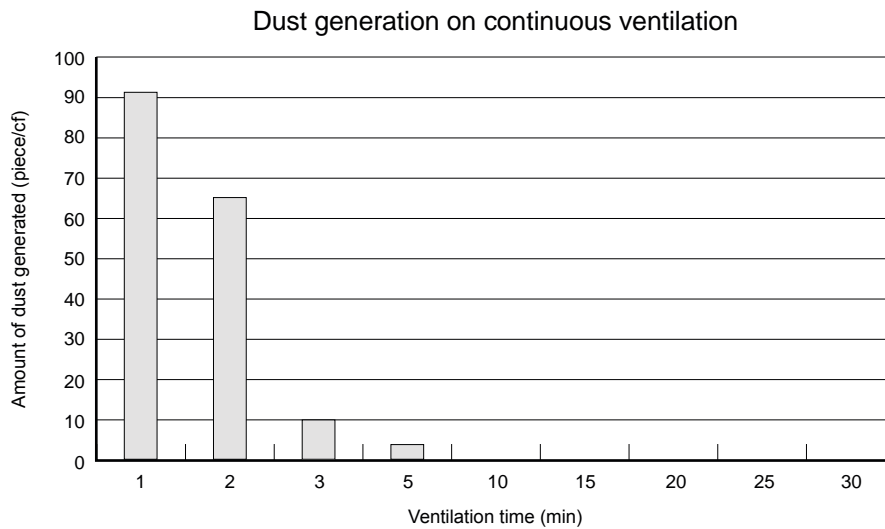
### [Test circuit]



### [Measuring instrument]

- Particle counter : Laser dust monitor  
 Minimum measurable particle diameter: 0.1 µm  
 Suction rate : 28.3 l/min

### [Results]



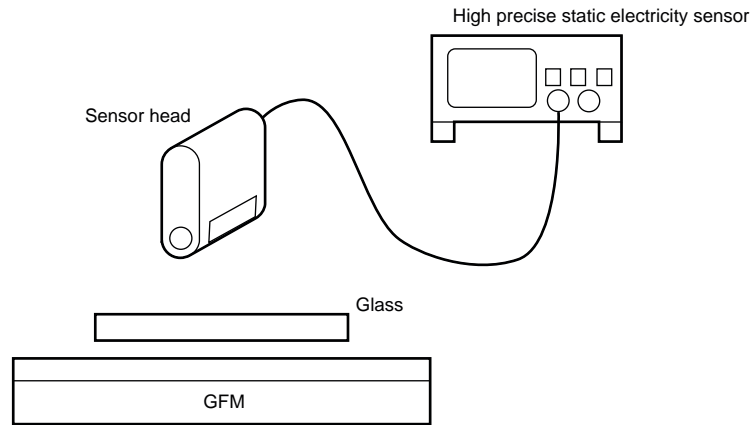
Note: Amount of dust generation includes larger than 0.5 µm particle diameter

## 5 Static electricity change amount

### [Measuring method]

- ① Install sensor head at the center of glass.
- ② Measure the value of static electricity amount (voltage) while air supplying.

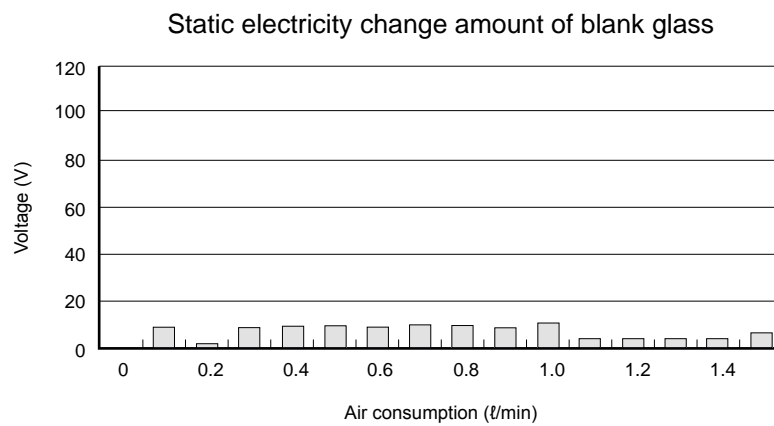
### [Test circuit]



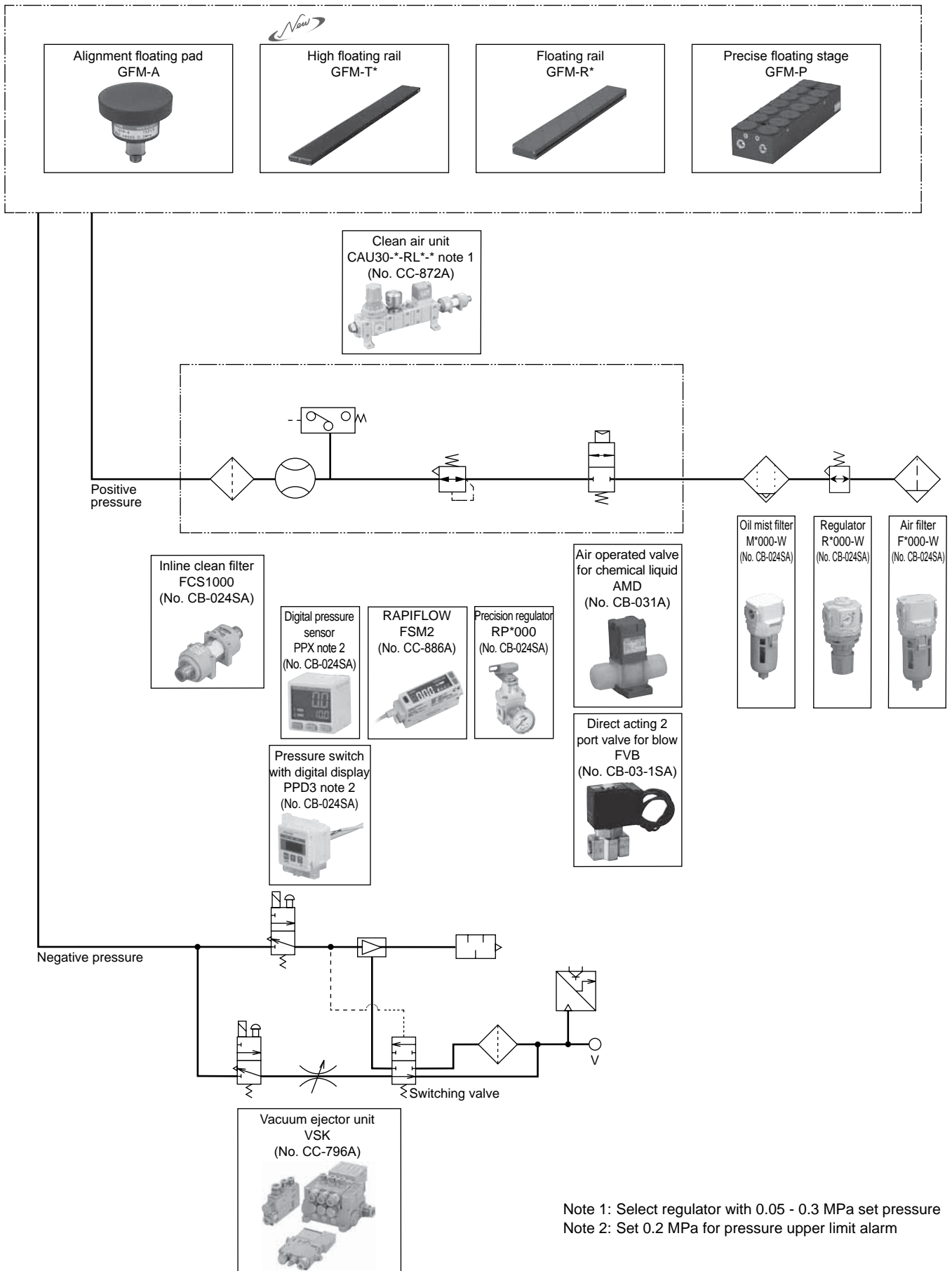
### [Measuring instrument]

Static electricity amount measurement: high precise static electricity measure (non-contact type)

### [Results]



## Floating system related products



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MEMO

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# Safety precautions

Always read this section before starting use.


When designing and manufacturing a device using CKD products, the manufacturer is obligated to check that device safety mechanical mechanism, pneumatic control circuit, or water control circuit and the system operated by electrical control that controls the devices is secured.


It is important to select, use, handle, and maintain the product appropriately to ensure that the CKD product is used safely. Observe warnings and precautions to ensure device safety.


Check that device safety is ensured, and manufacture a safe device.

## WARNING

- 1** This product is designed and manufactured as a general industrial machine part.  
It must be handled by an operator having sufficient knowledge and experience in handling.
  - 2** Use this product in accordance with specifications.  
This product must be used within its stated specifications. It must not be modified or machined.  
This product is intended for use as a general-purpose industrial device or part. It is not intended for use outdoors or for use under the following conditions or environment.  
(Note that this product can be used when CKD is consulted prior to use and the customer consents to CKD product specifications. The customer must provide safety measures to avoid risks in the event of problems.)
    - ①** Use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment, or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.
    - ②** Use for applications where life or assets could be adversely affected, and special safety measures are required.
  - 3** Observe corporate standards and regulations, etc., related to the safety of device design and control, etc.  
ISO4414, JIS B8370 (pneumatic system rules)  
JFPS2008 (principles for pneumatic cylinder selection and use)  
Including High Pressure Gas Maintenance Law, Occupational Safety and Sanitation Laws, other safety rules, body standards and regulations, etc.
  - 4** Do not handle, pipe, or remove devices before confirming safety.
    - ①** Inspect and service the machine and devices after confirming safety of the entire system related to this product.
    - ②** Note that there may be hot or charged sections even after operation is stopped.
    - ③** When inspecting or servicing the device, turn off the energy source (air supply or water supply), and turn off power to the facility. Discharge any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
    - ④** When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.
  - 5** Observe warnings and cautions on the pages below to prevent accidents.
- The safety cautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

 **DANGER:** When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, or when there is a high degree of emergency to a warning.

 **WARNING:** When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries.

 **CAUTION:** When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. In any case, important information that must be observed is explained.

## Disclaimer

- 1** Warranty period  
"Warranty Period" is one (1) year from the first delivery to the customer.
- 2** Scope of warranty  
In case any defect attributable to CKD is found during the term of warranty, CKD shall, at its own discretion repair the defect or replace the relevant product in whole or in part, according to its judgement.  
Note that the following faults are excluded from the warranty term:
  - (1) Product abuse/misuse contrary to conditions/environment recommended in its catalogs/specifications
  - (2) Failure caused by other than the delivered product
  - (3) Use other than original design purposes
  - (4) Third-party repair/modification
  - (5) Faults caused by reason that is unforeseeable with technology put into practical use at the time of delivery
  - (6) Failure attributable to force majeureThe warranty mentioned here covers the discrete delivered product. Only the scope of warranty shall not cover losses induced by the failure of the delivered product.
- 3** Compatibility confirmation  
In no event shall CKD be liable for merchantability or fitness for a particular purpose, notwithstanding any disclosure to CKD of the use to which the product is to be put.





# Safety precautions

Always read this section before starting use.

Individual precautions: Float star GFM Series

## Design & Selection

### 1. COMMON

#### WARNING

- Keep the environment temperature within storage temperature range (-10°C to 60°C), during transport and store this product.

Transportation and storage out of the range will lead damage, malfunction, or low performance/durability of the product. To use this product in better condition, transportation and storage in the temperature near 25°C is ideal.

- Always use within the product specifications.  
Do not use the product with exceeding the specifications range, otherwise a porous material could be damaged.
- Avoid installation outdoors such as where high powder dust or direct sunlight contact with the product.  
Do not use the product where corrosive or combustible gas contact with. Do not absorb such gases.
- This product is used with compressed air. Do not use other fluids.
- Do not machine the product additionally. Accuracy or strength could drop because of machining distortion, etc.
- Floated work will be moved with small action of force.  
Install support, holding, fixing, and stopper etc. for workpiece appropriately, not to harm human body or damage workpiece, device, equipment due to the movement or over run of workpiece.
- Consider the possibility of lowering pressure due to the blackout or malfunction of power supply etc.  
If the insufficient floating is possible to harm human body or damage workpiece, device, or equipment, install the safety equipment for that situation.  
If the insufficient suction is possible to harm human body or damage workpiece, device, or equipment, install the safety equipment for that situation.

- Consider the action at the emergency stop.  
Design the system so bodily injury or damage on work, device, equipment will not occur, if emergency stop or power supplies or machines stop due to black out would occur.
- Consider the action at restart after emergency stop or error stop.  
Design the system so bodily injury or damage on work, device, equipment will not occur when restarting.

- Perform piping with sufficient effective cross-sectional area.

Piping design suitable for air consumption is required. Keep sufficiently large effective cross-sectional area for tubes, fittings, valves etc. and minimum the pressure drop. It will be a cause of insufficient floating or suction and lead to human body injury, damage on workpieces, devices, or equipments.

- Do not perform piping as spiral.

Minimum the pressure drop by avoiding spiral piping at both inlet and vacuum side, and trying to perform piping as linear and short as possible. It will be a cause of insufficient floating or suction and lead to human body injury, damage on workpieces, devices, or equipments.

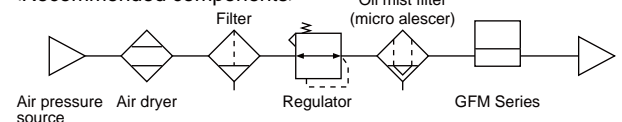
#### CAUTION

- Use dry and clean compressed air "class 1.1.1 to 1.6.2" (solid particle: 0.1 to 0.5 μm is less than 20,000/m<sup>3</sup>, pressure dew point: less than +10°C, oil content: less than 0.1 mg/m<sup>3</sup>)

(classes are based on compressed air quality classes specified in JIS B 8392-1: 2012).

<CKD Super dryer SD Series, CKD in line type filter FCS Series are recommended to use.>

<Recommended components>



- Take appropriate antifreeze measures when using in a cold district.  
Otherwise, faults or malfunction may occur as foreign matter or oil in compressed air clogs porous material.
- Block from any heat source around the product.  
Block with cover, etc., as the product's temperature rise by radiated heat may lead to exceeding operating temperature range.
- Do not use in environment where the vibration and impact will happen.  
Otherwise faults or malfunctions may occur.
- Wiping with cloth or paper, touching with hand, contacting with glass will cause foreign materials attached (color changing). This symptom means surface layer of porous material is peeled off or lopped off by adopting physical load. Be careful as this situation may lead to generation of particle. (Excluding GFM-T)

## Design & Selection

### 2. Head swinging type GFM-A

#### WARNING

- Take care when rotating actuation with a pad fixed with a screw.  
The rotation could cause the screw to loosen, and result in problems or hazards.
- When vacuuming and moving a part, note acceleration, impact, and wind pressure.  
The vacuumed part could drop off during movement.

#### CAUTION

- Set load as 1 - 5N for normal oscillation actuation.  
Quantity setting and installing layout are important.  
If the load is less than 1N, air may go through sides or bottom of the body.  
If the load is more than 5N, copy mechanism may not perform appropriately.

### 3. Rail type GFM-R\*, Precise type GFM-P

#### CAUTION

- Separately prepare a connection bracket to match your system's installing dimensions.  
<Separate bracket kits are available. Contact CKD for details.>
- Product installing threads pass through the air path, so air could leak from them.  
<GFM-R Series only>  
<This can be prevented by using gasket for screws.>

## Installation & Adjustment

### 1. COMMON

#### WARNING

- Before starting, confirm that load and fitting connections are not loose or abnormal.
- Confirm that the device runs properly before using.  
After installing, repairing, or modifying the product, conduct a function inspection and confirm that the product is correctly installed.
- Confirm that there is no machine interference and that the actuation system is normal.  
Provide sufficient safety measures for this device so that the workpiece and this product do not interfere when the workpiece is moving.
- Avoid installation outdoors such as where high powder dust or direct sunlight contact with the product.  
Do not use the product where corrosive or combustible gas contact with. Do not absorb such gases.
- Do not machine the product additionally.  
This may lead to breakage of the product which is a cause of human injury, damage on workpiece, device, and equipment.
- Keep persons involved in safe place before supplying air to the equipment system.

#### CAUTION

- Do not take the product out of the packing bag until just before piping.  
Foreign matter entering from the piping port could cause problems.
- When piping, flush pipes with air to remove foreign matter, swarf, etc.
- Read the instruction manual before use.  
Fully understand contents before starting use.
- Remove foreign matter from the installation surface or installation section by wiping with ethanol or scouring with air, etc.
- Store the product with care not to let foreign matter in through screws at edges, holes on sides, or gap under the body. For this reason, do not take the product out of the packing bag until just before installing and piping.  
If foreign materials entered, faults or malfunctions may occur.

- When suspending use for a long time, place the product in a polyethylene bag and store it in a clean dry environment. When you use the product again, do not take the product out of the packing bag until just before installing and piping.  
If foreign materials entered, faults or malfunctions may occur.
- Flush pipes to be connected to the product just before the connection.  
It is important that the foreign matter will not enter into the air compressor during piping.

### 2. Neck swinging type GFM-A

#### WARNING

- The porous section of this product tilts. To prevent interference with the workpiece, provide sufficient device safety measures, such as positioning this product away from the workpiece before the workpiece rises or before and after vacuuming.

#### CAUTION

- When fixing the product in place, use an M5 screw for connecting the pipe at the lower end of the product, and tighten with the appropriate torque.  
Use the across flat when tightening.  
[Tightening torque: 1.0 to 1.5 (N·m)]  
If transporting the system after installing, check that torque is appropriate after installing the device.
- Due to the product structure, the porous surface may rise and fall slightly when the air supply is turned on and off.  
Consider sufficiently on equipment system for workpiece floating and actuation before/after the suction.
- Use the across flat when tightening.  
[Width across flat dimensions: 5.9 - 6.0mm]  
If different part is used, it may lead to damage on the structure.

**Installation & Adjustment****3. High floating type GFM-T, Rail type GFM-R\*, Precise type GFM-P****⚠ WARNING**

- This product's carbon graphite is brittle and could break or scatter pieces on impact, resulting in injury. (Excluding GFM-T)
- Do not dent or scratch mounting part of the body. Otherwise, flatness will become impaired and lead to the degradation of floating function.
- Do not apply shock or excessive moment when installing. Too large moment may distort the body and lead to the degradation of floating function.

**⚠ CAUTION**

- Tighten the product's M screws with the appropriate torque.

Port thread	Tightening torque (N·m)
M4	0.6 to 0.8
M5	1.0 to 1.5

- Do not use fittings similar to small fittings - barbed or clamp fittings - when piping this product. The effective cross-sectional area is small and flow may not be sufficient.
- When installing, leave the product in use atmosphere till it gets heat equilibrium as the atmosphere (approx. 24 hours).  
Installing before the heat equilibrium, form precision may degrade due to the heat expansion and shrink.

**4. Rail type GFM-R\*****⚠ CAUTION**

- Use gasket for screws as product installing threads pass through the air path.

**5. Precise type GFM-P****⚠ WARNING**

- Maintain flatness of the installation surface at 0.01 mm or less.  
Insufficient flatness may lead to the degradation of floating function.

## During Use & Maintenance

### 1. COMMON

#### ⚠ WARNING

- Refer to the instruction manual and conduct careful maintenance and inspection.  
Incorrect handling could result in device or system damage or operation faults.
- Make sure to use within the product's specification range.  
Using the product with exceeding the specifications range may lead to damage of porous material or degradation of porous surface.
- This product is used with compressed air. Do not use other fluids.
- Make sure to exhaust residual pressure before install/un-install of the product.
- When restarting the product after a long-time left, perform test operation of normal actuation before the actual operation.

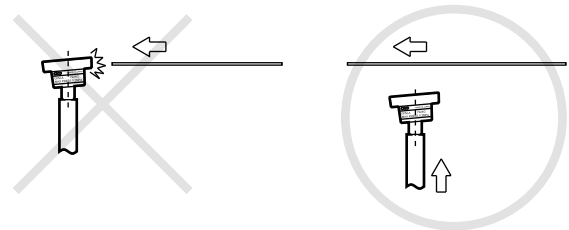
#### ⚠ CAUTION

- Conduct daily inspections and regular inspections to ensure that maintenance control is done correctly.  
Insufficient maintenance could lower product functions, shorten product life, or result in damage or incorrect operations.
- Stop use if leakage increases or if the device does not function correctly.  
After installing, repairing, or modifying the product, conduct an appropriate function inspection and confirm that the product is installed correctly.
- Make sure to exhaust residual pressure before install/un-install of the product.
- When suspending use for a long time, place the product in a polyethylene bag and store it in a clean dry environment.
- To ensure that product operation is optimum, conduct the following regular inspection once or twice a year.
  - ① Leakage to the outside (loosen or distortion of gasket)
  - ② Degradation of floating function
  - ③ Poor appearance (scratch, lack of porous material, dirt on the surface)

### 2. Neck swinging type GFM-A

#### ⚠ WARNING

- Be careful when performing rotation actuation by vacuuming and moving a part.  
The product is fixed by screws. The rotation could cause the screw to loosen, and result in problems or hazards.
- When vacuuming and moving a part, note acceleration, impact, and wind pressure.  
The vacuumed part could drop off during movement.
- Provide sufficient safety measures for this device so that the edges of workpiece and this product do not interfere when the workpiece is moving.  
Otherwise, workpiece or this product may be damaged.  
To prevent interference with the workpiece, provide sufficient device safety measures, such as positioning this product away from the workpiece before the workpiece rises or before and after vacuuming.



#### ⚠ CAUTION

- Due to the product structure, the porous surface may rise and fall slightly when the air supply is turned on and off.  
Consider sufficiently on equipment system for workpiece floating and actuation before and after vacuuming.

### 3. Rail type GFM-R\*, Precise type GFM-P

#### ⚠ WARNING

- This product's carbon graphite is brittle and could break or scatter pieces on impact, resulting in injury.

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**MEMO**

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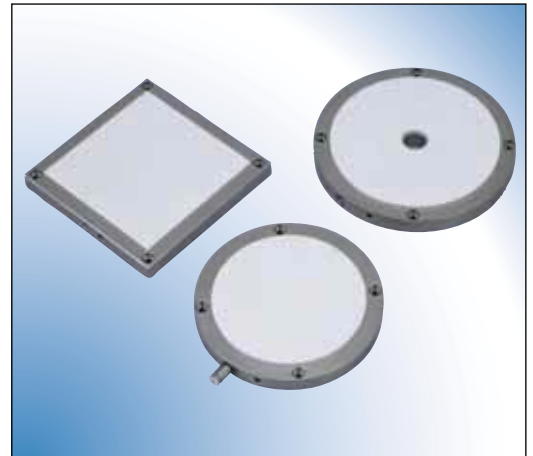
## Related products

### Precise suction plate PVP Series

Adopted vacuum suction surface with fluoro resin porous sintered compact on the workpiece contact surface

- High precise workpiece process  
Vacuum suction surface with flatness: 2 μm, parallelism: 5 μm
- Powerful vacuum suction  
With 40% rate of porous, powerful vacuum suction enabled whole surface vacuum
- Easy on workpieces  
Soft vacuum suction surface leaves workpieces damage-free.

Catalog no. CC-651A



### Fine buffer FBU2 Series

Achieved stable pushing pressure with magnetic spring system

- Adopted CKD original magnetic spring system for buffer part.  
Eliminated damage on workpieces with soft contact and stable pushing pressure
- Stable pushing pressure  
If the magnet assembled in the movable or fixed shaft deviates, a certain amount of magnetic return force is generated. For this reason, pushing pressure on the magnetic force will be suitable regardless the stroke.
- Rotation stop function  
A 4-pole spline magnet on the inner side of the fixed shaft and the outer side of the movable shaft generates magnetic return force toward rotating direction
- Compact and light weight

Catalog no. CC-787A



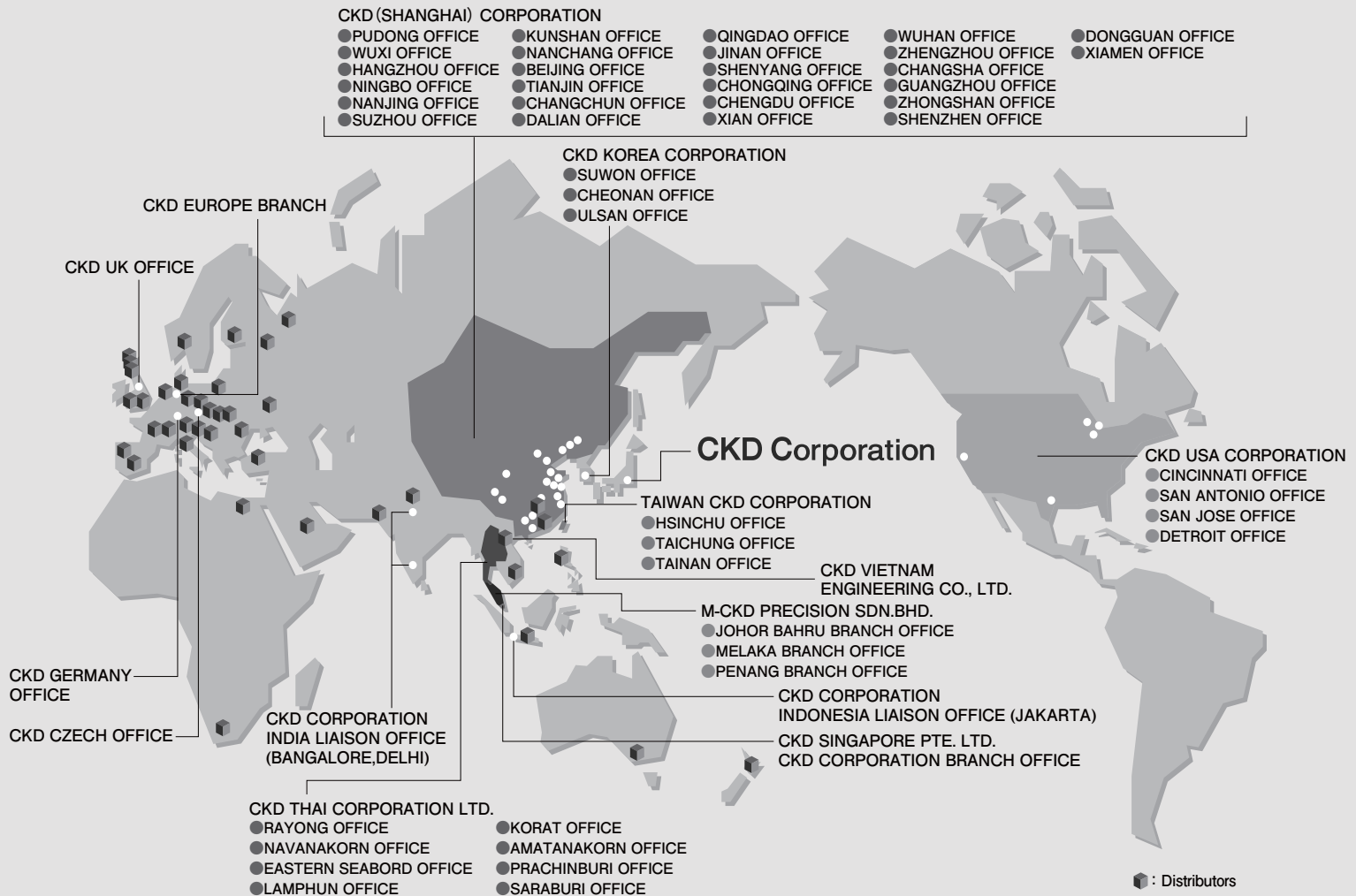
### Air bearing actuator LBC Series

Achieved "Zero" sliding resistance

- Clean environment is supported  
Air driven system with no dust generation, no lubrication by complete non-contact
- Soft touch  
Due to allowable minimum load control of 0.01 N, soft touch on target workpiece is possible
- High responsiveness  
High responsiveness is achieved by lightening rod material (movable part) with aluminum alloy
- Highly precise linear control  
Because of zero sliding resistance, highly precise linear control of load is possible by using electro-pneumatic regulator.
- Space-saving & compact

Catalog no. CC-652A





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