



VFC VanDer Waals Force Suction Cup

User Manual



Version: V1.3
Soft Robot Tech Co.,Ltd

Safety notes

Thank you for purchasing the VFC series VanDer Waals force Suction Cup of SRT. Please read the installation manual carefully before use so as to operate and use this product correctly.

This manual provides a safe and effective way of operation for users. Please keep it properly after reading for future reference.



Warning!

- Please strictly follow the safety precautions !
- Maintenance or wiring operation should be carried out after 30 seconds of disconnecting the power supply to prevent electric shock risk !
- Please do not carry out maintenance operation during robot movement !
- Please avoid sharp items during the use and storage of VanDer Waals force Suction Cup !
- When VanDer Waals force Suction Cup needs to be repaired, please contact our company for sales, and rework if necessary.
- When discarding VanDer Waals force Suction Cup, please treat them according to industrial waste standards to avoid pollution to the environment !
- When the product is used in equipment directly related to personal safety (medical equipment, entertainment equipment, industrial machinery and equipment, etc.), we must pay attention to the preparation of auxiliary protective measures to avoid possible personal injury !

Contents

1. Product briefing	2
1.1 Principle of structure	2
1.2 Application field.....	2
2. Technical Parameters	3
2.1 Working parameters	3
2.2 Flange installation size	4
3. Fixture installation and use	5
3.1 Product installation	5
3.2 Product control	5
3.3 Supplementary notes	6
4. Fixture cleaning and maintenance	7
5. The common fault analysis and the solution	8

1. Product briefing

1.1 Principle of structure

VanDer Waals force Suction Cup is mainly composed of flange interface, buffer mechanism and suction cup module (Fig.1). VanDer Waals force Suction Cup is a intermolecular force and a weak alkaline electrical attraction existing between neutral molecules or atoms. VanDer Waals force Suction Cup is a new type of robot end effector that uses van der Waals force to ' grab '. It does not require energy consumption in the adsorption link, commonly known as ' gecko sucker '.

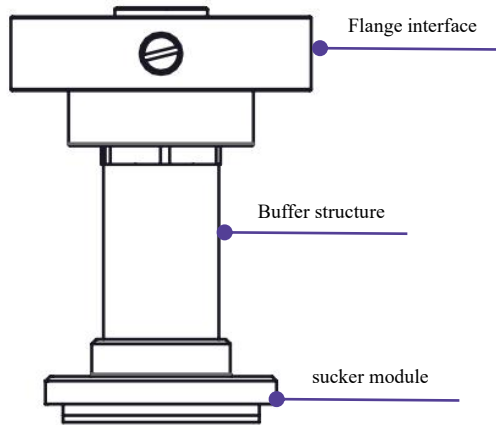


Fig.1

1.2 Application field

Suitable for chip industry, screen industry, 3C digital products industry wafer handling, glass handling, LCD panel handling, PCB loading and unloading application scenarios. It can work in vacuum, and does not consume energy in the grasping process. It can complete the grasping action without injury, scratch, high safety and high flexibility.

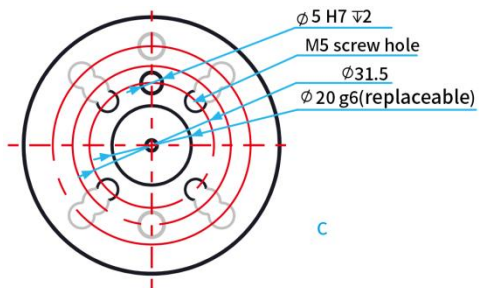
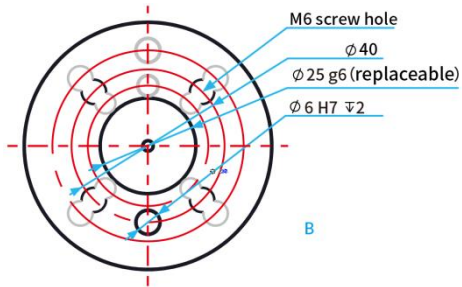
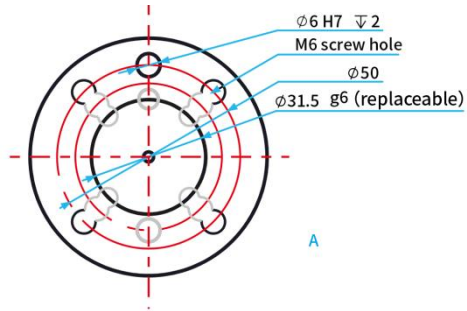
2. Technical Parameters

2.1 Working parameters

Model	VFC-D20	VFC-D30	VFC-D40
Preloading	1.2-10N	2.5-20N	5-40N
Overall weight	270g	280g	290g
Adsorption surface diameter	20mm	30mm	40mm
Max load	250g	560g	1000g
Power off hold	Yes		
Working life	The sucker module > 50 000 times depends on the working environment		
Wear resistance	Depending on the surface roughness of the workpiece		
Cleaning method	Silicone roller		
	Isoacetone + dust free cloth		

Note : The sucker module is consumable and can be replaced under the guidance of technicians

2.2 Flange installation size



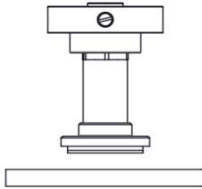
3. Fixture installation and use

3.1 Product installation

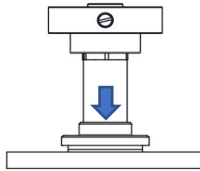
- 1) Install the fixture to the corresponding interface
- 2) Tear off the protective film, ready to use

3.2 Product control

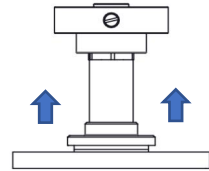
Grab



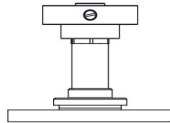
Position



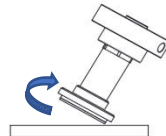
Contact and preload



Promot



Lay down



Tilt release

3.3 Supplementary notes

Since VanDer Waals force Suction Cup adopts a unique operating mechanism, it is very important to understand the following main working principles in order to correctly use the fixture and achieve the best performance of the fixture.

- **Surface roughness affects adsorption**

VanDer Waals force Suction Cup has the best effect on highly polished surface. From the microscopic point of view, this kind of surface has the largest contact area with Van der Waals suction cup. With the decrease of surface smoothness, more pre-loading force is needed to adsorb the workpiece.

- **Influence of environmental conditions on adsorption**

If there is dust or debris on the surface of the workpiece, the suction surface will interact with these particles. The workpieces filled with dust, oil mud and moisture cannot be adsorbed by VanDer Waals force Suction Cup. VanDer Waals force Suction Cup plate has the best adsorption effect on clean, smooth and dry surface.

- **Preloading force determines maximum effective load**

The adsorption force also depends on the magnitude of the preload applied to the workpiece surface. This pre-loading force also depends on the roughness of the workpiece surface. In general, the rougher the surface, the greater the pre-loading force is required.

- **Avoid collision**

Loading force is needed in the adsorption process, we design the buffer structure in the structure part, but the buffer stroke is limited, and the structure damage caused by the buffer bottom should be avoided in the use process.

In the release process, the suction cup needs to be tilted. At this time, the trajectory of the robot needs to be adjusted to avoid sliding displacement or structural collision between the surface of the suction cup module and the surface of the workpiece.

If you are using collaborative robots, in the process of adsorption and release, please configure the force feedback threshold reasonably to avoid alarm or collision.

- **Gravity torque resists adsorption**

The ideal working condition of VanDer Waals force Suction Cup is that the center of gravity of the workpiece coincides with the center axis of the sucker. If the center of gravity of the workpiece deviates from the center axis of the sucker, the center of gravity of the workpiece will exert torque on the center of the sucker module, thereby reducing the adsorption effect. In addition, the robot may also produce torque when it moves at high speed, resulting in accidental shedding of the workpiece.

- **Abrasion**

With the increase in the number of times of use, the suction cup module will wear and need to be replaced. Therefore, users need to pay attention to the adsorption capacity of the sucker module and replace it if necessary. The replacement interval of sucker module depends on the working environment and the surface quality of the workpiece.

- **Relationship between Workpiece Material and Adsorption Force**

There are many factors that affect the load capacity of VanDer Waals force Suction Cup. Including : surface roughness, surface structure modeling, material stiffness and so on. Generally speaking, the smoother the surface is, the smoother the structure is, and the greater the material stiffness is, the stronger the adsorption effect is, and vice versa.

4. Fixture cleaning and maintenance

The slight dust on the external structure of the fixture can be wiped with dust-free cloth, and the slight stain can be wiped with wet paper towels. The surface of the suction cup module can be cleaned by silica gel roller, or by plastic tape. When necessary, isoacetone and dust-free cloth can also be used for cleaning.

5. The common fault analysis and the solution

Fault phenomenon	Fault analysis	Solution
The adsorption force of the fixture is small	The pre loading force is too small	Increase preload force
	More dust on workpiece surface	Improve environmental cleanliness
	Fixture not fully fit with workpiece	Adjust robot pose and increase preload if necessary
	There is a big deviation between workpiece center of gravity and fixture axis	Adjust robot pose or adsorption position
	Protective film not torn	Remove protective film
The adsorption force of fixture is reduced	Excessive dust on the surface of the suction cup module	Silicone roller or plastic tape stick clean
	There is water on the surface of the suction cup module	After dust free cloth cleaning, silicone roller or plastic tape sticks
	Oil contamination on the surface of sucker module	After cleaning with isoacetone and dust-free cloth, stick with silicone roller or plastic tape
Still unable to regain adsorption after cleaning	Suction cup module is worn out	Replace the new sucker module

Warranty service

- ① Van der Waals force suction: Free maintenance service within 50,000 usages;
- ② If malfunctions of the product occur and they are verified to originate from quality problems of the product, free repairing or product replacement will be provided by our company. However, if they originate from misoperation of the user, our company shall not take any responsibility. Losses or accident responsibilities caused by product malfunctions are not covered by this guarantee.
- ③ In addition, the warranty is not available if product damage or failure are caused by following causes:
 - Malfunctions and damages caused by fire, earthquakes, floods and other force majeure.
 - Misoperations and other operations that disobey the user's manual.
 - Disassembly without permission when product malfunctions.
- ④ If some parts are damaged, assembly damaged module (example: soft fingers and the bracket) should be mailed to our company for damage cause identifications, then measures are taken in accordance with article 1 of warranty service.

Note: Terms of service listed above are only available for guests purchased pneumatic controllers of our company.

* The right of final interpretation is reserved by our company.

Warranty card

Product name		
Product model		
Purchase date		
Guest name		
Guest phone number		
Guest address		
Maintenance time	Maintenance record	Signature of maintenance staff

* This card is the basic voucher of warranty, please fill in carefully and save this card properly.

Product certificate

This product is qualified according to the delivery inspection.

Product model: _____

Inspector: _____

Manufacturing date: _____



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