### AIRBEST – A brand by Piab Group



Make Smart

Go Together



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Vacuum Solutions Supplier

# AIRBEST

### Make Smart , Go Together

### **Company Introduction**

AIRBEST was established in 2006, engaged in R&D, production and sales of vacuum gripping products (vacuum generators, vacuum suction cups and vacuum grippers, etc).

Products are used in different industries, mainly including intelligent manufacturing, automotive metal stamping, packaging, woodworking, industrial robots, foods, pharmaceuticals, electronics, etc.

We pay attention to the practical application of products, qualityorientation and innovation first. So far we acquired many patents.

In 2022, AIRBEST became a brand by Piab Group. AIRBEST constantly serves customers and makes improvements, contributes our professional technology in vacuum gripping field.

Appreciate your attention and support to AIRBEST.



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Data on catalogue for current product performance and size is for your reference. AIRBEST reserves the right to explain and change the data on catalogue.

# A Vacuum Technology



#### Vacuum level

The difference between standard atmospheric pressure and absolute pressure.

#### **Pressure unit**

Positive pressure conversion table

		Pa(N/m²)	kPa	bar	kg/cm <sup>2</sup>	torr	psi(ibf/in²)	inHg
1 Pa		1	0.001	0.00001	10.1792×10 <sup>-6</sup>	7.50062×10 <sup>-3</sup>	0.145038×10 <sup>-3</sup>	0.3×10 <sup>-3</sup>
1 kPa		1,000	1	0.01	10.1792×10 <sup>-3</sup>	7.50062	0.145038	0.3
1 bar		100,000	100	1	1.01972	750.062	14.5038	30
1 kg/o	:m²	98,066.5	98.0665	0.980665	1	735.559	14.2233	29.42
1 torr		133.322	0.133322	1.33322×10 <sup>-3</sup>	1.35951×10⁻³	1	19.3368×10 <sup>-3</sup>	0.04
1 psi		6,894.76	6.89476	68.9476×10 <sup>-3</sup>	70.3096×10 <sup>-3</sup>	51.7149	1	2.07

Negative pressure conversion table							
	mbar	kPa	-kPa	%vacuum	torr	-mmHg	-inHg
Atmospheric	1,013	101.3	0	0	760	0	0
pressure	913	91.3	10	9.9	685	75	3
	813	81.3	20	19.7	610	150	6
	713	71.3	30	29.6	535	225	9
	613	61.3	40	39.5	460	300	12
	513	51.3	50	49.3	385	375	15
	413	41.3	60	59.2	310	450	18
	313	31.3	70	69.1	235	525	21
	213	21.3	80	79	160	600	24
	113	11.3	90	89	85	675	27
Absolute vacuum	0	0	101.3	100	0	760	30

#### Flow

Air volume flows through specified cross section per unit time Flow conversion table

	m³/s	m³/h	NL/min	NL/s	ft³/min(scfm)
1 m³/s	1	3,600	60,000	1,000	2,118.9
1 m³/h	0.28×10 <sup>-3</sup>	1	16.6667	0.2778	0.5885
1 NL/min	16.67×10 <sup>-6</sup>	0.06	1	0.0167	0.035
1 NL/s	1×10 <sup>-3</sup>	3.6	60	1	2.1189
1 ft³/min	0.472×10 <sup>-3</sup>	1.6992	28.32	0.4720	1

### How to produce vacuum

Compressed air flows in high speed, which sucks the air in vacuum chamber, then vacuum chamber has negative pressure

### AIRBEST

### Instructions for suction cups' applications

We separated applications in vacuum applied to sealed and unsealed systems. Sealed systems are all applications where there is no leakage between the suction cup and the substrate

Examples: Handling of glass plates /handling of smooth surface metal plates/ Evacuation of containers / Tests of tightness



Figure 1.1 types of surface

### **Types of suction cups**

#### Flat suction cups

- Small course of work, suitable for fast gripping
- Good for handling flat objects
- Suitable for horizontal or vertical loads and flip over

#### 1.5 Bellows suction cups

- Good for handling objects with uneven surface and curved objects
- Large course of work, compensate for varying workpiece heights
- Suitable for horizontal or vertical loads, slightly flip over

#### Multiple bellows suction cups

- Large course of work, compensate for varying workpiece heights
- Good for handling objects with uneven surface and curved objects
- Limited load capacity, not suitable for fast gripping and flip over

We recommend the ideal vacuum level for suction cups working is -60kPa~-80kPa, because the energy consumption ratio is greatly reduced when the vacuum level beyond -80kPa

#### **Suction force**

Suction force means the maximum weight of the object, which can be gripped in vertical lifting; it is proportional to the pressure difference and effective suction area

Calculation formula of suction force: F = P×S

- F = Suction force
- P = Vacuum level, the difference between atmospheric pressure and internal pressure of suction cups.
- S = Effective suction area

Unsealed systems applications are that where there is leaking through the suction cup and the substrate, where the product is porous, or through the edge of the pad in the case of rough substrates. There is the possibility of applications where leakage occurs by both ways

Examples: Handling of cardboard box / Handling of foam/ Handling of rough ceramic floor







### Lateral force

Lateral force means the maximum weight of the object, which can be gripped in lateral lifting; it is related to suction force of suction cups and friction

Calculation formula of lateral force:  $F_L = P \times S \times \mu$ 

μ = Friction coefficient

Friction coefficient " $\mu$ " is the ratio of friction and suction force between the suction cups and workpiece, the inner structure of suction cups and surface of workpiece has influence on the friction coefficient. For the same type surface of workpiece, the friction coefficient of suction cups with inner support is larger than the flat suction cups; for the same suction cup, the friction coefficient of workpiece with dry and rough surface is larger than the smooth surface workpiece

#### **Safety factor**

The suction force or lateral force is theoretical value, many other important factors should be considered in practical application, such as the size and shape of suction cups, smoothness, hardness and shape of workpiece, handling speed, flip over, etc.The safety factor k should be considered when choose the model of suction cups,  $k\ge 2$ 

Table 1.2 Safety factor (reference)

Type of workpiece or working type	Safety factor k
Smooth and flat workpiece	2
Smooth and flat workpiece with fast movement or flip over	4
Rough or irregular workpiece	4
Carton packages	4
Softbag packages	6

### Selection of diameter of the suction cup

According the formulas, we could calculate the approximate diameter of suction cups

Table1.3 Formulas for diameter for different type of suction cup

Table 1.1 Friction coefficient (reference)

Surface of workpiece	Friction coefficient µ
Wet or oily surface	0.1~0.4
Smooth and flat surface (glass, slate, plastic, metal)	0.5
Rough and flat surface (dry)	1



Vertical lifting

Figure1.7 Movement

D=diameter of suction cup (mm) V=vacuum level (-kPa) k=safety factor (refer to table 1.1) m=weight of workpiece (kg) n=number of suction cups in the application

Type of suction cups	Formula	Type of suction cups	Formula
1.5 bellow type	$D=152\times\sqrt{\frac{m\times k}{V\times n}}$	Multiple bellows	D= (223.5~558.5) $\times \sqrt{\frac{m \times k}{V \times n}}$
Flat type	D=139.5× $\sqrt{\frac{m \times k}{V \times n}}$	Theoretical (without deformation)	$D=117\times \sqrt{\frac{m\times k}{V\times n}}$



#### Example

#### Sealed system

Determine the type and number of suction cups for handling an aluminum plate, with smooth and flat surface, size 2000x2000mm, weight 260kg. The manipulation will be done through a pulley in the horizontal direction at low speed

The handling surface is nearly smooth and flat Safety factor is 2

To ensure the stability of handling and avoid the deformation and bending of aluminum plate under gravity, we use 8pcs suction cups and calculate the result in case of vacuum level -60kPa

From Table 1.3, we could conclude that:



According to the result, we could choose AIRBEST flat suction cup SPF150 or SF150

#### Layout of hoses



Common application (for reference):

♦ The diameter mentioned above, for hoses dia.≤16mm means outer diameter; dia. > 16mm, means inner diameter

 $\diamond$  The hoses layout above is for reference only, please consider the actual application



#### **Material characteristic**

Material	Short time contact temperature(℃) ≤ 30s	Long time contact temperature(°C) > 30s	Wear resistance	Oil resistance	Weather and ozone	Resistivity
N - NBR	- 20 ~ +110	- 10 ~ +80	0	0	0	-
<b>S</b> - Silicone	- 40 ~ +250	- 30 ~ +200	×	×	0	-
<b>CN -</b> Conductive NBR	- 10 ~ +100	- 10 ~ +70	0	0	0	10 <sup>5</sup> -10 <sup>9</sup>
<b>CS</b> - Conductive silicone	- 30 ~ +200	- 20 ~ +160	×	×	0	10⁵-10°
U - Polyurethane	+10 ~ +60	+10 ~ +40	0	0	0	-
HK - Extra high temp rubber	- 10 ~ +350	- 5 ~ + 250	0	0	0	-
E - EPDM	- 30 ~ +150	- 20 ~ +120	0	×	0	-
HS - High temp silicone	- 20 ~ +300	- 50 ~ + 250	Δ	×	0	-
HD - High temp/mark free material	- 10 ~ +180	- 5 ~ +160	O	0	0	-
<b>NR -</b> Natural rubber	- 20 ~ +80	- 10 ~ +60	O	×		-
NF - Neoprene foam rubber	- 20 ~ +80	- 10 ~ +60	0		0	-
<b>OF</b> - Geranium foam rubber	- 20 ~ +80	- 10 ~ +60	0	×	×	-

©: Excellent ○: Good △: Fair ×: Unsuitable

#### Suction cups storage instruction

#### Temperature

The suitable temperature for suction cups storage is  $15^{\circ}C-25^{\circ}C$  ( $59^{\circ}F-77^{\circ}F$ )

#### Humidity

The relative humidity of storage environment should be less than 65% and without condensation, avoid extremely wet or dry storage environment

#### Lights

Please store in dark environment, avoid direct sunlight or strong UV

#### Radiation

Keep away from ionizing radiation

#### **Ozone** Ozone will cause harm to the products

Deformation

The products should be stored in a loose space to avoid being squeezed

#### Stock turnover

Follow "First In First Out" for the stocks

### Color and hardness of suction cup

#### Examples

S - Silicone	50	Color is red, calibration hardness is 50°
WS - White silicone	50	Color is white, calibration hardness is 50°
CS - Conductive silicone	• 55	Color is black, there is red dot on surface ,calibration hardness is 55°

Suction cup's color, hardness are shown as above icon for your reference. Besides, slight color difference caused by catalogue printing and difference between calibration hardness of material and actual hardness of suction cup are normal. (Generally within  $\pm 5^{\circ}$ )

### Industry Application Symbols Instruction



UI	Industry Description		Recommendation	Applicable	
			Vacuum generator	Suction cup	Suction cups
	PACKAGING (Carton)	Mainly for handling,logistics, stacking, storage of carton and soon.The features are that the workpiece is easy to deform, porous, medium weight, various sizes, and has high requirement for wrear resistance of the suction cup	Vacuum gripper, multi stage vacuum pump, etc take advantage of flow to compensate leakage loss	NBR, PU, etc. Excellent wear resistance, recommend bellows suction cups	TXC, TXM SB, SPC
	PACKAGING (Plastic Bag)	Mainly for gripping, destacking, handling of plastic bag, purchasing bag, cat food bag and dog food bag. The features are that the workpiece can be both soft and hard and has wrinkles, and has high requirement for deformation and adaptability of suction cup itself	Select vacuum generator accordingto weight and characteristic of workpiece	Silicone, soft and flexible, recommend multiple bellows suction cups	SBL, SBLP STP, SPJ SFA
	GLASS	Mainly for handling, gripping of universal glass, industry glass, float glass and so on. The features are that workpiece is heavy, flat, smooth, hard and it has requirement of powerful lateral gripping force	Select vacuum generator according to weight and characteristic of workpiece	NBR, excellent wear resistance, recommend flat suction cups	SFG, SF
	METAL SHEET (Sheet Metal)	Metal sheet industry, mainly for handling, fixing and processing of metal plate. The features are that the workpiece is easy to deform, with oily surface,curved metal plate, heavy weight and has high requirement for big internal support, anti slip, anti deformatione of suction cup	Select vacuum generator according to weight and characteristic of workpiece	NBR, PU etc. excellent wear resistance ,recommend flat or 1.5 bellows suction cups	SFF, SFM STC, SBF SOF, SOB SDM, SOM
	META SHEET (Thick Metal Plate)	Metal sheet industry, mainly for handling, fixing and processing of metal plate. The features are that the workpiece is, with oily surface, heavy weight and hashigh requirement for large internal support, slip resistance, anti deformation of suction cup	Select vacuum generator according to weight and characteristic of workpiece	NBR,PU ,etc. Excellent wear resistance,recommend flat suction cups	SFF, SFM SDM, SOF SFK
	AUTOMOTIVE	Automotive industry, mainly for glass, curved metal plate, tyreand so on. The features are that metal plate is with uneven andcurved surface, glass is smooth and with heavy weight, and hashigh requirement for slip resistance	Select vacuum generator according to weight and characteristic of workpiece	NBR, PU etc. excellent wear resistance and good oil resistance	SBB, SFG SFF, SFM STC, SBF SOF, SOB
	WOOD	Wood industry, mainly for handling of wood plate,fiberboard, wooden handicraft and so on. The features are uneven surface, porous, heavy weight, good sealness and large internal support for suction cup	Multistage vacuum generator AM/AL,etc. Take advantage of flow to compensate the flow loss between suction cup and workpiece	NBR, excellent wear resistance	SF, SPF SFU, SFD SOM
	FABRIC	Fabric industry, mainly for handling of cloth, gauze and so on. The features are workpiece is easy to deform, porous, light weight, overlap, and has requirement of large vacuum flow for suction cup	Select vacuum generator according to weight and characteristic of workpiece	POM material special gripper, which is with suction cup, recommend flow gripper	SLP, SLB
	COMPOSITE MATERIAL	Mainly for handling leather, fiber plate, the features are that the workpieces are porous, light, and overlapping and hasrequirement of large vacuum flow for suction cup	Select vacuum generator according to weight and characteristic of workpiece	Select suction cup according to actual condition	SLB
	STONE	Stone industry,mainly for handling marble, bricks, and so on. The features are that workpiece is with uneven surface andhas requirement for large deformation of suction cup	Multistage vacuum generator AM/AL, etc. Take advantage of flow to compensate the flow loss between suction cup and workpiece	NF-Neoprene foam rubber OF-Geranium foam rubber large deformation and good tightness, recommend foam rubber suction cup	SOP, SNP
	INJECTION MOLDING	Plastic industry, mainly for handling in latter procedure of plastic injection molding. The features are high temperature resistance, workpiece with curved surface, and has high requirement for high temperature	Select vacuum generator according to weight and characteristics of workpiece	Silicone,HD high temp material, recommend high temp material suction cup	Silicone, HD high temp material, other special custom-made products
	ROBOT	Robot terminal components, supporting robot to grip and handle. The features are that it requires fast response, combined type saving pipes, system with high safety factor.	Select vacuum generator according to weight and characteristics of workpiece	Select suction cup according to workpiece	
	MACHINE	Machine terminal components, supporting intelligent manufactureequipment to grip and handle. The features are that they are small size, light weight, compact and most of them are metal products	Select vacuum generator accordingto weight and characteristics of workpiece	Select suction cup according to workpiece	
	ELECTRONICS (Screen)	Handling of the screen of mobilephone, tablet PC, etc. The featuresare mark free, without deformation, slip resistance, small and light, etc.	Select vacuum generator according to weight and characteristics of workpiece	Flat suction cup,mark free suction cup which is HD material, halogenation, and teflon tape	SNT, SZU SZC, SZB SPC, SLP SP3, etc.
	ELECTRONICS (PCB Board)	Electronics industry, mainly for handling electronic components. The features are that workpiece is with small surface, light weight, without mark, and has high requirement for conductivity of suction cup	Select vacuum generator according to weight and characteristics of workpiece	Materials like NBR, Si or conductive NBR, Conductive Si, etc are soft, wear resistant and conductive. Recommend flat, or 1.5bellows suction cups	SZU, SZC SZB, SAN SAO, SLB TXC, SP3, etc.
	PHARMACEUTICALS	Pharmaceuticals industry, mainly for handling of medical kits , medical devices, etc. The features are that there is alcohol, chemical reagent on the surface of workpice, and it has high requirement for chemical resistance of suction cup	Select vacuum generator according to working enviroment and characteristic	Special plastic material, corrosion resistance, alcohol resistance, wear resistance, weather resistance	SBOF
	FOOD	Food industry, mainly for handling of bread, chocolate, milk, etc. The features are irregular shape of surface of workpiece, light weight, plastic bag package, and it has high requirement for material of suction cup	Select vacuum generator according to weight and characteristics of workpiece	FDA silicone, soft seal or FDA POM suction cup	SBL, SBLP SNT, SBS
	NEW ENERGY (Photovoltaic)	New energy industry, mainly for handling of solar cell, circuit board. The features are that the workpiece is porous, fragile and require soft contact and large vacuum flow and average air flow	Air flow is well distributed, smoothly gripping	Wafer gripper	SLW
<u>−−</u> + −	NEW ENERGY (Li Battery)	New energy li battery industry, mainly for handling of battery pack, battery. The features are corrosion resistant, explosion proof of soft package gripping, safe and reliable	Select vacuum generator according to weight and characteristics of workpiece	Suction cup with corrosion resistant material, such as EPDM , fluorine rubber	SLB,SF SB, etc.

### Product Characteristics Symbol Instruction



UI	Characteristic	Description	Applicable suction cups
<u></u>	Porous	Suitable for porous workpiece, main features are that vacuum generator with low vacuum level and large vacuum flow(usually use flow gripper)is through flow to compensate air permeability loss to create vacuum to grip workpiece	SLB, SLP
	Curved surface	Suitable for workpiece with curved surface or certain slope surface. Usually adopt bellows suction cups to compensate the plane.	All bellows suction cups
72	Slip resistance	For workpiece with smooth surface and prevent it from side slip when grip. Generally adopt flat with ribs or flat with pattern suction cup	All flat with ribs suction cups and flat with pattern suction cups
~~~~	Rough surface	Mainly for workpiece with rough surface such as wood plate, stone. In order to prevent air leakage, usually adopt sponge suction cup to compensate the micro space to grip the workpiece	SNP, SOP
G	Heavy load	For gripping workpiece with heavy load, generally adopt heavy load suction cups and mounting parts	Flat suction cup with big diameter PSPH heavy load level compensator.
	Non-rotating	Mainly for workpiece having precise positioning and direction requirement.It needs non-rotating function	Non-rotating level compensator etc.
FDA	FDA	For workpiece requiring safety certificate in food industry of medical industry, usually adopt food grade white silicone of POM scution sups with FDA	WS material suction cup, SNT-P series
	Tube shaped object	Adopt special concave suction cups for tube shaped or stick shaped workpieces	SOG
	Long and narrow object	Adopt oval suction cups speical for long and narrow workpiece	SOB, SOF
C)	Corrosion resistance	Adopt fluorine rubber or EPDM suction cups for requirements of corrosion resistance, (such as battery liquid, chemical environment)	F/E material suction cups
	Long lifet ime	Adopt suction cups with special material for high weariness occasion which is longer than average life	V/U material suction cups
	Spherical objects	Adopt deep taper suction cup to grip spherical objects	SZD, SBS
$\bigcirc$	Water resistance Oil resistance	Adopt special suction cups with oil resistant material and design	SFM, SBF, STC, SFF, etc.
	Composite product	Composite product integrated with vacuum generator and suction cups, save space,easy to assemble and wide usage	SLB, SLW, SLP, SNT, SLF, etc.
	Anti-deformation	Select different suction cups for different workpieces and conditions to grip workpiece without deformation	SF, SFF, SFT, SFA, etc.
180°C	Temperature resistance up to 180°C	Adopt suction cups with high temperature resistant material for gripping workpiece with high temperature 180°C	HD suction cup, Silicone suction cup
400°C	Temperature resistance up to 400°C	Gripping workpiece with high temperature 400°C	SHT

### **Thread Instruction**

### **AIRBEST**

### M5 M Thread М Male thread F Female thread Types of thread М Metric thread British standard pipe thread G т NPT thread NPSF thread Ν R British conical pipe thread

#### Example

#### Types of thread Size

м	5	M5:	M5
G	1	G1:	G1/8
т	4	Т4:	NPT1/2
Ν	8	N8:	NPSF1"
R	12	R12:	R1"1/2

#### **Connection thread instruction**

G1M	G1/8 Male thread	G6F	G3/4 Female thread
G2M	G1/4 Male thread	G8F	G1" Female thread
G3M	G3/8 Male thread	G12F	G1"1/2 Female thread
G4F	G1/2 Female thread		

Note: Thread pitch which is not indicated in the catalogue, is considered as national standard coarse thread specification.

### **Connector Selction Instruction**



P J S - *** ⊤ ⊤ ⊤								
	Categories of connector							
	S	Universal inserted fitting for suction cup						
	т	Adapter						
	F	Locking fitting						
	В	Ball joint						
	н	Universal holder						
	E	Flexible joint						
	Р	One-touch fitting						
	Q	Pagoda fitting						
	Product	t code for connector						
	J	Connector						
	Product	t code for mounting parts						
	Р	Mounting parts						



#### Series Size Fitting Suction cup connection range M5 | M8 G2 SC G1 G3 G4 SF ST MF MF M F 1 2 3 4 5 6 1 2 3 4 5 6 7 1 2 3 4 5 6 7 8 MF MF MF SB 5 6 8 10-15 17-20 30-40 50 SBA 11-78 • • SBL 15 20 • • 30-40 50 • • SF 15 20-30 40 50 75 110 150 200 SU 6-8 10-15 • 20-30 40 50 SFP 20-30 40 SBP 20 • 30-40 50 SXP 20-30 • • 35-40 • • 50 • •

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## **PJS** Universal Inserted Fitting for Suction Cup Selection Instruction

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Example: SB5-M5M, fitting for suction cup: PJS-M5M-SC2

 $\diamond$  Note: For detailed size of fitting for suction cup, please refer to related content of PJS series from page 409

 $\diamond$  Note: For sizes of SC, SF, ST type fitting, please refer to page 410-412



### **PJF** Mounting Parts for Universal Suction Cup -Locking Fitting Selection Instruction

Series	Size	Suction cup connection							
	range	M5F	M8F	G1F	G2F	G3F			
SB	5-15	•							
	17-40			•					
	50				•	•			
	75				•				
SBA	11-25	•							
	33-78				٠				
SBF	All sizes				•	•			
SBOF	All sizes				•				
SFT	15-24	•		•					
	30-40				•				
SBL	15	•							
	20-40			•					
	50				•	•			
SBLP	30				•				
	40					•			
SF	15	•							
	20-40			•					
	50				•	•			
SU	2-8	•							
	20-40			•					
	50				•	•			
SUF	All sizes	•							
STC	All sizes				•				
SFF	All sizes				•				
SFM	50-120				•				
SOB	All sizes				•				
SOF	All sizes				•				
SOG	15×40	•							
	35×100				•				
SFP	All sizes			•					
SBP	10-15	•							
	20-40			•					
	50				•	•			
	70					•			
SXP	20-40			•					
	50				•	•			
	70					•			



### **PJF** Mounting Parts for Universal Suction Cup -Locking Fitting Selection Instruction

Series	Size		:	Suction cup connec	tion	
	range	M5F	M8F	G1F	G2F	G3F
SGP	25-45			•		
	55				•	•
SAN	All sizes	•				
SAO	All sizes					
SPA	10-20	٠				
	30B	•				
	25-50		•			
SPC	5-7	٠				
	10-20	•				
	30-60					
	90					
SPF	2-3.5					
	5-8	•				
	10-15	•				
	20	•				
	25-40	•				
	50					
	60-95					
	120-300					
SPJ	4					
	6-8	•				
	10-15	٠				
	20-25	٠				
	30-40	•				
	50					
	60-80					



### **PJT** Adapter Selection Instruction

Thread(1)		Thread(2)										
	M5F	М5М	M8F	м8м	G1F	G1M	G2F	G2M	G3F	G3M	G4F	G4M
M5F	•											
M5M		•	•	•								
M8F		•	•									
M8M				•	•	•						
G1F				•	•							
G1M						•	•	•				
G2F						•	•					
G2M								•	•	•		
G3F								•	•			
G3M										•	•	•

Example: PJT-M5M-M8F

♦ Note: For detailed sizes of adapter, please refer to PJT series on page 428-429

### Level compensator selection instruction

Series	Applicable industry	Description
PSPE	Electronics industry for light and small load	Small and light level compensator, port specifications are M5 male thread and SC type
PSPT	All industries	Conventional level compensator Port specification is M8, G1/8, G1/4, G3/8 male thread and G1/8, G1/4 female thread
PSPH	Metal sheet,automotive, machinery,etc. for heavy load	Heavy-duty level compensator, connection thread on suction cup side is G3/8, G1/2 male thread
PSPF	All industries,mainly used with suction cup SPA series, SPJ series, SPF series	Compact external level compensator, port specification is M5, M8 female thread, M10 male thread
PSPD	Metal sheet, automotive, machinery, glass, packaging, etc. For heavy load	Double spring heavy-duty level compensator, can balance the deformation of the workpiece and the mounting plate of the level compensator
PSPL	For light or small size load,such as electronics industry	Retraction type level compensator,thread of connection port is M5 female thread





# Level Compensator Selection Instruction



Series	Vacuum	Mounting connection	Buffer stroke (mm)										Vacuum port+rotary type							
	port		6	10	15	20	25	30	40	50	60	75	90	110	Nil Vertical rotating	R Vertical non-rotating	L Lateral rotating	B Lateral non-rotating		
PSPE	M5M	M8	•	•	•		•										•	٠		
	M5M	M10		•		•		•	•	•					•	•	•	•		
	M5F	M10		•		•		•	٠	٠					•					
	M8M M8F	M14		•		•		•		•					•					
PSPT	M8M M8F	M14		•		•		•		•					•					
	G1/8M	M16		•		•		•		•					•		•			
	G1/8F	M16		•		•		•		•					•					
	G1/4M	M18		•		•		•		•					•	•				
	G1/4F	M18		•		•		•		•	•	•	•	•	•					
	G3/8M	M18		•		•		•		•					•	•				
										-	•	•	•	•	•					
PSPH	G3/8M	M30					•			•		•	•		•					
	G1/2M	M30					•			•		•	•		•					
PSPD	G1/4M	M20					•			•					•	•				
	G3/8M	M30					•			•			•		•	•				
	G1/2M	M30					٠			•			•		•	•				
PSPL	M5F	M10		•	•	•									•					
Series	Vacuum	Mounting					Buf	fer st	troke	(mn	(mm)				Vacuum port+rotary type					
	port	connection	connection	connection		4		6		10			15		30	)	Nil Verti	cal rotating	L Late	ral rotating
PSPF	M5F	M11		•				•								•		•		
		M14				•					•					•		•		
	M8F	M14				•					•					•		•		

 $\diamond$  Note: " $\bullet$ " – standard type, contact with sales if need customized one

M16

M10M

### Selection Instruction for Suction Cup and Fitting for Suction Cup

		ltem	Model	Applicable suction cup						
		Fitting for	PJS-M5M-ST2	SPC5、7						
		suction cup	PJS-M5M-SPC10	SPC10						
			PJS-M5M-SPC20	SPC15、18、20						
		♦ The above	table is from page 319							
	Suction cup(without fitting)									
$\bigcirc$	SPC 10 N									
		- NBR								
		– Diameter φ10mm								
		<ul> <li>SPC series bellows suction cup</li> </ul>								
		Remark: For s to n	suction cup connection, please refer nounting parts of SPC 10							
	PJS series fitting for suction cup			<						
P	PJS-M5M-SPC10			acuum pa						
		Fitting spe	d con							
		Mounting	thread M5 male thread	nection						
		PIS Series	fitting for suction cup	n port						
	Suction cup + PJS series fitting for susctio	in cup		spedifications are matching						
(P)	SPC 10 N - M5M									
		<ul> <li>Mounting thread M5 male thread</li> <li>NBR</li> </ul>								
		Diameter	φ10mm							

### Suction cup(without fitting)+PJS series fitting for suction cup

Note: 1. For description of shape of fitting for suction cup which is non-integrated vulcanized with fitting(it means that suction cup can be changed separately), please refer to PJS series fitting for suction cup on page 10-11 or parts selection of each series of suction cups. For actual dimensions of fitting, please refer to PJS series 425-427 2. All of fitting for non-integrated vulcanized suction cup can be found in instruction of each series, which is easy for customers to select model

SPC series bellows suction cup

### Selection Instruction for Suction Cup and Fitting for Suction Cup



Suction cup(with fitting)



SPC 10 N - M5M

Fitting for suction cup M5 male thread

NBR

Diameter \$10mm

SPC series bellows suction cup

PJT - M5F

M5 female thread

PJT - M5F

Di series adapter

Suction cup(with fitting)+PJT Adapter

SPC 10 N - M5F



Mounting thread M5 female thread
NBR
Diameter ф10mm
 SPC series bellows suction cup

Note:1. The above example is fitting for suction cup changing from M5M to M5F

2. Please refer to convertible specifications of PJT adapter on page 14, and real dimensions on page 428-429

### Selection Instruction for Suction Cup and Fitting for Suction Cup

# Suction cup(with fitting)+PJF locking fitting Suction cup(with fitting) SPC 10 N - M5M Mounting thread M5 male thread NBR Diameter Φ10mm SPC series bellows suction cup The specifications of fitting for suction cup matches PJF Locking fitting PJF - LB6 - M4F - M5F Connection on suction cup side M5 female thread Mounting thread M4 female thread Connect with pagoda fitting $\Phi 6$ in level direction PJF series locking fitting Suction cup(with fitting)+PJF Locking fitting SPC 10 N - LB6 - M4F Mounting thread M4 female thread Connect with pagoda fitting $\Phi 6$ in lateral direction NBR Diameter $\phi$ 10mm SPC series bellows suction cup

Note: 1. The above example is suction cup SPC10N with locking fitting PJF-LB6-M4F-M5F 2. Please refer to detailed specifications of PJF adapter on page 430-431

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### Selection Instruction for Suction Cup+Level compensator (PSPE)





### Suction cup(with fitting)+ Level compensator





SPC series bellow suction cup

Note: 1. The above example is suction cup SPC20N-M5M with level compensator PSPF-E6LB6M5F-M14 2. Please refer to PSPF level compensator on page 422-423

# Selection Instruction for Suction Cup +Level Compensator Recommend applicable level compensators according to suction cups



Series	Size range	Recommend level compensator (AIRBEST standard)						Series	Size range	Recommend level compensator (AIRBEST standard)				
		PSPE	PSPT	PSPH	PSPF	PSPD				PSPE	PSPT	PSPH	PSPF	
SB	5-15	•						SBP	10-15	•				
	17-75		•						20-70		•			
	110-150			•				SXP	All sizes		•			
SBA	11-25	•						SGP	All sizes		•			
	33-78		•					SDL	All sizes		•			
SBB	All sizes			•		•		SZD	10-25	•				
SBF	All sizes		•						40	•	•			
SBOF	All sizes		•					SH	All sizes		•			
SFT	15-24		•					SHB	All sizes		•			
	30-40		•				-	SZC	10-32	•				
SFA	All sizes	•							40-50	•	•			
STP	All sizes		•				-	SZU	2-32	•				
SBL	15	•							40-50	•	•			
	20-50		•				-	SZB	6-32	•				
SBLP	30		•						40-50	•	•			
	40-50 *						-	SAN	All sizes	•				
SF	15	•					-	SAO	All sizes	•				
	20-75		•				-	SPA	All sizes				•	
	110-200			•		•	-	SPC	5-60				•	
	300*								90		•			
SU	2-8	•					-	SPF	2-95				•	
	20-80		•						120-200*					
SUF	All sizes						-	SPJ	4-50				•	
SFG	All sizes			•		•			60-80		•		•	
SFU	All sizes		-			•	-	SPU	10-50				•	
STC	All sizes								60-100		•			
5FF	All sizes						-	SNP	50-75		•			
	All sizes								68		•	•		
5011	All SIZES								140			•		
SHT	All sizes						-	SOP	40-64		•			
SOB	All sizes								92		•	•		
506	All SIZES	-							127-220			•		
300	15×40	•					-							
	35×100													
215	All sizes		-											

Note:1. "•" means that selected suction cup directly matches the recommended level compensator 2. "\*" means that there is no level compensator directly for this item

### **Application Instructions of Vacuum Technology**

### AIRBEST

### Working Environment

### 🗥 Warning

- 1. Protection measures must be provided to ensure safety, if there is risk of falling
- Because the connector of the vacuum device is not explosion-proof, the pressure in vacuum pipe which is 0.1MPa or more for a long time is not safe, please note
- When there are two pieces or more suction cups connected to one vacuum generator, the workpiece may fall off if one of the suction cups failure
- 4. Do not use the products in the environment with corrosive gas, flammable gas, explosive gas, chemicals, seawater or steam, which are not allowed enter into the vacuum system
- 5. Don't block the ports of vacuum generators or increase the exhaust resistance, will otherwise it cause flow loss or vacuum reduction
- 6. Protective cover should be added when the equipment is exposed in sunlight directly
- Avoid using the equipment in environment of excessive vibration, which may cause failure

### **Design/Setting**

### \land Note

- Please pay attention to the vacuum level drop, it may be caused by the unstable air supply or power supply failure, and the workpiece may fall. Protective measures must be made
- 2. Check the mark of each port on vacuum generator, wrong connection to the vacuum system will damage the equipments
- 3. The supplied air to vacuum generator should be clean, and lubricant should not be used in the supplied air. Impurities or oil in compressed air will cause failure and reduce the performance
- 4. If there is leakage from workpiece or pipes, the vacuum flow will not be enough to hold the workpiece. If the connection pipe is too long or thick, the action time will be longer as the volume of pipe is increased
- 5. The effective sectional area of pipe for vacuum port should be selected according to the maximum vacuum flow of the vacuum generator. The effective sectional area of pipe for air supply port should be selected according to the maximum air consumption of the vacuum generator
- 6. The max. vacuum level, max. vacuum flow and air concumption are the values at the rated air supply pressure and under the test conditions. The values may differ to the weather, altitude as well as the test methods
- 7. Noise level is the value under the test conditions, but not a guaranteed value
- 8. Evacuation time is the time for evacuating 1L measuring vessel

### Maintenance

### 🗥 Warning

- Elements of silencer and filter elements should be maintained and examined regularly. Block in elements will reduce the performance or cause products damage
- 2. Need to study the components of vacuum generator before replacement.
- 3. Do not wash or spray equipment with water or solvents
- In vacuum system, do not use lubricator in the front pipe of vacuum generator, dirties will be blocked in the nozzle and affect the performance of vacuum generator
- Do not use PTFE tape for connection use (especially the fittings), this tape would fall off easily and block the pipe, affecting the performance of vacum generator

### Installation

### 🗥 Warning

- 1. Don't block the ports of vacuum generators or increase the exhaust resistance, otherwise is will cause flow loss or vacuum reduction
- 2. Do not remove the shell, the shell will be damaged or leaking if it's forced to shake or rotate
- 3. Do not use the equipment in the flammable or explosive environment, which may cause fire or explosion

### How to use sponge suction cups



# How to use sponge suction cups

Sponge suction cup is a foamed rubber suction cup with fluffy structure and low porous density. Compared to other material, the tension of foam material itself is insufficient and it cannot be used as a buffer zone by its own deformation.

Therefore, when setting the compression stroke of the sponge suction cup, it needs to be closer to the suction cup itself and try to avoid pulling the sponge outward (internal compression does not affect the performance of the sponge). If there is a pulling trend, it will affect the service life of the sponge suction cup, and attention should be paid when using it. When using a sponge suction cup, ensure that the sponge is compressed to theroot, generate a vacuum and ensurethat the workpiece can be lifted afterthe vacuum is achieved.

Otherwise, relying on the sponge's own tensionto extract the workpiece will cause the sponge to tear and the product to fail.

# Recommended setting of workpiece distance for sponge suction cups, case description.

Sponge suction cups should be pressed to the root.



### Incorrect settings can damage the sponge

Incorrect setting may cause tearing and failure of sponge suction cups, reducing product life.



Normal sponge morphology



Damaged sponge morphology



Sponge cavity is over stretched, permanent deformation Sponge body cracks, sealing performance reduced, and product failure.

### Recommended usage of sponge suction cups

Recommended setting, vacuum instruct issued under this status.

Sponge compressed to the root

Vacuum generated, lifting and moving action is allowed.



does not bear any extra force.

### The status when the vacuum breaks and the workpiece is released.



Vacuum is closed, the actuating element is lifted, and the sponge does not bear any external force during the process, allowing for natural recovery.

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