

### GENERAL

Plain **vertically-connected** suction cups are suitable for vacuum lifting in most general handling applications.

Ambient temperature range : 0°C to +50°C

### ATTACHMENT

Plain suction cups are provided with an M10 threaded shank enabling height adjustment (locknuts not included).



### SELECTING NITRILE (NBR) PLAIN SUCTION CUPS

Vertically-connected flat suction cup	cup dia. (mm)	CATALOGUE NUMBER to specify in order	shank size	
			Threaded	
	30	<b>367 01 098</b>	Threaded	M10
	40	<b>367 01 099</b>		M10
	50	<b>367 01 100</b>		M10
	60	<b>367 01 101</b>		M10
	80	<b>367 01 102</b>		M10
	95	<b>367 01 103</b>		M10

**OPTIONS** : For **urethane** and **silicone** suction cups, consult us.

### THEORETICAL WEIGHT LIFTING CAPACITY

The theoretical weight lifting capacity of a suction cup is determined by its diameter and the ultimate vacuum pressure as indicated in the diagram below.

THEORETICAL WEIGHT LIFTING CAPACITY ( N )

Suction cup dia. (mm)	10 *	14 *	18 *	30	40	50	60	80	85 *	95
Ultimate vacuum pressure (mbar)										
- 900	6,8	13,5	22,2	62	110	171	254	452	495	690
- 800	6	12	19,8	55	97	152	226	402	440	610
- 700	5,3	10,5	17,3	48	85	133	197	352	385	530
- 600	4,6	9	14,8	41	73	114	169	301	330	460
- 500	3,8	7,5	12,3	34	61	95	141	251	275	380
- 400	3	6	9,8	27	49	76	113	200	220	300

\* diameter specific to bellows type suction cups

### ACTUAL LIFT FORCE

The actual lift force - the only one needed for selecting the diameter of the suction cup (or cups) necessary for lifting the workpiece - is given by the following formula :

$$\text{Actual lift force} = \frac{\text{Theoretical lift force}}{k}$$

k = safety factor to be applied depending on the mode of lifting :

- workpiece horizontal : k = 2

- workpiece vertical : k = 4, this mode is to be avoided whenever possible, and unconditionally for bellows type cups (see following pages).

### NOTES

- When load is moving, additional efforts relating to the working environment should be considered : acceleration, deceleration etc. These parameters may double or even treble the nominal value of the load, and allowance must be made for this when determining number and diameter of suction cups required.

### SELECTING MATERIAL

Depending on the application conditions, the table below will help you to select the appropriate material

Application Material	Tension	Stretch	Wear	Hydrocarbons	Benzol	Electrical installation	Adhesion to metal (1)	Main applications	Colour
<b>NITRILE (NBR)</b>	●	●	○	●	△	○	●	General purpose	black
<b>URETHANE (U)</b>	●	●	●	●	○	●	○	Wear resistant	grey
<b>SILICONE (SI)</b>	△	○	×	△	△	●	△	Heat-resistant and non-marring	green

(1) For minimum leakage

▭ Standard products (consult us for **urethane** and **silicone** suction cups).

● Excellent

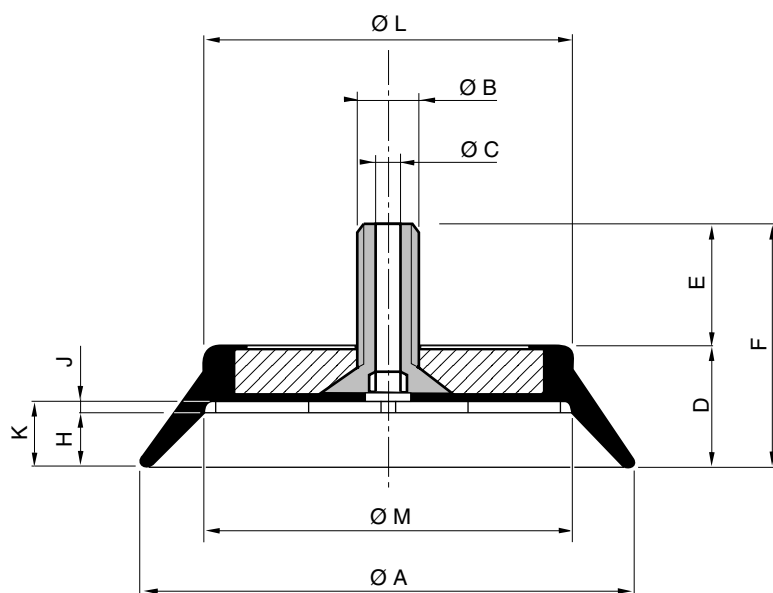
○ Good

△ Usable under certain conditions

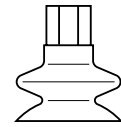
× Not suitable

### DIMENSIONS AND WEIGHTS

#### VERTICALLY-CONNECTED SUCTION CUPS



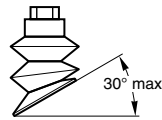
ØA	ØB	ØC	D	E	F	H	J	K	L	M	⚖ (g)
30	M10	4	10	20	30	2,5	1	3,5	22	22	25
40	M10	4	12	20	32	2,5	1	3,5	30	30	27
50	M10	4	14	20	34	4	1	5	37	37	40
60	M10	4	16	20	36	6	1	7	47	40	53
80	M10	4	20	20	40	9	2	11	60	50	80
95	M10	4	22	20	42	12	2	14	67	67	109



**GENERAL**

Bellows type suction cups are particularly suitable for lifting objects :

- with inclined surfaces  
(maximum angular compensation 30° with 2 1/2 corrugations)
- of which the surfaces are not flat
- of different heights  
(stroke compensations , C1 or C2 max., see "Dimensions"),
- which are fragile (shock-absorber function)



Two versions of bellows type suction cups are available :

1 1/2 and 2 1/2 corrugations, for vertical connection.

This type of suction cup is not suitable for lifting workpieces oriented vertically.

Ambient temperature range : 0°C to +50°C

**LIFT FORCE** : identical to plain suction cups.

See table and information relating to plain suction cups.

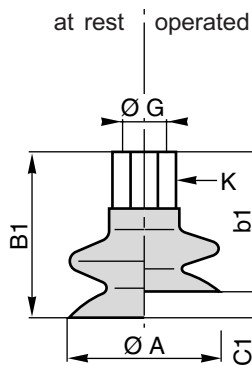


**SELECTING NITRILE (NBR) SUCTION CUPS**

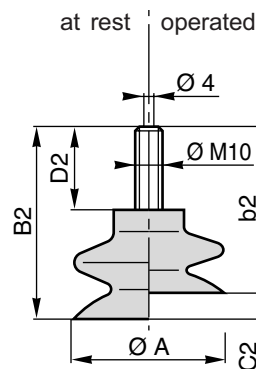
suction cup diameter (mm)	connection size	CATALOGUE NUMBERS to specify in order	
		1 1/2 corrugation cups, vertically connected	2 1/2 corrugation cups vertically connected
<b>TAPPED CONNECTION</b>			
10	G 1/8	-	<b>367 01 080</b>
14	G 1/8	-	<b>367 01 081</b>
18	G 1/8		<b>367 01 082</b>
30	G 1/4	<b>367 01 104</b>	<b>367 01 108</b>
40	G 1/4	<b>367 01 105</b>	<b>367 01 084</b>
50	G 1/4	<b>367 01 077</b>	<b>367 01 109</b>
60	G 1/4	<b>367 01 106</b>	<b>367 01 085</b>
85	G 1/4	<b>367 01 078</b>	<b>367 01 086</b>
		<b>367 01 079</b>	
<b>M10 THREADED CONNECTION</b>			
40	M10	<b>367 01 088</b>	<b>367 01 091</b>
60	M10	<b>367 01 089</b>	<b>367 01 092</b>
85	M10	<b>367 01 090</b>	<b>367 01 093</b>

**DIMENSIONS AND WEIGHTS**

**1 1/2 CORRUGATION CUPS**

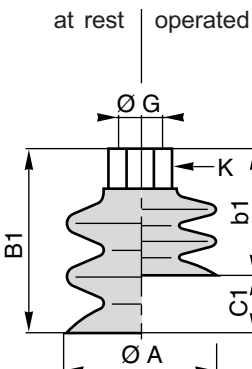


Ø A	B1	b1	C1	K*	Ø G	(g)
18	28	24	4	14	G 1/8	4
30	41	35	6	17	G 1/4	9
40	45	38	7	17	G 1/4	19
50	47	38	9	17	G 1/4	30
60	49	39	10	17	G 1/4	41
85	65	57	8	17	G 1/4	146

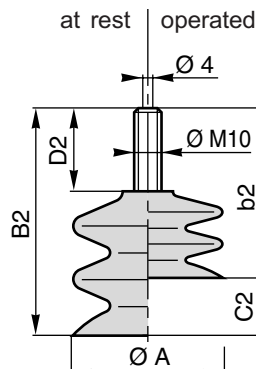


Ø A	B2	b2	C2	D2	(g)
40	51	43	8	15	18
60	57	50	7	15	40
85	74	63	11	15	160

**2 1/2 CORRUGATION CUPS**

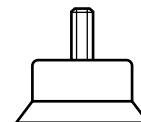


Ø A	B1	b1	C1	K*	Ø G	(g)
10	27	24	3	14	G 1/8	3
14	35	26	9	14	G 1/8	4
18	35	26	9	14	G 1/8	4
30	52	43	9	17	G 1/4	11
40	60	44	16	17	G 1/4	25
50	65	48	17	17	G 1/4	35
60	70	52	18	17	G 1/4	62
85	93	60	33	17	G 1/4	207



Ø A	B2	b2	C2	D2	(g)
40	64	48	16	15	25
60	80	52	28	15	60
85	100	69	31	15	210

\*hex-connection fitting, dimension K is across flats.



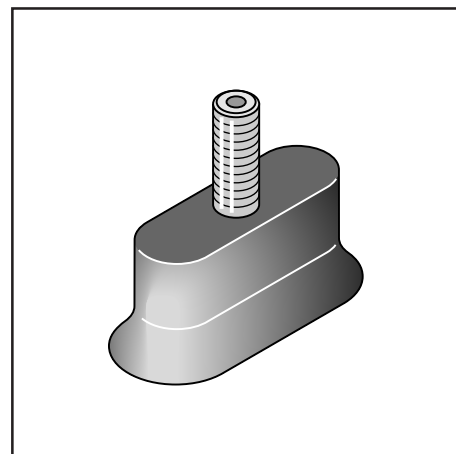
**GENERAL**

Oblong suction cups are suitable for lifting narrow flat objects, avoiding the need to use a larger number of small diameter cups.

**WEIGHT LIFTING CAPACITY**

THEORETICAL WEIGHT LIFTING CAPACITY (N)

Ultimate vacuum pressure (mbar)	Theoretical weight lifting capacity (N)	
	30 x 65 mm	40 x 100 mm
- 900	160	320
- 800	145	290
- 700	125	250
- 600	110	220
- 500	90	180
- 400	70	140



**ACTUAL LIFT FORCE**

The actual lift force - the only one needed for selecting the diameter of the suction cup (or cups) necessary for lifting the workpiece - is given by the following formula :

$$\text{Actual lift force} = \frac{\text{Theoretical lift force}}{k}$$

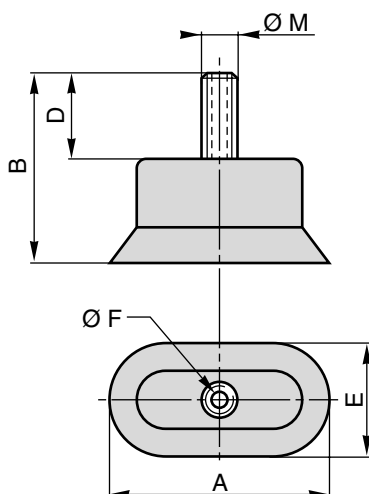
k = safety factor to be applied depending on the mode of lifting :

- workpiece horizontal : k = 2
- workpiece vertical : k = 4, this mode is to be avoided whenever possible

**SELECTING SUCTION CUPS**





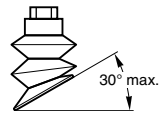
Cup dimensions	Connection size	CATALOGUE NUMBER
30 x 65	M10	367 01 095
40 x 100	M10	367 01 097

**DIMENSIONS AND WEIGHTS**



E x A	B	D	Ø F	Ø M	Weight (g)
30 x 65	52	15	4	M10	40
40 x 100	55	15	4	M10	90

# SELECTING A SUCTION CUP

Characteristics of the workpiece		Type of suction cup				Material of suction cup			Remarks
Shape	Surface					NBR	U	SI	
Even and wide	Standard	●	-	-	-	●	●	●	Urethane : good abrasion resistance  The good adherence of NBR and the smaller diameter of suction cups needed make it possible to reduce leakage. For leakage compensation, use a high output generator
	Rough	●	-	-	-	-	●	-	
	Porous	●	-	-	-	●	●	●	
Even and narrow	Standard	●	-	-	●	●	-	-	An oblong suction cup may be preferable to several plain suction cups of small diameter  Use plain suction cups of small diameter in urethane (30 mm min.) as oblong suction cups are in NBR only.  Use 10 to 18 mm diameter 2 1/2-corrugation cups (smaller size reduces leakage)
	Rough	●	-	-	-	-	●	-	
	Porous	●	-	●	-	●	-	-	
Pieces of different thicknesses	Standard	-	●	●	-	●	-	-	Compensation (depending on diameter) for 4 to 11 mm (1 1/2 corrugation) or 3 to 33 mm (2 1/2 corrugations)  Good abrasion resistance  Small diameters - low capacity
	Rough	-	-	-	-	-	●	-	
	Porous	-	-	●	-	●	-	-	
Inclined surface	Standard	-	-	●	-	●	-	-	Angular compensation up to 30° max.  
	Rough	-	-	-	-	-	-	-	
	Porous	-	-	-	-	-	-	-	
Fragile items	Standard	-	●	●	-	●	-	-	Bellow suction type cups work as shock absorbers for smooth lifting.  Good abrasion resistance  Small diameters - low internal volume
	Rough	-	-	-	-	-	-	-	
	Porous	-	-	●	-	●	-	-	
Tiny items	Standard	-	-	●	-	●	-	-	Bellow type suction cups 10 mm dia. and over recommended for the lifting of tiny workpieces (e.g. : mini-electronic components etc.)  Small diameters - low internal volume
	Rough	-	-	-	-	-	-	-	
	Porous	-	-	●	-	●	-	-	
Thin pieces (e.g. : paper)	Standard	●	-	●	-	●	-	-	To avoid strain, use several suction cups of small diameters, with low vacuum pressure. Space suction cups regularly.
High temperature	Standard	●	-	-	-	-	-	●	Silicon suction cups are heat resistant.
	Rough	-	-	-	-	-	-	-	
	Porous	-	-	-	-	-	-	-	
Dusty atmosphere	Not abrasive	●	●	●	●	●	-	●	The use of a vacuum filter is strongly recommended.  Urethane allows a good abrasion resistance. The use of a vacuum filter is required
	Abrasive	●	-	-	-	-	●	-	
No trace on the piece	Standard	●	-	-	-	-	-	●	Silicone suction cups leave no lift marks (e.g. : glass industry, cathode-ray tubes etc.)
	Rough	-	-	-	-	-	-	-	
	Porous	-	-	-	-	-	-	-	
Long-life suction cups	Standard	●	-	-	-	-	●	-	Spring type suction cups in urethane have a longer service life.  Urethane is not suitable.
	Rough	●	-	-	-	-	●	-	
	Porous	-	-	-	-	-	-	-	

● recommended model