SMC

Vacuum Pad: Ball Joint Type

Series ZPT/ZPR

Pad diameters: ø10, ø13, ø16, ø20 ø25, ø32, ø40, ø50

Series ZPT: Vertical vacuum entry type

Series ZPR: Lateral vacuum entry type One-Touch fitting

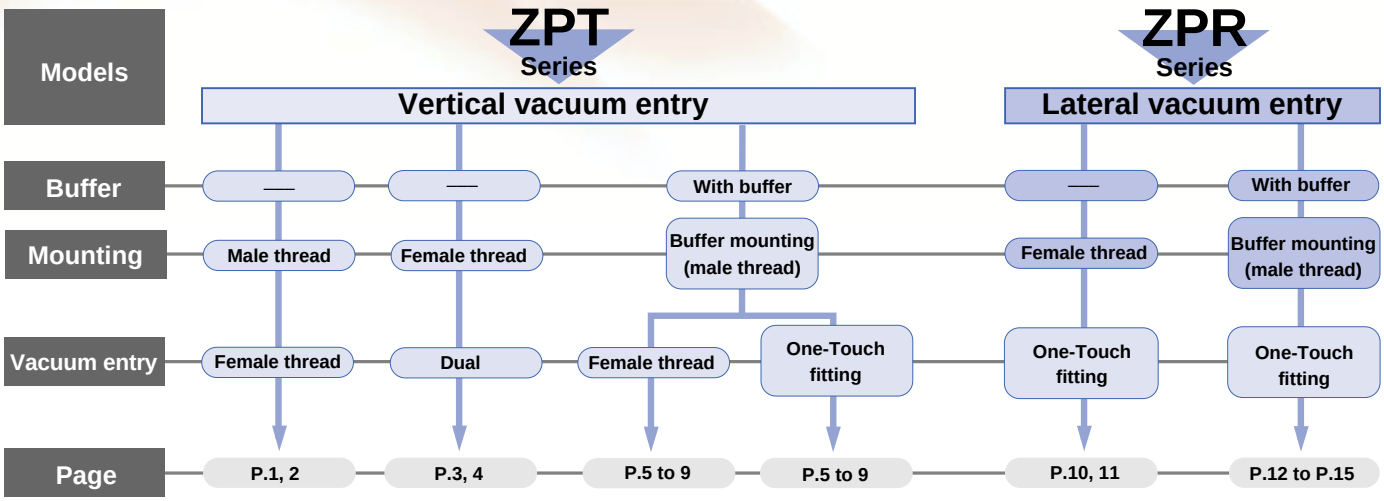
Vacuum Pad: Ball Joint Type

Series ZPT/ZPR

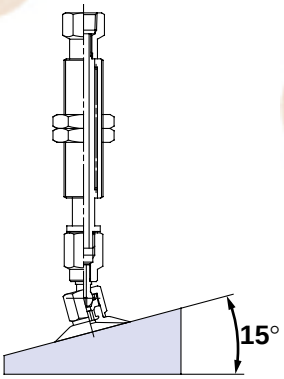
Pad diameters: ø10, ø13, ø16, ø20, ø25, ø32, ø40, ø50

Pad materials: NBR, Silicon rubber, Urethane rubber, Fluoro rubber, Conductive NBR, Conductive silicon rubber

Series variations

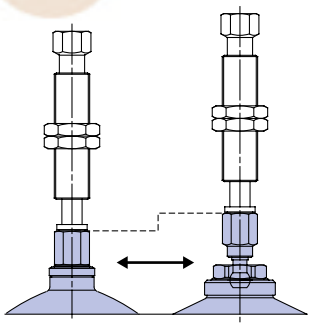


Adsorption is possible even on a slanted surface.



Rotation ±15°

Interchangeable with standard type.



Exchangeable at the adapter.

Buffer stroke

Pad diameter / Buffer stroke	ø10	ø13	ø16	ø20	ø25	ø32	ø40	ø50
10mm	•	•	•	•	•	•	•	•
20mm	•	•	•	•	•	•	•	•
30mm	•	•	•	•	•	•	•	•
40mm	•	•	•	–	–	–	–	–
50mm	•	•	•	•	•	•	•	•

Pad materials and characteristics

◎: Little or no effect ○: Can be used depending on conditions X: Not suitable

Material \ Item	Durometer HS(± 5°)	Operating temperature range °C	Oil resistance (gasoline)	Oil resistance (benzol)	Alkali resistance	Acid resistance	Weather resistance	Ozone resistance	Abrasion resistance	Water resistance	Solvent resistance (benzene, toluene)
NBR	50°	0 to 120	◎	X	○	○	○	X	◎	○	X
Silicon rubber	40°	– 30 to 200	X	X	○	X	◎	◎	X	○	X
Urethane rubber	60°	0 to 60	◎	X	X	X	○	◎	◎	X	X
Fluoro rubber	60°	0 to 250	◎	◎	X	◎	◎	◎	○	◎	◎
Conductive NBR	50°	0 to 100	○	X	○	X	○	X	○	○	X
Conductive silicon rubber	50°	– 10 to 200	X	X	○	X	◎	◎	X	○	X

The characteristics shown above represent the general properties of the rubber materials.
Pad materials used by SMC meet JIS material standards, however, even in pad tests similar to JIS material tests, results differ depending upon shape and operating conditions.

Vertical
Vacuum
Entry

Series ZPT
Without Buffer/Male Thread

How to Order

ZPT 25 F GN – B5 – A8

Pad diameter (mm)

10	ø10
13	ø13
16	ø16
20	ø20
25	ø25
32	ø32
40	ø40
50	ø50

Pad type

F	Ball joint

Pad material

N	NBR
S	Silicon rubber
U	Urethane rubber
F	Fluoro rubber
GN*	Conductive NBR
GS*	Conductive silicon rubber

* ø20 and larger are manufactured upon receipt of order.

Vacuum entry

B5	M5 x 0.8

Mounting thread diameter male thread

Symbol	Thread	Pad dia. (mm)
A8	M8 x 1	ø10 to ø16
A10	M10 x 1	ø20 to ø32
A14	M14 x 1	ø40, ø50

Note) Pads are exclusively ball joint type and are not interchangeable with other pads.

Standard Specifications

Vacuum entry direction		Vertical	
Connection		Mounting	Vacuum entry
		Male thread	Female thread
Pad diameter (mm)	**ø10 to ø16**	M8 x 1	M5 x 0.8
	ø20 to ø32	M10 x 1	
	ø40, ø50	M14 x 1	
Ball joint rotation		±15°	

Weight Table

(g)

Pad diameter (mm)	Mounting (male thread)	Vacuum entry (female thread)
		M5 x 0.8
ø10 to ø16	M8 x 1	20
ø20 to ø32	M10 x 1	24
ø40, ø50	M14 x 1	55

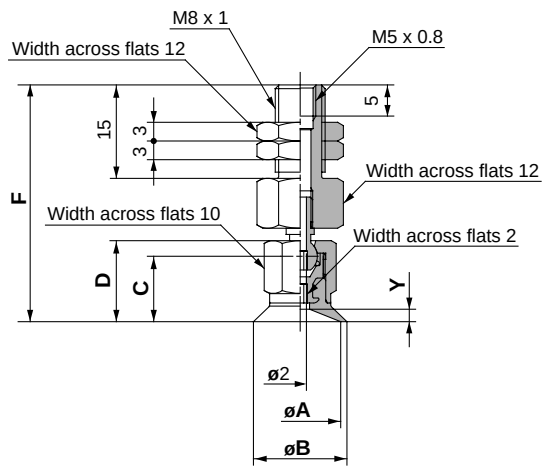
Pad Types

Pad type	Ball joint					
Pad diameter (mm)	ø10, ø13, ø16, ø20, ø25, ø32, ø40, ø50					
Material	NBR	Silicon rubber	Urethane rubber	Fluoro rubber	Conductive NBR	Conductive silicon rubber
Colour	Black	White	Brown	Black with green mark	Black with 1 white mark	Black with 2 white marks
Durometer Note	50°	40°	60°	60°	50°	50°

Note: Shore Durometer A scale HS(±5º)

Series ZPT Without Buffer/Male Thread

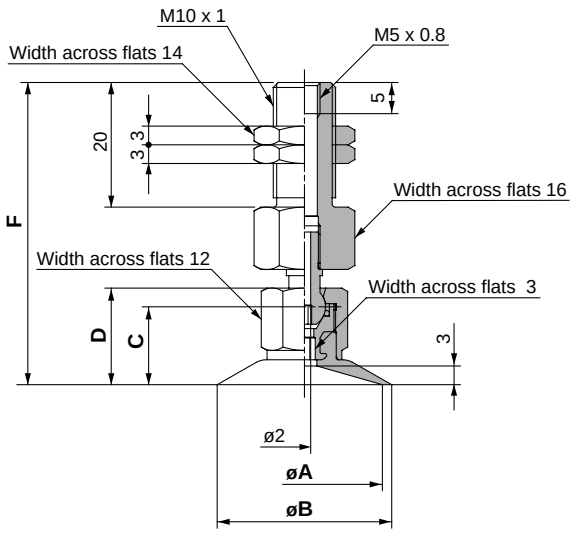
ZPT 10/13/16 F□□-B5-A8 (Without Buffer/Male Thread)



Dimensions (mm)

Model	A	B	C	D	F	Y
ZPT10F□□-B5-A8	10	12	10	12.5	37.5	1.5
ZPT13F□□-B5-A8	13	15	10.5	13	38	
ZPT16F□□-B5-A8	16	18				2

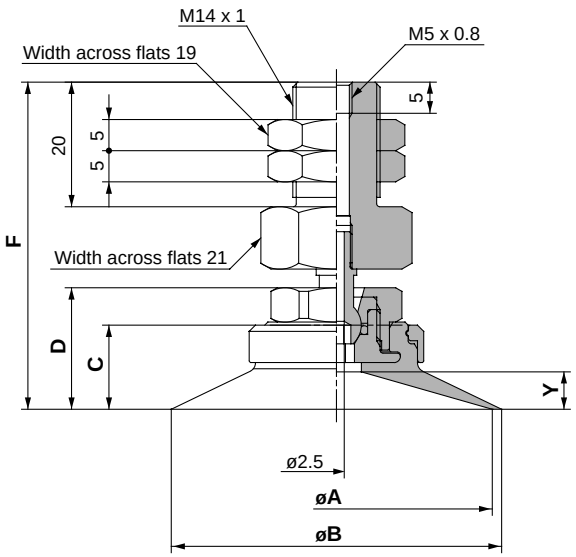
ZPT 20/25/32 F□□-B5-A10 (Without Buffer/Male Thread)



Dimensions (mm)

Model	A	B	C	D	F
ZPT20F□□-B5-A10	20	22	12.5	15.5	48.5
ZPT25F□□-B5-A10	25	28			
ZPT32F□□-B5-A10	32	35	13	16	49

ZPT 40/50 F□□-B5-A14 (Without Buffer/Male Thread)



Dimensions (mm)

Model	A	B	C	D	F	Y
ZPT40F□□-B5-A14	40	43	12.5	18.5	51.5	5
ZPT50F□□-B5-A14	50	53	13.5	19.5	52.5	6

Vertical Vacuum Entry

Series ZPT
Without Buffer/Female Thread

How to Order

ZPT 20 F GS – B01

Pad diameter (mm)

10	ø10
13	ø13
16	ø16
20	ø20
25	ø25
32	ø32
40	ø40
50	ø50

Pad type

F	Ball joint

Vacuum entry (same as mounting thread)

Connection	Symbol	Thread diameter	Pad diameter (mm)		
			ø10 to ø16	**ø20 to ø32**	**ø40, ø50**
Female thread	**B5**	M5 x 0.8	•	•	–
	B8	M8 x 1.25	–	•	•
	B01	Rc(PT)1/8	–	•	•

Pad material

N	NBR
S	Silicon rubber
U	Urethane rubber
F	Fluoro rubber
GN*	Conductive NBR
GS*	Conductive silicon rubber

* ø20 and larger are manufactured upon receipt of order.

Note) Pads are exclusively ball joint type and are not interchangeable with other pads.

Standard Specifications

Vacuum entry direction		Vertical
Connection		Mounting/Vacuum entry
		Female thread
Pad diameter (mm)	**ø10 to ø16**	M5 x 0.8
	ø20 to ø32	M5 x 0.8
		M8 x 1.25
		Rc(PT)1/8
	ø40, ø50	M8 x 1.25
		Rc(PT)1/8
Ball joint rotation		±15°

Weight Table

(g)

Pad diameter (mm)	Vacuum entry (female thread)		
	M5 x 0.8	M8 x 1.25	Rc(PT)1/8
ø10 to ø16	10	–	–
ø20 to ø32	14	17	19
ø40, ø50	–	47	46

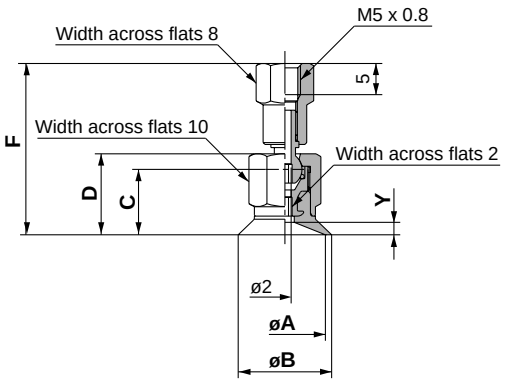
Pad Types

Pad type	Ball joint					
Pad diameter (mm)	ø10, ø13, ø16, ø20, ø25, ø32, ø40, ø50					
Material	NBR	Silicon rubber	Urethane rubber	Fluoro rubber	Conductive NBR	Conductive silicon rubber
Colour	Black	White	Brown	Black with green mark	Black with 1 white mark	Black with 2 white marks
Durometer Note	50°	40°	60°	60°	50°	50°

Note: Shore Durometer A scale HS(±5°)

Series ZPT Without Buffer/Female Thread

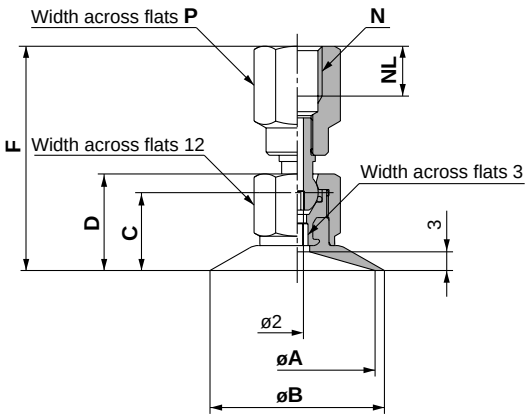
ZPT 10/13/16 F□□-B5 (Without Buffer/Female Thread)



Dimensions (mm)

Model	A	B	C	D	F	Y
ZPT10F□□-B5	10	12	10	12.5	27	1.5
ZPT13F□□-B5	13	15	10.5	13	27.5	
ZPT16F□□-B5	16	18				2

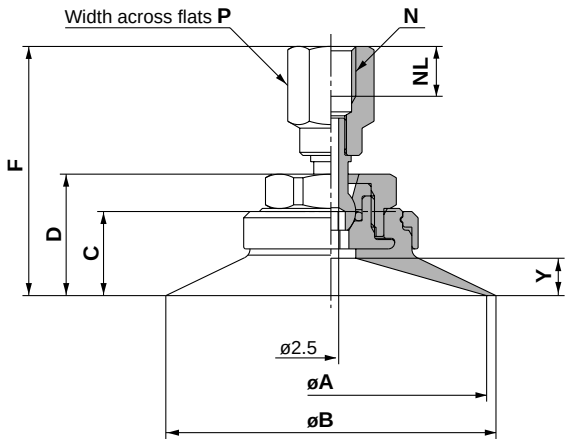
ZPT 20/25/30 F□□-B 5/8/01 (Without Buffer/Female Thread)



Dimensions (mm)

Model	A	B	C	D	F	N	NL	P
ZPT20F□□-B5	20	22	12.5	15.5	32	M5 x 0.8	5	9
ZPT20F□□-B8					36	M8 x 1.25	8	12
ZPT20F□□-B01						Rc(PT)1/8	6.2	14
ZPT25F□□-B5	25	28			32	M5 x 0.8	5	9
ZPT25F□□-B8					36	M8 x 1.25	8	12
ZPT25F□□-B01						Rc(PT)1/8	6.2	14
ZPT32F□□-B5	32	35	13	16	32.5	M5 x 0.8	5	9
ZPT32F□□-B8					36.5	M8 x 1.25	8	12
ZPT32F□□-B01						Rc(PT)1/8	6.2	14

ZPT 40/50 F□□-B 8/01 (Without Buffer/Female Thread)



Dimensions (mm)

Model	A	B	C	D	F	N	NL	P	Y
ZPT40F□□-B8	40	43	12.5	18.5	39	M8 x 1.25	8	12	5
ZPT40F□□-B01						Rc(PT)1/8	6.2	14	
ZPT50F□□-B8	50	53	13.5	19.5	40	M8 x 1.25	8	12	6
ZPT50F□□-B01						Rc(PT)1/8	6.2	14	

Vertical Vacuum Entry

Series ZPT With Buffer

How to Order

ZPT | **10** | **F** | **GN** | **J** | **20** | **04** | **A10**

Pad diameter (mm)

10	ø10
13	ø13
16	ø16
20	ø20
25	ø25
32	ø32
40	ø40
50	ø50

Pad type

F	Ball joint

Pad material

N	NBR
S	Silicon rubber
U	Urethane rubber
F	Fluoro rubber
GN*	Conductive NBR
GS*	Conductive silicon rubber

* ø20 and larger are manufactured upon receipt of order.

Buffer type

J	Without detent
K	With detent

Buffer stroke

Symbol	Stroke	Pad diameter (mm)	
		ø10 to ø16	**ø20 to ø50**
10	10mm	•	•
20	20mm	•	•
30	30mm	•	•
40	40mm	•	–
50	50mm	•	•

Mounting thread diameter/male thread
(Refer to Table 1 for applications.)

Vacuum entry
(Refer to Table 1 for applications.)

Table 1 Vacuum entry/Mounting thread diameter

				Mounting thread diameter (male thread)	
Pad diameter (mm)				**ø10 to ø16**	**ø20 to ø50**
Connection		Thread diameter, Piping diameter		M10 x 1	M14 x 1
			Symbol	A10	A14
Vacuum entry	Female thread	M5 x 0.8	**B5**	•	–
		Rc(PT)1/8	**B01**	–	•
	One-Touch fitting	ø4 tube	**04**	•	–
		ø6 tube	**06**	•	•
		ø8 tube	**08**	–	•

Buffer spring reactive force

Pad diameter (mm)	0 stroke	Stroke end
ø10 to ø16	1.0N{0.10kgf}	3.0N{0.31kgf}
ø20 to ø50	2.0N {0.20kgf}	5.0N{0.51kgf}

Note) Pads are exclusively ball joint type and are not interchangeable with other pads.

Pad Types

Pad type	Ball joint					
Pad diameter (mm)	ø10, ø13, ø16, ø20, ø25, ø32, ø40, ø50					
Material	NBR	Silicon rubber	Urethane rubber	Fluoro rubber	Conductive NBR	Conductive silicon rubber
Colour	Black	White	Brown	Black with green mark	Black with 1 white mark	Black with 2 white marks
Durometer Note	50°	40°	60°	60°	50°	50°

Note: Shore Durometer A scale HS(±5º)

Series ZPT With Buffer

Standard Specifications

Vacuum entry		Vertical		
Connection		Mounting	Vacuum entry	
		Buffer male thread	Female thread	One-Touch fitting
Pad diameter (mm)	**ø10 to ø16**	M10 x 1	M5 x 0.8	ø4 tube
				ø6 tube
	ø20 to ø50	M14 x 1	Rc(PT)1/8	ø6 tube
				ø8 tube
Ball joint rotation		±15°		

Buffer Specifications

Pad diameter (mm)	**ø10 to ø16**		**ø20 to ø50**	
Mounting	M10 x 1		M14 x 1	
Stroke (mm)	10, 20, 30, 40, 50		10, 20, 30, 50	
Spring reactive force	0 stroke	1.0N {0.10kgf}	0 stroke	2.0N {0.20kgf}
	Stroke end	3.0N {0.31kgf}	Stroke end	5.0N {0.51kgf}
Detent specifications	Without detent (J), With detent (K)			

Weight Table

(g)

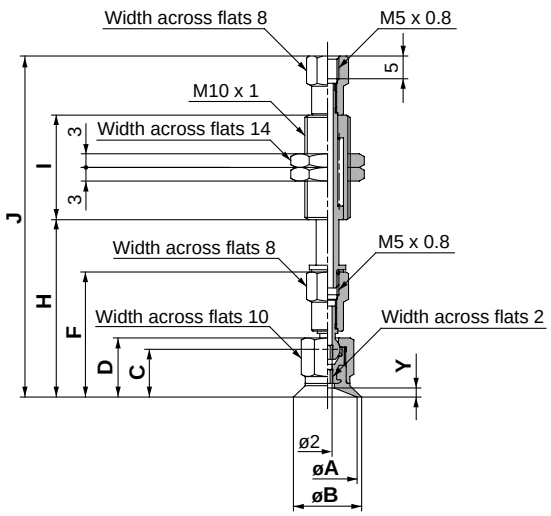
Pad diameter (mm)	Vacuum entry				
	Female thread		One-Touch fitting		
	M5 x 0.8	Rc(PT)1/8	ø4 tube	ø6 tube	ø8 tube
ø10 to ø16	30	–	32	33	–
ø20 to ø32	–	128	–	133	139
ø40, ø50	–	158	–	159	167

Additional Weight by Stroke

(g)

Pad diameter (mm)	Stroke (mm)			
	20	30	40	50
ø10 to ø16	+10.5	+12.5	+22.5	+24
ø20 to ø50	+37.5	+40	–	+66.5

ZPT 10/13/16 F□□ J/K 10-B5-A10 (With Buffer/Female Thread)



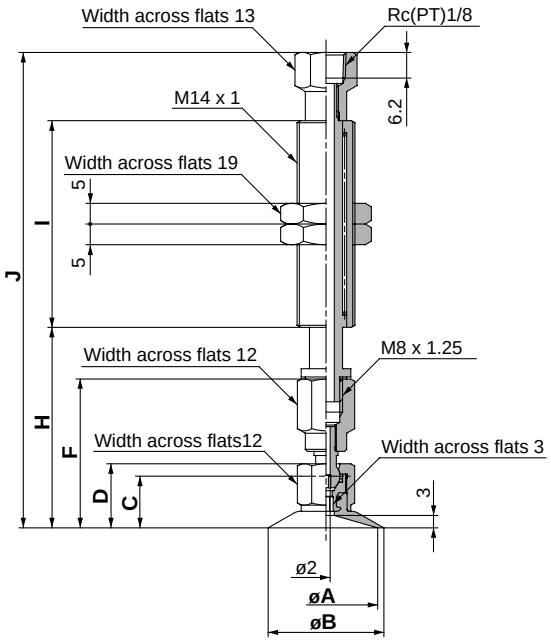
Dimensions/10mm stroke (mm)

Model	A	B	C	D	F	H	I	J	Y
ZPT10F□□□10-B5-A10	10	12	10	12.5	27	38.5	23	74.5	1.5
ZPT13F□□□10-B5-A10	13	15	10.5	13	27.5	39		75	2
ZPT16F□□□10-B5-A10	16	18							

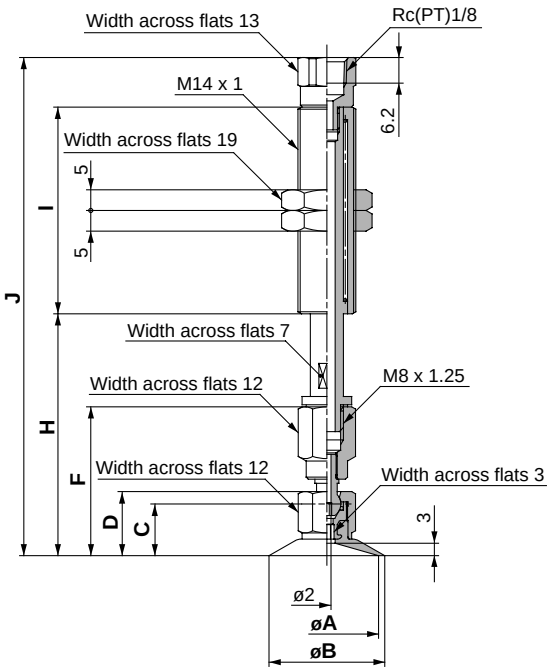
Additional dimensions by stroke (mm)

Stroke	H	I	J
20	+10	+28	+38
30	+20		+48
40	+30	+54	+84
50	+40		+94

ZPT 20/25/32 F□□ J/K 10-B01-A14 (With Buffer/Female Thread)



With a stroke of 10mm



With a stroke of 20 to 50mm

Dimensions/10mm stroke (mm)

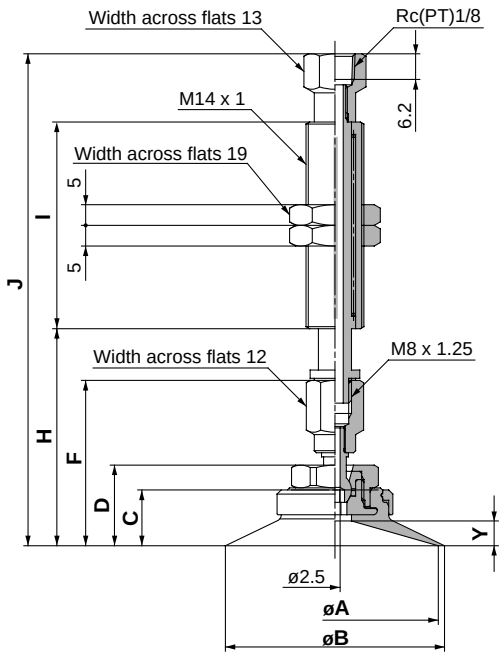
Model	A	B	C	D	F	H	I	J
ZPT20F□□□10-B01-A14	20	22	12.5	15.5	36	48.5	50	115
ZPT25F□□□10-B01-A14	25	28						
ZPT32F□□□10-B01-A14	32	35	13	16	36.5	49		115.5

Additional dimensions by stroke (mm)

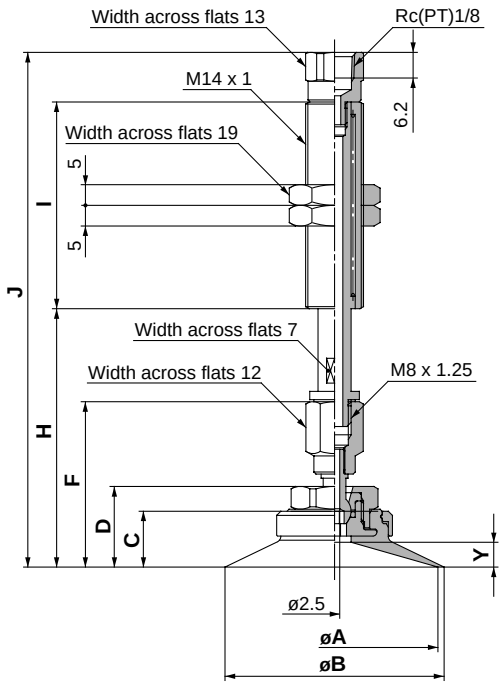
Stroke	H	I	J
20	+10	±0	+5.5
30	+20		+15.5
50	+40	±25	+60.5

Series ZPT With Buffer

ZPT 40/50 F□□ J/K 10-B01-A14 (With Buffer/Female Thread)



With a stroke of 10mm



With a stroke of 20 to 50mm

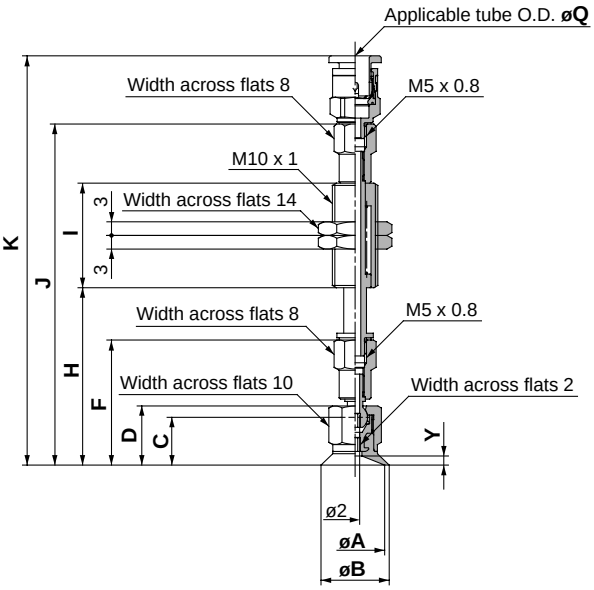
Dimensions/10mm stroke (mm)

Model	A	B	C	D	F	H	I	J	Y
ZPT40F□□□10-B01-A14	40	43	12.5	18.5	39	51.5	50	118	5
ZPT50F□□□10-B01-A14	50	53	13.5	19.5	40	52.5		119	6

Additional dimensions by stroke (mm)

Stroke	H	I	J
20	+10	±0	+5.5
30	+20		+15.5
50	+40	+25	+60.5

ZPT 10/13/16 F□□ J/K 10-0□-A10 (With Buffer/One-Touch Fitting)



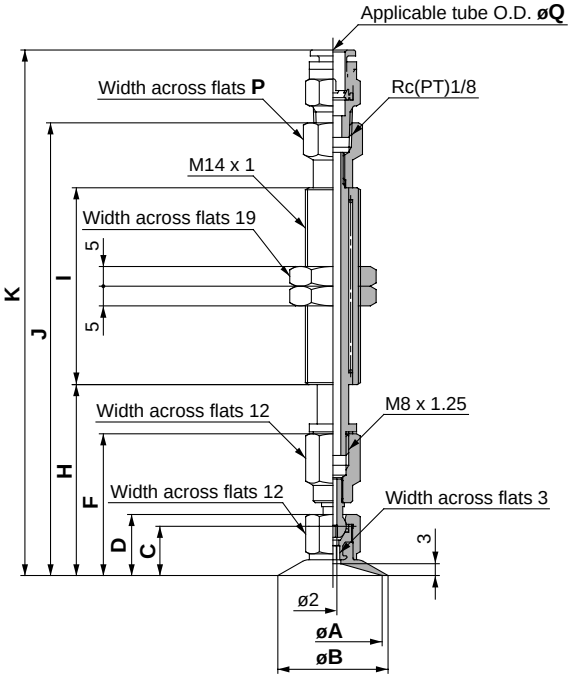
Dimensions/10mm stroke (mm)

Model	A	B	C	D	F	H	I	J	Q:4 K	Q:6 K	Y
ZPT10F□□□10-0□-A10	10	12	10	12.5	27	38.5	23	74.5	88.5	89.5	1.5
ZPT13F□□□10-0□-A10	13	15	10.5	13	27.5	39		75	89	90	2
ZPT16F□□□10-0□-A10	16	18									

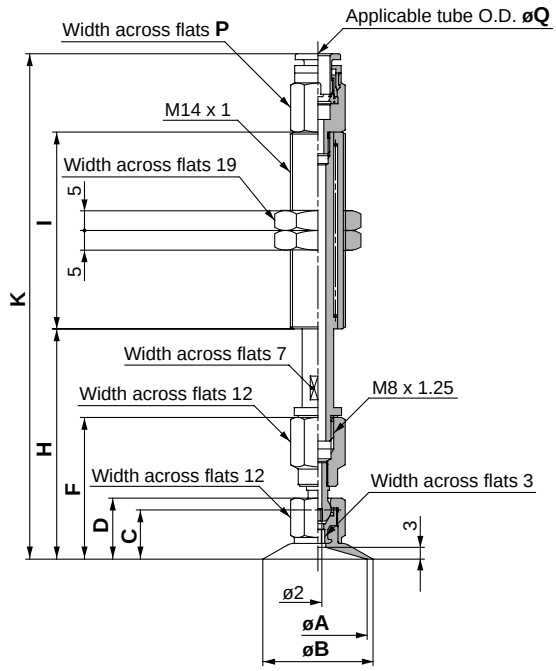
Additional dimensions by stroke (mm)

Stroke	H	I	J	K
20	+10	+28	+38	
30	+20		+48	
40	+30	+54	+84	
50	+40		+94	

ZPT 20/25/32 F□□ J/K 10-0□-A14 (With Buffer/One-Touch Fitting)



With a stroke of 10mm



With a stroke of 20 to 50mm

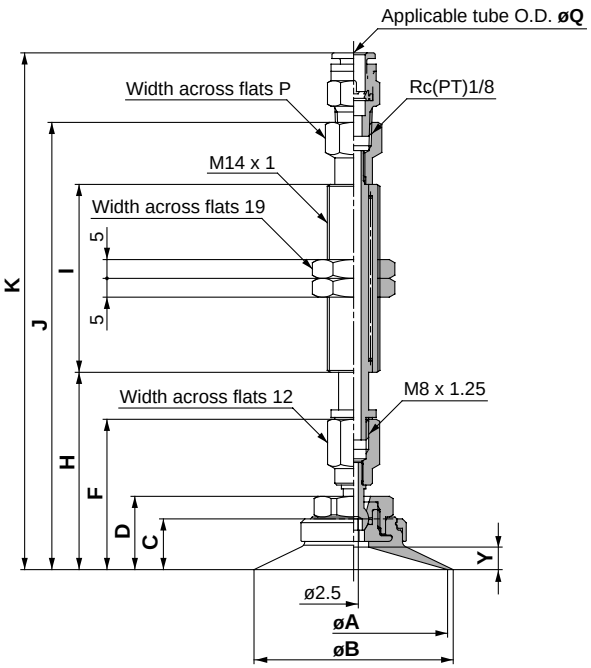
Dimensions/10mm stroke (mm)

Model	A	B	C	D	F	H	I	J	Q: 6		Q: 8	
									K	P	K	P
ZPT20F□□□10-0□-A14	20	22	12.5	15.5	36	48.5	50	115	133.5	13	137	13
ZPT25F□□□10-0□-A14	25	28										
ZPT32F□□□10-0□-A14	32	35	13	16	36.5	49		115.5	134		135.5	

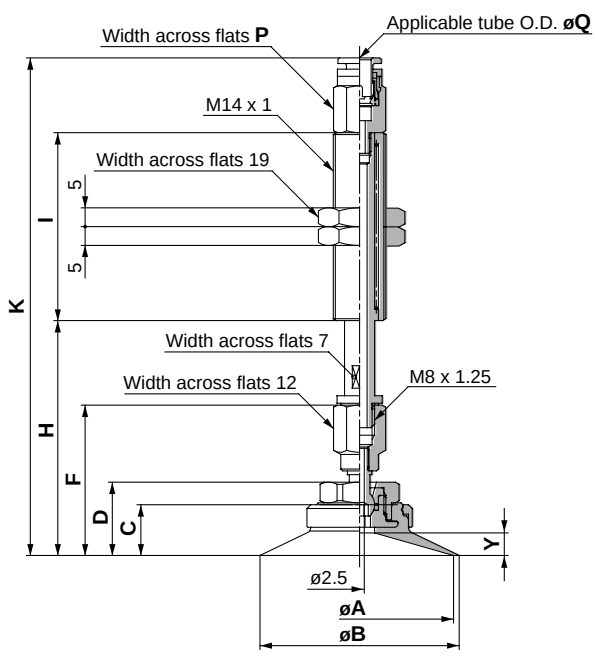
Additional dimensions by stroke (mm)

Stroke	H	I	Q: 6		Q: 8	
			K	P	K	P
20	+10	±0	–5.1	–1	–3.6	+1
30	+20		–4.9		–6.4	
50	+40	+25	–49.9		–51.4	

ZPT 40/50 F□□ J/K 10-0□-A14 (With Buffer/One-Touch Fitting)



With a stroke of 10mm



With a stroke of 20 to 50mm

Dimensions/10mm stroke (mm)

Model	A	B	C	D	F	H	I	J	Q: 6		Q: 8		Y
									K	P	K	P	
ZPT40F□□□10-0□-A14	40	43	12.5	18.5	39	51.5	50	118	136.5	13	140	13	5
ZPT50F□□□10-0□-A14	50	53	13.5	19.5	40	52.5		119	137.5		141		6

Additional dimensions by stroke (mm)

Stroke	H	I	Q: 6		Q: 8	
			K	P	K	P
20	+10	±0	–5.1	–1	–3.6	+1
30	+20		+ 4.9		–6.4	
50	+40	+25	+49.9		–51.4	

Lateral
Vacuum
Entry

Series ZPR
Without Buffer/Female Thread

How to Order

ZPR 10 F GS — 06 — B5

Pad diameter (mm)

10	ø10
13	ø13
16	ø16
20	ø20
25	ø25
32	ø32
40	ø40
50	ø50

Pad type

F	Ball joint

Pad material

N	NBR
S	Silicon rubber
U	Urethane rubber
F	Fluoro rubber
***GN**	Conductive NBR
***GS**	Conductive silicon rubber

∗ ø20 and larger are manufactured upon receipt of order.

Vacuum entry
(Refer to Table 1 for applications.)

Mounting thread diameter/female thread
(Refer to Table 1 for applications.)

Table 1 Vacuum entry/Mounting thread diameter

				Mounting thread diameter		
Pad diameter (mm)				**ø10 to ø16**	**ø20 to ø50**	
Connection		Thread diameter, Piping diameter		M5 x 0.8	M5 x 0.8	M8 x 1.25
			Symbol	B5	B5	B8
Vacuum entry	One-Touch fitting	ø4 tube	**04**	•	–	–
		ø6 tube	**06**	•	•	•
		ø8 tube	**08**	–	•	•

Note) Pads are exclusively ball joint type and are not interchangeable with other pads.

Standard Specifications

Vacuum entry direction		Lateral	
Connection		Connection	Vacuum entry
		Female thread	One-Touch fitting
Pad diameter (mm)	**ø10 to ø16**	M5 x 0.8	ø4 tube
			ø6 tube
	ø20 to ø50	M5 x 0.8	ø6 tube
			ø8 tube
		M8 x 1.25	ø6 tube
			ø8 tube
Ball joint rotation		±15°	

Weight Table

(g)

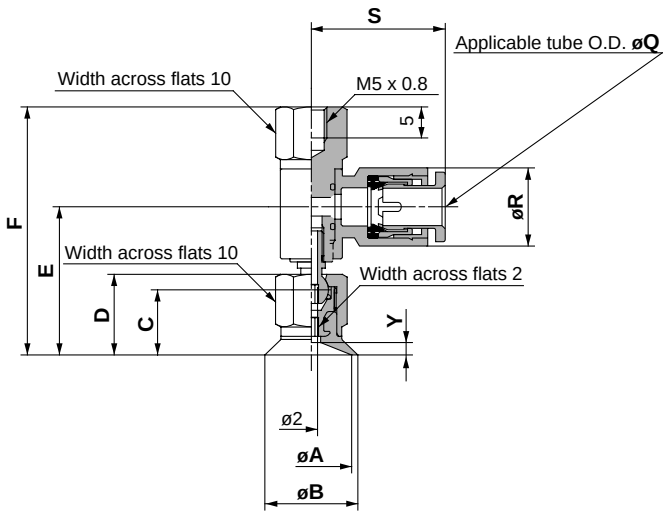
Pad diameter (mm)	Mounting female thread	Vacuum entry (One-Touch fitting)		
		ø4 tube	ø6 tube	ø8 tube
ø10 to ø16	M5 x 0.8	18	19	–
ø20 to ø32	M5 x 0.8	–	22	23
	M8 x 1.25	–	21	22
ø40, ø50	M5 x 0.8	–	58	60
	M8 x 1.25	–	57	59

Pad Types

Pad type	Ball joint					
Pad diameter (mm)	ø10, ø13, ø16, ø20, ø25, ø32, ø40, ø50					
Material	NBR	Silicon rubber	Urethane rubber	Fluoro rubber	Conductive NBR	Conductive silicon rubber
Colour	Black	White	Brown	Black with green mark	Black with 1 white mark	Black with 2 white marks
Durometer Note	50°	40°	60°	60°	50°	50°

Note: Shore Durometer A scale HS(±5°)

ZPR 10/13/16 F□□-0□-B5 (Without Buffer/Female Thread)



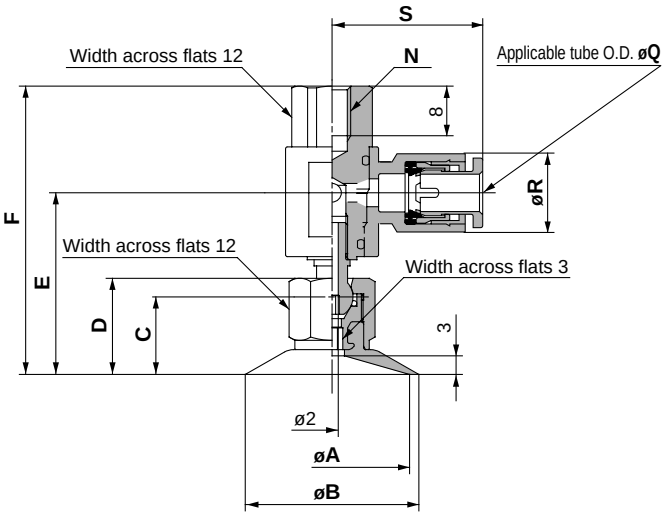
Dimensions (mm)

Model	A	B	C	D	E	F	Y
ZPR10F□□-0□-B5	10	12	10	12.5	23.4	39.5	1.5
ZPR13F□□-0□-B5	13	15	10.5	13	23.9	40	2
ZPR16F□□-0□-B5	16	18					

Dimensions by tube diameter (mm)

Pad diameter (mm)	Q: 4		Q: 6	
	R	S	R	S
ø10 to ø16	10.4	20.6	12.8	21.6

ZPR 20/25/32 F□□-0□-B 5/8 (Without Buffer/Female thread)



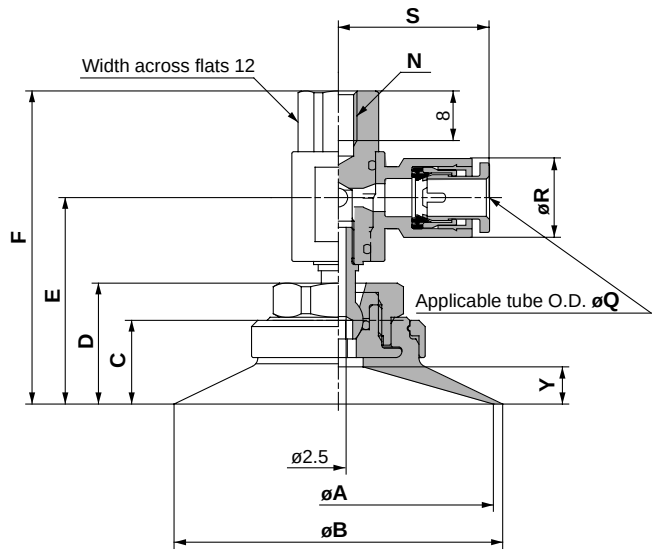
Dimensions (mm)

Model	A	B	C	D	E	F	N
ZPR20F□□-0□-B5	20	22	12.5	15.5	29.3	46.5	M5 x 0.8
ZPR20F□□-0□-B8							M8 x 1.25
ZPR25F□□-0□-B5	25	28					M5 x 0.8
ZPR25F□□-0□-B8							M8 x 1.25
ZPR32F□□-0□-B5	32	35	13	16	29.8	47	M5 x 0.8
ZPR32F□□-0□-B8							M8 x 1.25

Dimensions by tube diameter (mm)

Pad diameter (mm)	Q: 6		Q: 8	
	R	S	R	S
ø20 to ø32	12.8	24.3	15.2	26.2

ZPR 40/50 F□□-0□-B8 (Without Buffer/Female Thread)



Dimensions (mm)

Model	A	B	C	D	E	F	N	Y
ZPR40F□□-0□-B8	40	43	12.5	18.5	32.3	49.5	M8 x 1.25	5
ZPR50F□□-0□-B8	50	53	13.5	19.5	33.3	50.5		6

Dimensions by tube diameter (mm)

Pad diameter (mm)	Q: 6		Q: 8	
	R	S	R	S
ø40, ø50	12.8	24.3	15.2	26.2

Lateral
Vacuum
Entry

Series ZPR
With Buffer

How to Order

ZPR | **10** | **F** | **GN** | **J** | **30** | **06** | **A10**

Pad diameter (mm)

10	ø10
13	ø13
16	ø16
20	ø20
25	ø25
32	ø32
40	ø40
50	ø50

Pad type

F	Ball joint

Pad material

N	NBR
S	Silicon rubber
U	Urethane rubber
F	Fluoro rubber
GN*	Conductive NBR
GS*	Conductive silicon rubber

* ø20 and larger are manufactured upon receipt of order.

Buffer type

J	Without detent
K	With detent

Buffer stroke

Symbol	Stroke	Pad diameter (mm)	
		ø10 to ø16	**ø20 to ø50**
10	10mm	•	•
20	20mm	•	•
30	30mm	•	•
40	40mm	•	–
50	50mm	•	•

Mounting thread diameter/male thread
(Refer to Table 1 for applications.)

Vacuum entry
(Refer to Table 1 for applications.)

Table 1 Vacuum entry/Mounting thread diameter

				Mounting thread diameter (male thread)	
Pad diameter (mm)				**ø10 to ø16**	**ø20 to ø50**
Connection		Thread diameter, Piping diameter		M10 x 1	M14 x 1
			Symbol	A10	A14
Vacuum entry	One-Touch fitting	ø4 tube	**04**	•	–
		ø6 tube	**06**	•	•
		ø8 tube	**08**	–	•

Buffer spring reactive force

Pad diameter (mm)	0 stroke	Stroke end
ø10 to ø16	1.0N {0.10kgf}	3.0N {0.31kgf}
ø20 to ø50	2.0N {0.20kgf}	5.0N {0.51kgf}

Note) Pads are exclusively ball joint type and are not interchangeable with other pads.

Pad Types

Pad type	Ball joint					
Pad diameter (mm)	ø10, ø13, ø16, ø20, ø25, ø32, ø40, ø50					
Material	NBR	Silicon rubber	Urethane rubber	Fluoro rubber	Conductive NBR	Conductive silicon rubber
Colour	Black	White	Brown	Black with green mark	Black with 1 white mark	Black with 2 white marks
Durometer Note	50°	40°	60°	60°	50°	50°

Note: Shore Durometer A scale HS(±5º)

Standard Specifications

Vacuum entry direction		Lateral	
Connection		Mounting	Vacuum entry
		Male thread	One-Touch fitting
Pad diameter (mm)	**ø10 to ø16**	M10 x 1	ø4 tube
			ø6 tube
	ø20 to ø50	M14 x 1	ø6 tube
			ø8 tube
Ball joint rotation		±15°	

Buffer Specifications

Pad diameter (mm)	**ø10 to ø16**		**ø20 to ø50**	
Mounting	M10 x 1		M14 x 1	
Stroke (mm)	10, 20, 30, 40, 50		10, 20, 30, 50	
Spring reactive force	0 stroke	1.0N {0.10kgf}	0 stroke	2.0N {0.20kgf}
	Stroke end	3.0N {0.31kgf}	Stroke end	5.0N {0.51kgf}
Detent specifications	Without detent (J), With detent (K)			

Weight Table

(g)

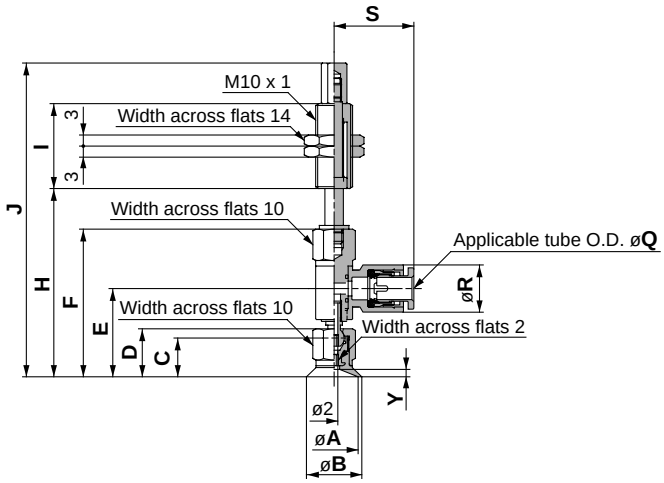
Pad diameter (mm)	Vacuum entry		
	One-Touch fitting		
	ø4 tube	ø6 tube	ø8 tube
ø10 to ø16	34	35	–
ø20 to ø32	–	38	39
ø40, ø50	–	134	136

Additional Weight by Stroke

(g)

Pad diameter (mm)	Stroke (mm)			
	20	30	40	50
ø10 to ø16	+10.5	+12.5	+22.5	+24
ø20 to ø50	+37.5	+40	–	+66.5

ZPR 10/13/16 F□□ J/K10-0□-A10 (With Buffer)



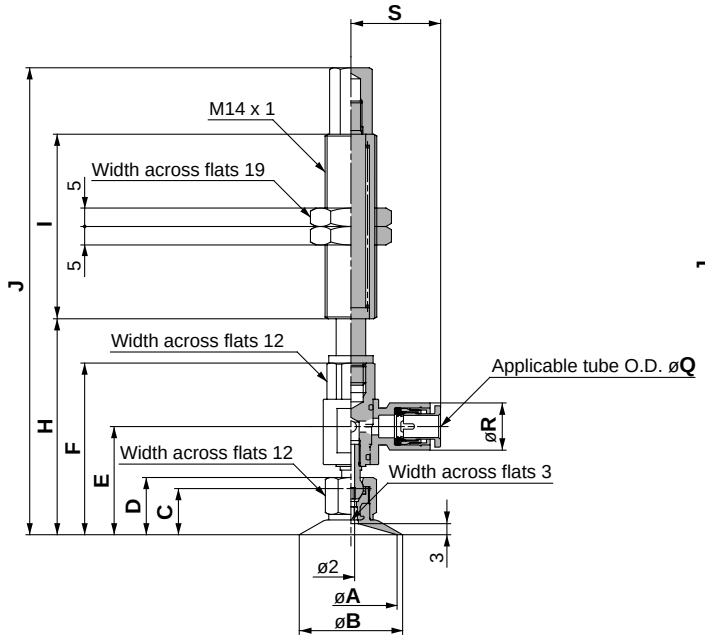
Dimensions/10mm stroke (mm)

Model	A	B	C	D	E	F	H	I	J	Q: 4		Q: 6		Y
										R	S	R	S	
ZPR10F□□□10-0□-A10	10	12	10	12.5	23.4	39.5	50.5	23	84.5	10.4	20.6	12.8	21.6	1.5
ZPR13F□□□10-0□-A10	13	15	10.5	13	23.9	40	51		85					2
ZPR16F□□□10-0□-A10	16	18												

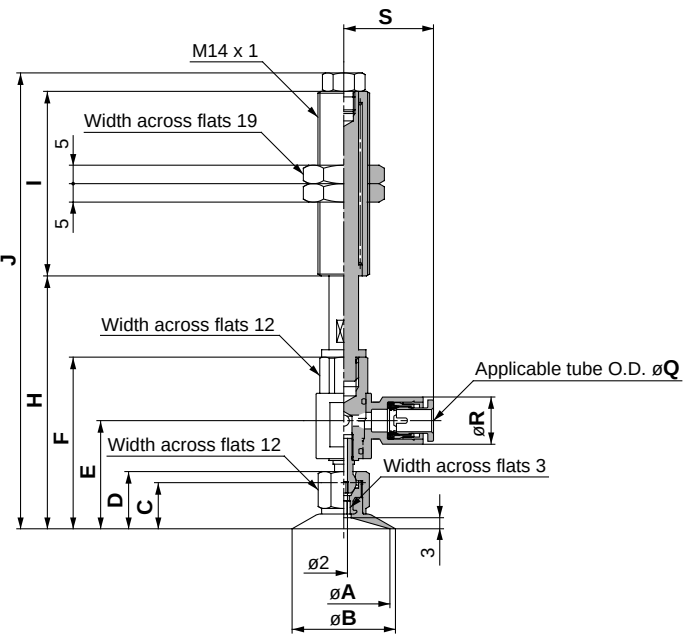
Additional dimensions by stroke (mm)

Stroke	H	I	J
20	+10	+28	+38
30	+20		+48
40	+30	+54	+84
50	+40		+94

ZPR 20/25/32 F□□ J/K10-0□-A14 (With Buffer)



With a stroke of 10mm



With a stroke of 20 to 50mm

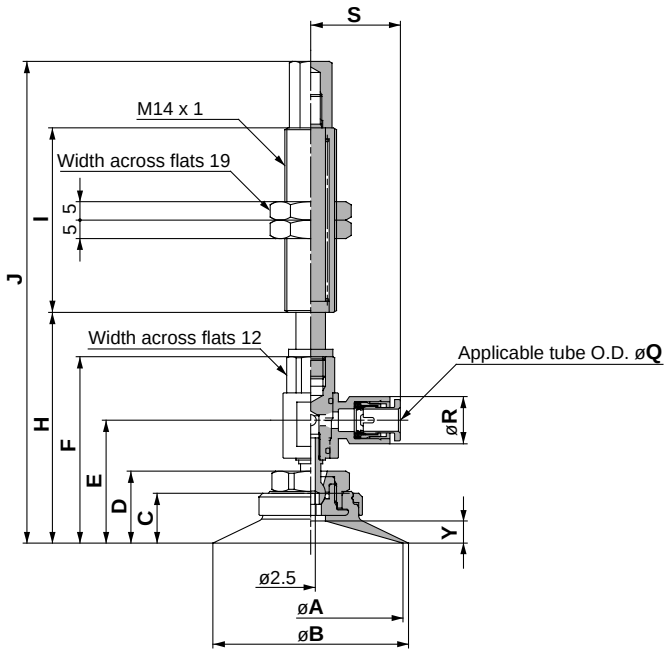
Dimensions/10mm stroke (mm)

Model	A	B	C	D	E	F	H	I	J	Q: 6		Q: 8	
										R	S	R	S
ZPR20F□□□10-0□-A14	20	22	12.5	15.5	29.3	46.5	58.5	50	126.5	12.8	24.3	15.2	26.2
ZPR25F□□□10-0□-A14	25	28	13	16	29.8	47	59		127				
ZPR32F□□□10-0□-A14	32	35											

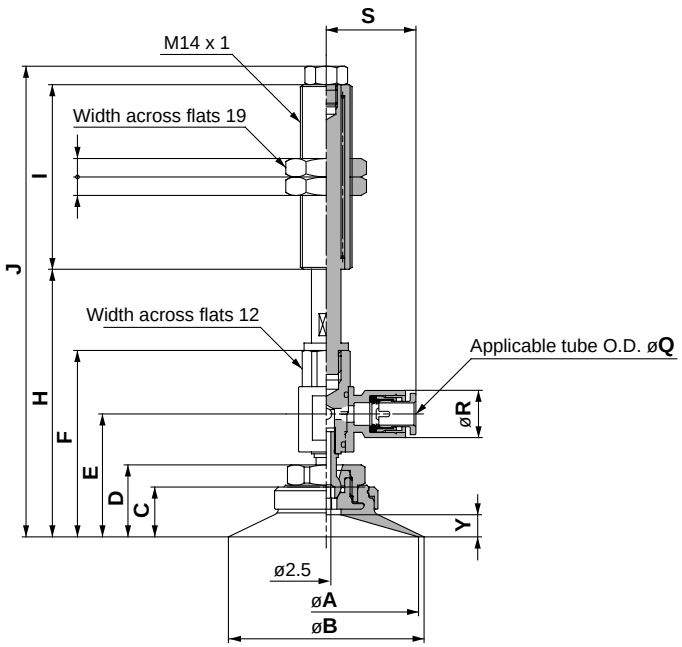
Additional dimensions by stroke (mm)

Stroke	H	I	J
20	+10	±0	–3
30	+20		+7
50	+40	+25	+52

ZPR 40/50 F□□ J/K 10-0□-A14
(With Buffer)



With a stroke of 10mm



With a stroke of 20 to 50mm

Dimensions/10mm stroke (mm)

Model	A	B	C	D	E	F	H	I	J	Q: 6		Q: 8		Y
										R	S	R	S	
ZPR40F□□□10-0□-A14	40	43	12.5	18.5	32.3	49.5	61.5	50	129.5	12.8	24.3	15.2	26.2	5
ZPR50F□□□10-0□-A14	50	53	13.5	19.5	33.3	50.5	62.5		130.5					6

Additional dimensions by stroke (mm)

Stroke	H	I	J
20	+10	±0	–3
30	+20		+7
50	+40	+25	+52

Series ZPT/ZPR
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution", "Warning" or "Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠ Caution : Operator error could result in injury or equipment damage.

⚠ Warning : Operator error could result in serious injury or loss of life.

⚠ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414 : Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems.

Note 2) JIS B 8370 : Pneumatic system axiom.

⚠ Warning

1 The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

2 Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3 Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is re-started, take measures to prevent shooting-out of cylinder piston rod etc. (Bleed air into the system gradually to create back-pressure.)

4 Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjuction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Series ZPT/ZPR
Vacuum Equipment Precautions

Be sure to read before handling.

Selection & Design

⚠ Warning

1. Safe design should be performed, which addresses the possibility of accidents resulting from a drop in vacuum pressure due to power failure or trouble with the air supply, etc.

If vacuum pressure drops and there is a loss of vacuum pad adsorption force, work pieces being carried may fall, causing a danger of human injury and damage to machinery. Safety measures should be implemented such as the installation of drop prevention guides.

2. Use vacuum specifications for vacuum switching valves and vacuum breakers.

If valves are installed in vacuum piping which do not meet vacuum specifications, vacuum leakage will occur. Be certain to use vacuum specification valves.

3. Select ejectors which have a suitable suction flow rate.

<When there is a vacuum leak from the work piece or the piping>

If the ejector's suction flow rate is too low, this will cause poor adsorption.

<When piping is long or of large diameter>

The adsorption response time will increase due to the increased volume of the piping.
Select ejectors with a suitable suction flow rate by referring to their technical data.

4. If the suction flow rate is too high, setting of vacuum switches will become difficult.

In the case of adsorption on a small work piece of only a few millimeters, if an ejector is selected which has a high suction flow rate, the pressure difference when adsorbing and releasing the work piece is small, and sometimes setting of the vacuum switch becomes difficult. Therefore, an appropriate ejector should be selected.

5. When two or more pads are piped to one ejector, if one pad releases its work piece, the other pads will also release.

When one pad is removed from its work piece, there is a drop in vacuum pressure which causes the other pads to release their work pieces also.

6. Use piping with an adequate effective sectional area.

Select piping for the vacuum side which has an adequate effective sectional area, so that the ejector's maximum suction flow rate can be accomodated by the piping.

Also, make sure that there are no unnecessary restrictions or leaks, etc. along the course of the piping.

The piping on the air supply side must be designed so that it corresponds to each ejector's air consumption. The effective sectional area of tubing, fittings and valves, etc., should be sufficiently large, and the pressure drop reaching the ejector should be kept to a minimum.

Further, design of the air supply should be performed while taking into consideration the ejector's maximum air consumption and the air consumption of other pneumatic circuits.

Selection & Design

⚠ Caution

1. For information on related items, such as directional control equipment and drive equipment, refer to the caution sections in each respective catalog.

Mounting

⚠ Warning

1. Do not obstruct the exhaust port of the ejector.

If the exhaust port is obstructed when mounted, a vacuum will not be generated.

Piping

⚠ Caution

1. Avoid disorganized piping.

Piping which is direct and of the shortest possible length should be used for both the vacuum and supply sides, and disorganized piping should be avoided. Unnecessary length increases the piping volume, and this increases the response time.

2. Use piping having a large effective sectional area on the exhaust side of the ejector.

If the exhaust piping is restrictive, there will be a decline in the ejector's performance.

3. Make sure that there are no crushed areas in the piping due to damage or bending.

Operating Environment

⚠ Warning

1. Do not operate in locations having an atmosphere of corrosive gases, chemicals, sea water, water or steam, or where there will be contact with the same.

2. Do not operate in locations having an explosive atmosphere.

3. Do not operate in locations where vibration or impact occurs.

Confirm the specifications for each series.

4. In locations which receive direct sunlight, provide a protective cover, etc.

5. In locations near heat sources, block off any radiated heat.

6. In locations where there is contact with spatter from water, oil or solder, etc., implement suitable protective measures.

7. In cases where the vacuum unit is surrounded by other equipment, etc., or the unit is energized for an extended time, implement measures to radiate excess heat, so that temperatures remain within the range of the vacuum unit's specifications.

Maintenance

⚠ Warning

1. Clean suction filters and silencers on a regular basis. (Refer to specifications.)

The performance of ejectors will deteriorate due to clogging in filters and silencers. Large capacity filters should be used, especially in dusty locations,

Series ZPT/ZPR
Specific Product Precautions

Be sure to read before handling.
Refer to pages 16 and 17 for safety precautions and vacuum equipment precautions.

Precautions on Design

⚠ Warning

1. In cases where the work pieces are heavy or dangerous objects, etc., take measures to address a possible loss of adsorption force (installation of drop prevention guides, etc.).

In the case of transportation by vacuum adsorption using vacuum pads, adsorption force is lost when there is a drop in vacuum pressure.

Furthermore, since vacuum pressure can also deteriorate due to wear and cracking of pads, and vacuum leakage from piping, etc., be certain to perform maintenance on vacuum equipment.

Selection

⚠ Caution

1. The pad materials which can be used differ depending upon the operating environment.

An appropriate pad material should be selected.

Furthermore, since vacuum pads are manufactured for use with industrial products, they should not come into direct contact with medicines or food products, etc.

2. Depending upon the weight and shape of the work pieces, the diameter, quantity and shape of pads suitable for use will vary.

Use the pad lifting force table for reference.

Also, the pads to be selected will differ based upon conditions other than the above, such as the condition of the work piece surface (presence or absence of oil or water), the work piece material and its gas permeability. Confirmation is necessary by actually performing vacuum adsorption on the subject work pieces.

3. Use a buffer for adsorption on fragile work pieces.

The cushioning performed by the buffer is also necessary when there is variation in the height of work pieces. When it is desired to perform further positioning of pads and work pieces, a detent buffer can be used.

Selection

⚠ Caution

4. The life of the buffer will be reduced if lateral force is applied to the buffer shaft.

Note that sometimes a load is applied to the buffer by a piping tube (pulling or pressing, etc. in a lateral direction).

5. Do not apply an impact or large force to a pad when adsorbing a work piece.

This will cause deformation, cracking and wear of the pad to be accelerated. The stiffening ribs, etc. should touch lightly, while staying within the pad skirt's deformation range. Positioning should be performed accurately. Especially in the case of small diameter pads.

6. When transporting in an upward direction, factors such as acceleration, wind pressure and impact force must be considered in addition to the work piece weight.

Use caution particularly when lifting items such as glass plates and circuit boards, because a large force will be applied by wind pressure. When a work piece which is oriented vertically is transported horizontally, large forces are applied by acceleration when movement is started and stopped. Further, in cases where the pad and work piece can slip easily, accelerations and decelerations of horizontal movement should be kept low.

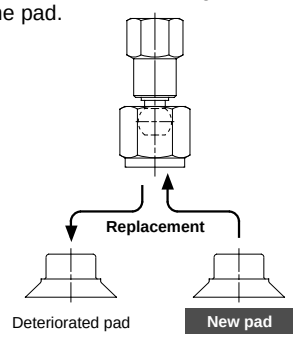
7. When transporting flat shaped work pieces that have large surface areas using multiple pads, care must be taken in arranging the pads, giving consideration to balance of the work pieces.

Maintenance

⚠ Caution

1. Perform pad maintenance regularly.

Since pads are essentially rubber, deterioration is unavoidable. The rate of deterioration depends upon factors such as conditions of use, environment and temperature. Regular maintenance should be performed. If any damage, splitting, cracking or abrasion has occured in a pad which appears to be harmful, replace it immediately. Also, take care not to damage the outside of the pad.

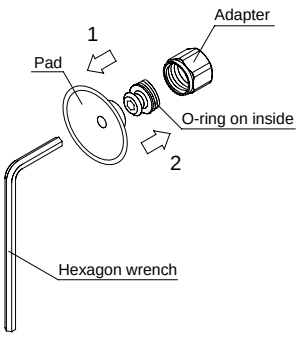


Replacement of Pads

⚠ Caution

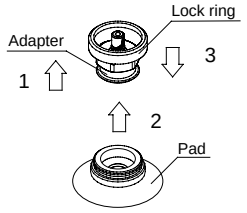
Pad diameter: ø10 to ø32

1. Insert a hexagon wrench from the bottom of the pad, loosen the screw and remove the old pad from the adapter.
2. Place a new pad on the adapter, and after confirming that the O-ring is in place, retighten the screw with the hexagon wrench.



Pad diameter: ø40, ø50

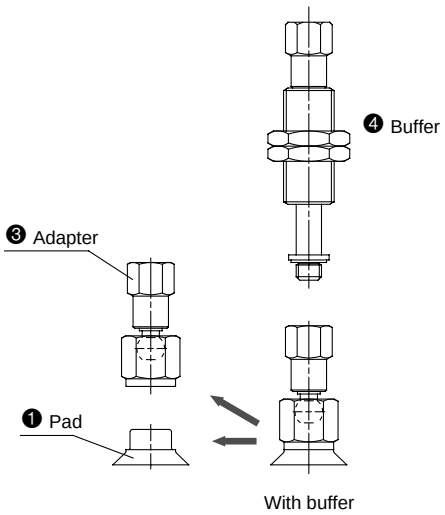
1. Pull the lock ring upward, and after lifting it to the adapter, remove the old pad by pulling it downward.
2. While holding the lock ring in the raised position, place a new pad onto the adapter.
3. Confirm that the pad is securely in place, and then return the lock ring to its original position.



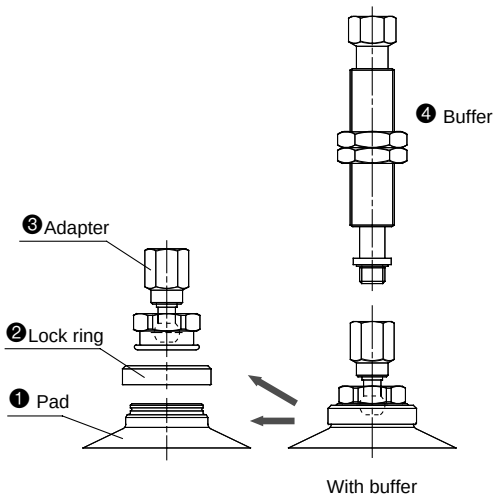
Series ZPT/ZPR
Components

ZPT Series

Pad diameter: ø10 to ø32

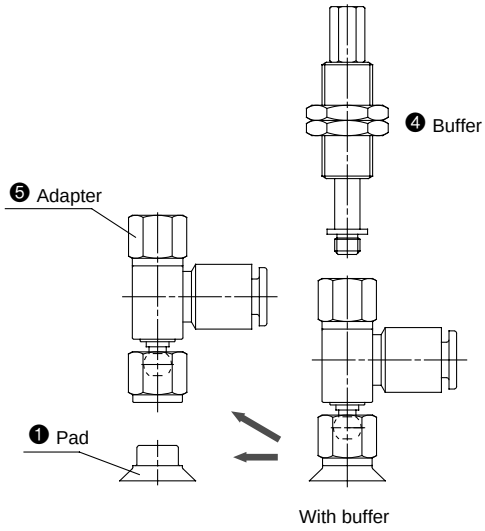


Pad diameter: ø40, ø50

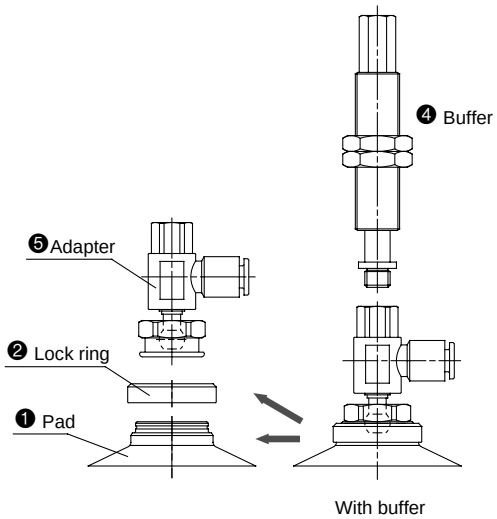


ZPR Series

Pad diameter: ø10 to ø32



Pad diameter: ø40, ø50



Parts list

No.	Description	Material	Note
❶	**Pad**	NBR, Silicon rubber, Urethane rubber, Fluoro rubber Conductive NBR, Conductive silicon rubber	
❷	**Lock ring**	Aluminium	
❸	**Adapter**	Brass, SUS	Electroless nickel plated
❹	**Buffer**	Brass	Electroless nickel plated
❺	**Adapter**	Brass, SUS, PBT	Electroless nickel plated

Series ZPT/ZPR

Replacement Parts

Pad Unit

How to Order

ZP 10 F GN

Pad diameter (mm)

10	ø10
13	ø13
16	ø16
20	ø20
25	ø25
32	ø32
40	ø40
50	ø50

Pad material

N	NBR
S	Silicon rubber
U	Urethane rubber
F	Fluoro rubber
GN*	Conductive NBR
GS*	Conductive silicon rubber

* ø20 and larger are manufactured upon receipt of order.

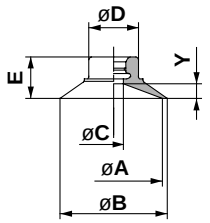
Pad type

F	Ball joint

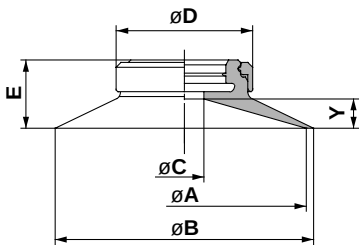
Note) Pads are exclusively ball joint type and are not interchangeable with other pads.

Dimensions

Ball joint type: ø10 to ø32



Ball joint type: ø40, ø50



(mm)

Model	A	B	C	D	E	Y
ZP10F□□	10	12	3	8.2	6.5	1.5
ZP13F□□	13	15			7	2
ZP16F□□	16	18				
ZP20F□□	20	22	4	10.2	8.5	3
ZP25F□□	25	28				
ZP32F□□	32	35			9	
ZP40F□□	40	43	10	28	13	5
ZP50F□□	50	53	8		14	6

Lock Ring Unit

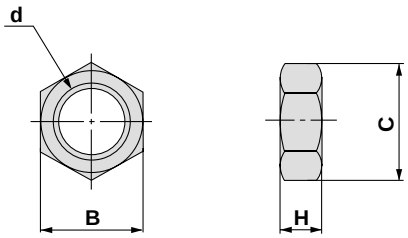
How to Order

ZPL F

For ball joint pad (ø40, ø50)

Buffer Mounting Nut

Dimensions



(mm)

Model	Pad diameter	d	H	B	C
SNJ-015A	**ø10 to ø16**	M10 x 1	3	14	16.2
SN-015A	**ø20 to ø50**	M14 x 1	5	19	21.9

Series ZPT/ZPR
Pad Selection

The pad diameter is found by means of a pad lift calculation. The calculated value should be used for reference and confirmed by actual adsorption tests when necessary. In the lift calculation, consideration should be given to the weight of the work piece, forces due to acceleration during movement (lifting, stopping, turning, etc.) and a sufficient extra margin should be allowed. A margin should also be allowed when determining the number and arrangement of pads.

Finding the Theoretical Lifting

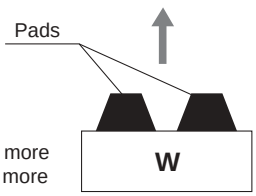
The theoretical lifting force of a pad can be found by calculation or from the theoretical lifting force table.

Calculation

$$W = P \times S \times 0.1 \times \frac{1}{t}$$

$$\left(W' = \frac{P'}{760} \times 1.033 \times S \times \frac{1}{t}\right)$$

W : Lifting force (N)
W' : Lifting force (kgf)
P : Vacuum pressure (kPa)
P' : Vacuum pressure (mmHg)
S : Pad area (cm²)
t : Safety factor Horizontal lifting: 4 or more
Vertical lifting: 8 or more



Horizontal lifting

Vertical lifting
(This type of application should basically be avoided.)

Theorectical Lifting Force

The theoretical lifting force (not including the safety factor) is found from the pad diameter and vacuum pressure. The required lifting force is then found by dividing the theoretical lifting force by the safety factor.

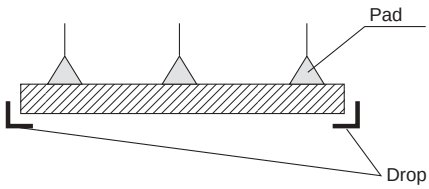
Lifting force = Theoretical lifting force ÷ t

1. Theoretical lifting force (Theoretical lifting force = P x S x 0.1 {Theoretical lifting force = $\frac{P'}{760}$ x S x 1.033}) Unit: N(kgf)

Pad diameter (mm)		ø10	ø13	ø16	ø20	ø25	ø32	ø40	ø50
S: Pad area cm²		0.785	1.33	2.01	3.14	4.91	8.04	12.6	19.6
Vacuum pressure kPa {mmHg}	–85 {–638}	6.67 {0.680}	11.3 {1.15}	17.1 {1.74}	26.7 {2.72}	41.7 {4.25}	68.3 {6.96}	107 {10.9}	167 {17.0}
	–80 {–600}	6.28 {0.640}	10.6 {1.08}	16.1 {1.64}	25.1 {2.56}	39.3 {4.01}	64.3 {6.56}	101 {10.3}	157 {16.0}
	–75 {–563}	5.89 {0.601}	9.98 {1.02}	15.1 {1.54}	23.6 {2.41}	36.8 {3.75}	60.3 {6.15}	94.5 {9.64}	147 {15.0}
	–70 {–525}	5.50 {0.561}	9.31 {0.949}	14.1 {1.44}	22.0 {2.24}	34.4 {3.51}	56.3 {5.74}	88.2 {8.99}	137 {14.0}
	–65 {–488}	5.10 {0.520}	8.65 {0.882}	13.1 {1.34}	20.4 {2.08}	31.9 {3.25}	52.3 {5.33}	81.9 {8.35}	127 {13.0}
	–60 {–450}	4.71 {0.480}	7.98 {0.814}	12.1 {1.23}	18.8 {1.92}	29.5 {3.01}	48.2 {4.92}	75.6 {7.71}	118 {12.0}
	–55 {–413}	4.32 {0.441}	7.32 {0.746}	11.1 {1.13}	17.3 {1.76}	27.0 {2.75}	44.2 {4.51}	69.3 {7.07}	108 {11.0}
	–50 {–375}	3.93 {0.401}	6.65 {0.678}	10.1 {1.03}	15.7 {1.60}	24.6 {2.51}	40.2 {4.10}	63.0 {6.42}	98.0 {10.0}
	–45 {–338}	3.53 {0.360}	5.99 {0.611}	9.05 {0.923}	14.1 {1.44}	22.1 {2.25}	36.2 {3.69}	56.7 {5.78}	88.2 {8.99}
	–40 {–300}	3.14 {0.320}	5.32 {0.542}	8.04 {0.820}	12.6 {1.28}	19.6 {2.00}	32.2 {3.28}	50.4 {5.14}	78.4 {7.99}

⚠ Caution

1. In cases such as those in which a flat item having a large surface area is carried by multiple pads, balance must be considered when determining the pad arrangement.
Additionally, supplementary devices (for example, drop prevention guides) should be installed as necessary to prevent dropping of work pieces.



Data

Finding the Pad Diameter

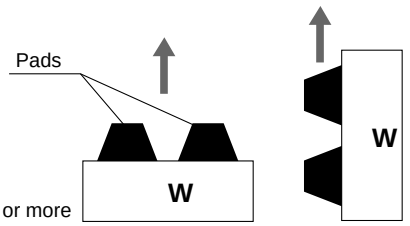
A pad diameter which allows for a safety factor based upon the work piece lifting method (horizontal or vertical), can be selected by using the calculation formula or the selection graphs (graphs 1 and 2 below).

Calculation

$$\left(\text{øD} = \sqrt{\frac{4}{3.14} \times \frac{760}{P' \times 1.033} \times \frac{W'}{n} \times t \times 1000}\right)$$

$$\text{øD} = \sqrt{\frac{4}{3.14} \times \frac{1}{P} \times \frac{W}{n} \times t \times 1000}$$

øD : Pad diameter (mm)
W' : Lifting force (kgf)
n : Number of pads per work piece
W : Lifting force (N)
P : Vacuum pressure (kPa)
P' : Vacuum pressure (mmHg)
t : Safety factor Horizontal lifting: 4 or more
Vertical lifting: 8 or more



Horizontal lifting

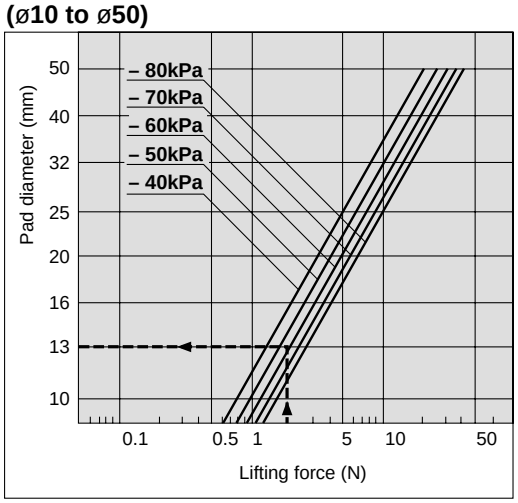
Vertical lifting

(This type of application should basically be avoided.)

Selection Graphs

After establishing the work piece weight, number of pads to be used and the vacuum pressure when adsorbing the work piece, the pad diameters for horizontal lifting and vertical lifting can be found by means of selection graphs 1 and 2.

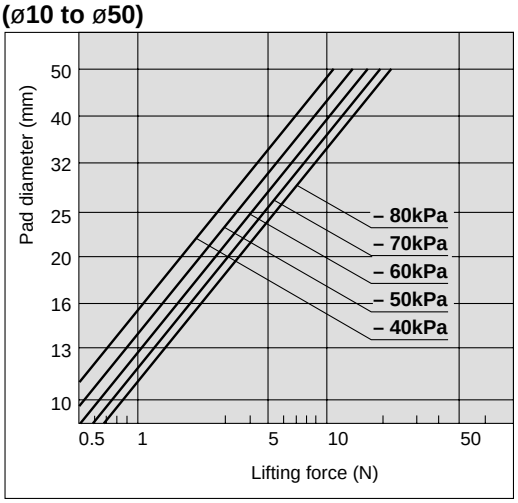
Selection graph 1
Pad diameter selection graph by lifting force
Horizontal lifting
(ø10 to ø50)



How to read the graphs

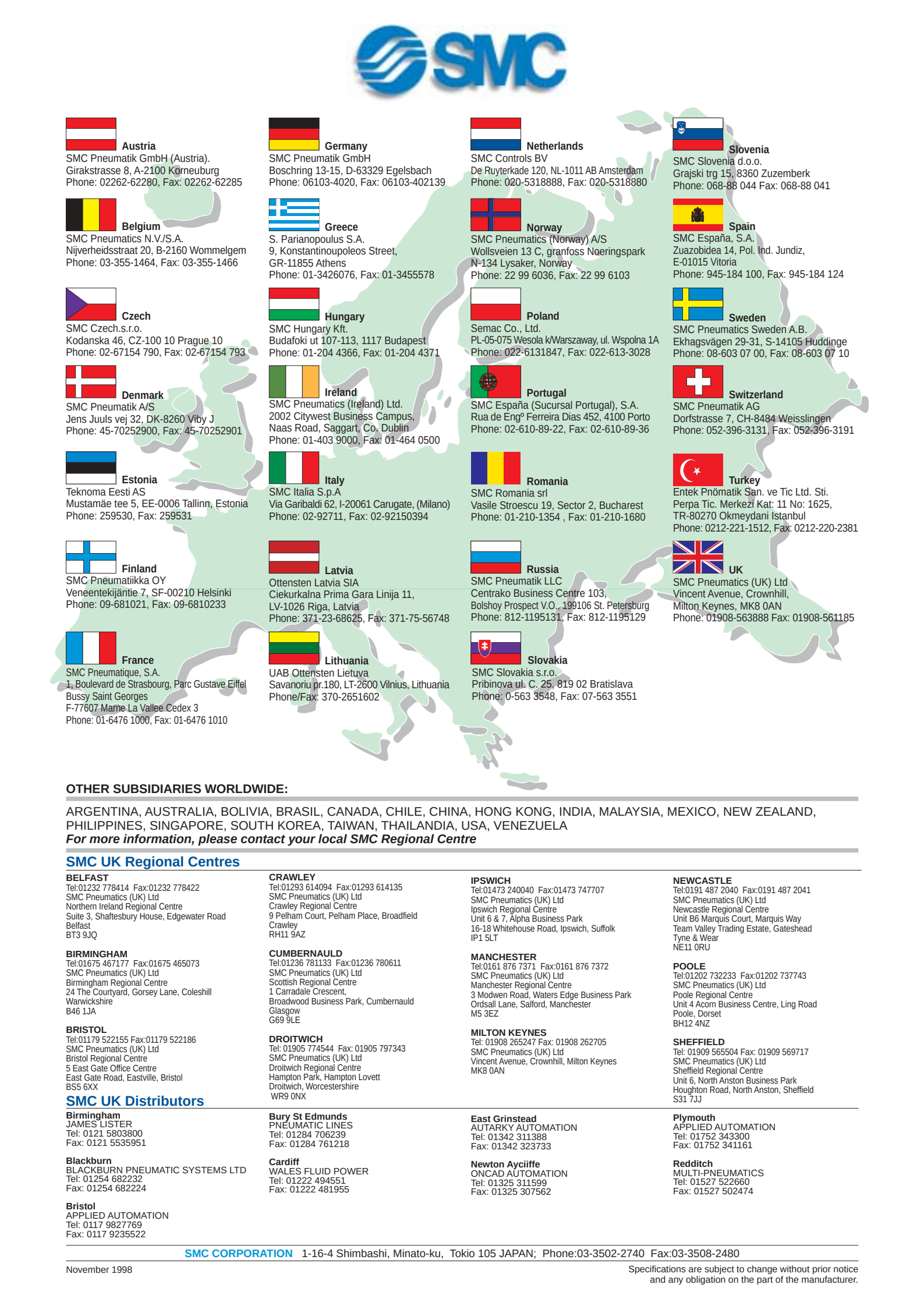
Example: Work piece weight 1kg (lifting force: 9.8N)
: Conditions/Number of pads ; 5pcs.
Vacuum pressure –60kPa (–450mmHg)
Horizontal lifting

Selection graph 2
Pad diameter selection graph by lifting force
Vertical lifting
(ø10 to ø50)



<Selection procedure>

From the conditions at the left, the lifting force per pad: 9.8N ÷ 5pcs. = 2N, and for horizontal lifting, selection is made from graph 1. Then, extending the intersection point of the lifting force 2N and the vacuum pressure –60kPa to the left, a pad diameter of 13mm is obtained. Therefore, a pad diameter of 13mm or greater should be selected.



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