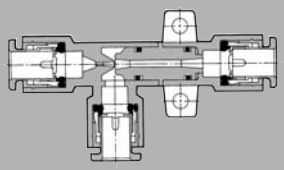
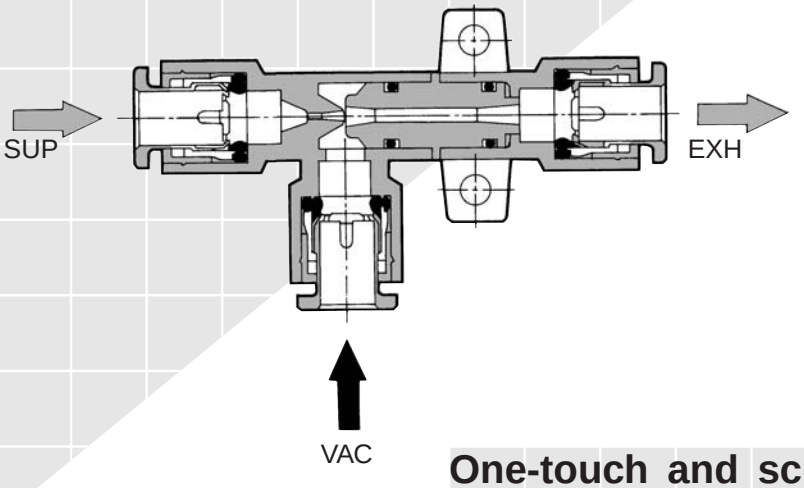


Vacuum Ejector
Box Style (Built-in Silencer)/Body Ported Style
Series ZH

Nozzle diameter — ø0.5, ø0.7, ø1.0, ø1.3, ø1.5, ø1.8, ø2.0
Style — S: Standard
L: Large Flow Capacity

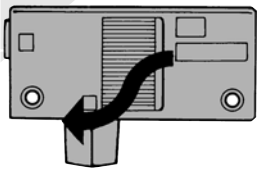
Compact and Lightweight

The nozzle and the body, which have been made into a composite resin construction, are compact and lightweight.
Nozzle diameter ø0.5···28g

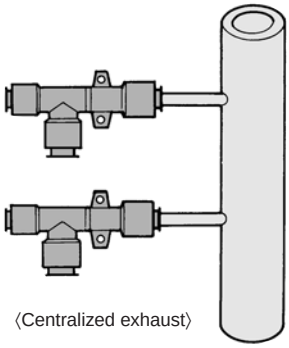


Box style (built-in silencer) and body ported style

Two styles are available in the series: the box style with a silencer exhaust and the body ported style with an individual exhaust.



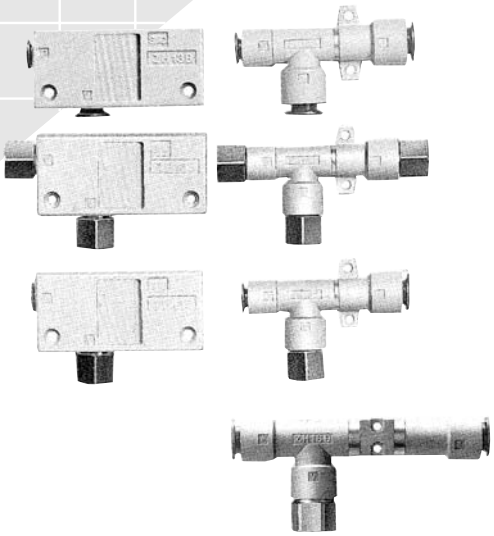
〈Silencer exhaust〉



〈Centralized exhaust〉

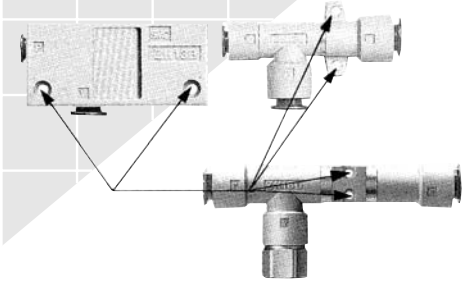
One-touch and screw-in connections can be combined.

To suit the operating conditions, port connections can be combined with a choice of One-touch and screw-in connections.



Body can be mounted and secured.

The body ported style is also provided with mounting holes for securing the body.



How to Order

Box style
(Built-in silencer)

Body ported style
(Without silencer)

Note Refer to table ①&② below for combination of connection and port size.

ZH 07 B S 06 06

ZH 07 D S 01 01 01

Nozzle diameter

05	0.5mmø
07	0.7mmø
10	1.0mmø
13	1.3mmø
15	1.5mmø
18	1.8mmø
20	2.0mmø

Max. vacuum pressure

S	–88kPa{–660mmHg}
L	–48kPa{–360mmHg}

SUP port size Note)

Symbol	Size	Style
06	ø6	One-touch
08	ø8	One-touch
10	ø10	One-touch
12	ø12	One-touch
01	Rc1/8	Screw-in
02	Rc1/4	Screw-in
03	Rc3/8	Screw-in

VAC port size Note)

Symbol	Size	Style
06	ø6	One-touch
10	ø10	One-touch
12	ø12	One-touch
16	ø16	One-touch
01	Rc1/8	Screw-in
02	Rc1/4	Screw-in
03	Rc3/8	Screw-in
04	Rc1/2	Screw-in

EXH port size Note)

Symbol	Size	Style
06	ø6	One-touch
08	ø8	One-touch
10	ø10	One-touch
12	ø12	One-touch
16	ø16	One-touch
01	Rc1/8	Screw-in
02	Rc1/4	Screw-in
03	Rc3/8	Screw-in
04	Rc1/2	Screw-in

Table①Combination of connection

Body		SUP	VAC	EXH
Box style (Built-in silencer)	①	One-touch	One-touch	—
	②	One-touch	Screw-in	—
	③	Screw-in	Screw-in	—
Body ported style (Without silencer)	①	One-touch	One-touch	One-touch
	②	One-touch	Screw-in	One-touch
	③	Screw-in	Screw-in	Screw-in

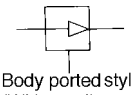
Table②Port size

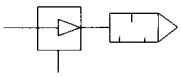
Model	Connection (One-touch/Screw-in)		
	SUP	VAC	EXH
ZH05B	ø6/Rc1/8	ø6Rc 1/8	—
ZH07B			
ZH10B			
ZH13B	ø8/Rc1/8	ø10/Rc1/4	
ZH05D	ø6/Rc1/8	ø6/Rc1/8	ø6/Rc1/8
ZH07D			
ZH10D	ø6/Rc1/8	ø6/Rc1/8	ø8/Rc1/8
ZH13D	ø8/Rc1/8	ø10/Rc1/4	ø10/Rc1/4
ZH15D	ø10/Rc1/4	ø12/Rc3/8	ø12/Rc3/8
ZH18D	ø12/Rc3/8		
ZH20D	ø12/Rc3/8	ø16/Rc1/2	ø16/Rc1/2

Box style: B type

Body ported style: D type

Ejector symbol





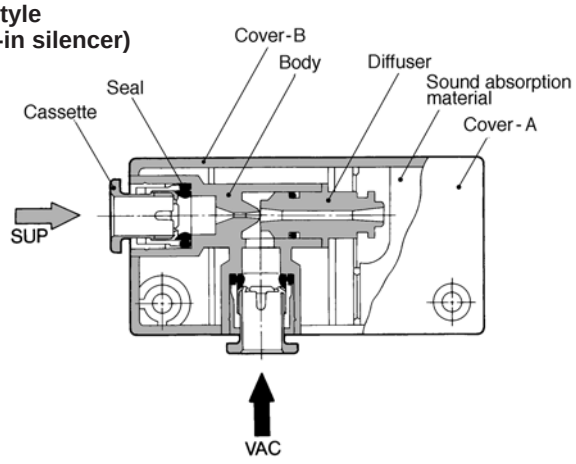
Model

Model	Nozzle dia. (mm)	Body style	Max. vacuum pressure* (kPa)		Max. suction flow (ℓ/min(ANR))		Air consumption (ℓ/min(ANR))	Connection (One-touch/Screw-in)			Weight (g)
			S type	L type	S type	L type	S type/L type	SUP	VAC	EXH	
ZH05B□	0.5	Box style (Built-in silencer)	−48	−48	5	8	13	ø6/Rc1/8	ø6/Rc1/8	—	28
ZH07B□	0.7				12	20	23				28
ZH10B□	1.0				24	34	46				33
ZH13B□	1.3				40	70	78	ø8/Rc1/8	ø10/Rc1/4		66
ZH05D□	0.5	Body ported style (Without silencer)	−88	−48	5	8	13	ø6/Rc1/8	ø6/Rc1/8	ø6/Rc1/8	11
ZH07D□	0.7				12	20	23				12
ZH10D□	1.0				24	34	46	ø6/Rc1/8	ø6/Rc1/8	ø8/Rc1/8	16
ZH13D□	1.3				40	70	78	ø8/Rc1/8	ø10/Rc1/4	ø10/Rc1/4	27
ZH15D□	1.5	Body ported style (Without silencer)	−88	−53	55	75	95	ø10/Rc1/4	ø12/Rc 3/8	ø12/Rc 3/8	43
ZH18D□	1.8				65	110	150	ø12/Rc 3/8			55
ZH20D□	2.0				85	135	185	ø12/Rc 3/8	ø16/Rc1/2	ø16/Rc1/2	95

*Supply pressure: 0.45MPa.

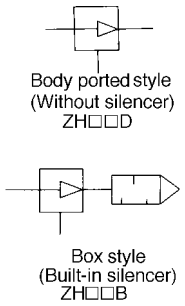
Construction

Box style (Built-in silencer)



Body ported style (Without silencer)

Ejector symbol



⚠ Precautions

Be sure to read before handling. Refer to p.0-20 and 0-21 for Safety Instructions and common precautions on the products mentioned in this catalogue, and refer to p.3.0-2 for precautions on every series.

⚠ Caution

Installation
Make sure that an excessive amount of load or moment is not applied to the ejector body due to pipe connections or installation.

Exhaust piping
On the ZH□□B□models, keep exhaust ports open on at least one side. Make sure that the back pressure of the exhaust pipe on the ZH□□D□models is 0.005MPa max. (Reference: Using a tube with the applicable diameter, its length must be 0.5m max.) (Port indication: P: supply port; V: vacuum port; E: exhaust port.)

Matching of the ejector to the vacuum circuit:
For precautions associated with the matching of the ejector to the vacuum circuit, refer to the technical data in "Best Pneumatics 3"

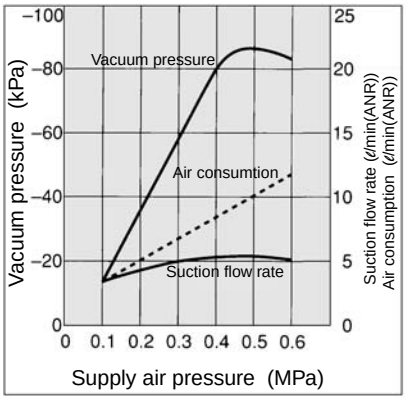
Exhaust Characteristics/Flow Characteristics

Flow characteristics: at 0.45MPa supply pressure

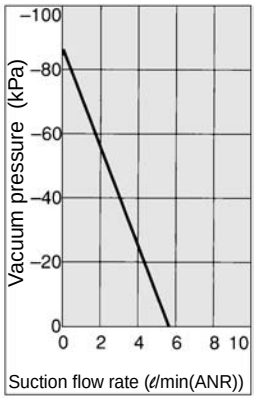
ZH05□S

Max. vacuum pressure: –88kPa

Exhaust characteristics



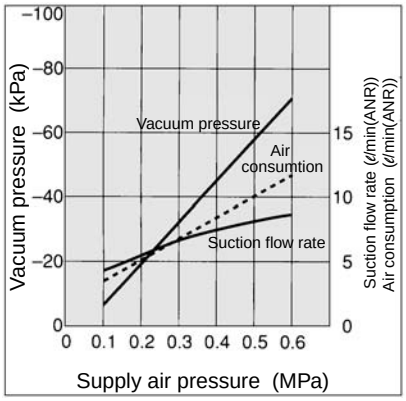
Flow characteristics



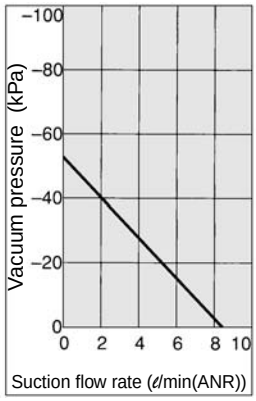
ZH05□L

Max. vacuum pressure: –48kPa

Exhaust characteristics



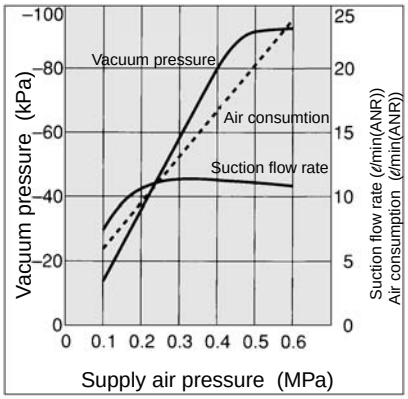
Flow characteristics



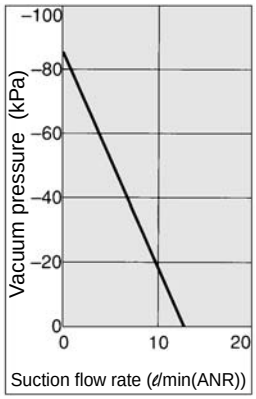
ZH07□S

Max. vacuum pressure: –88kPa

Exhaust characteristics



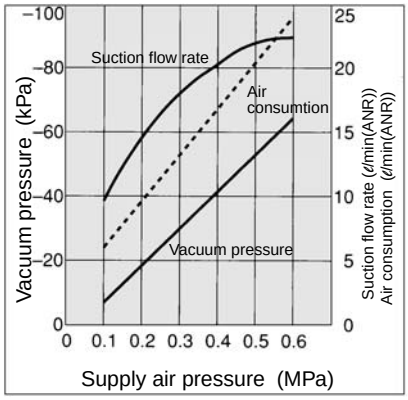
Flow characteristics



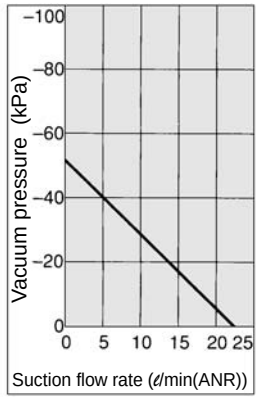
ZH07□L

Max. vacuum pressure: –48kPa

Exhaust characteristics



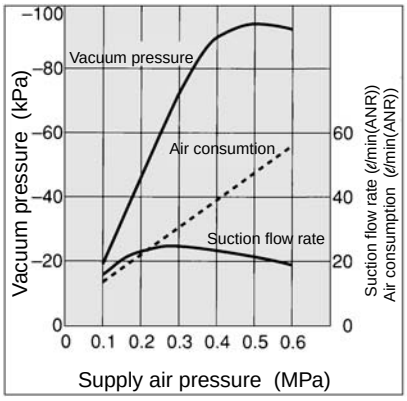
Flow characteristics



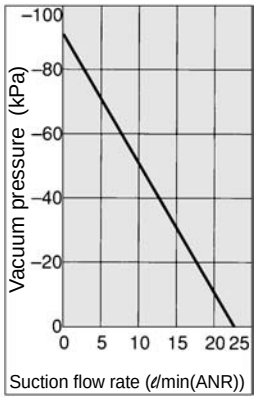
ZH10□S

Max. vacuum pressure: –88kPa

Exhaust characteristics



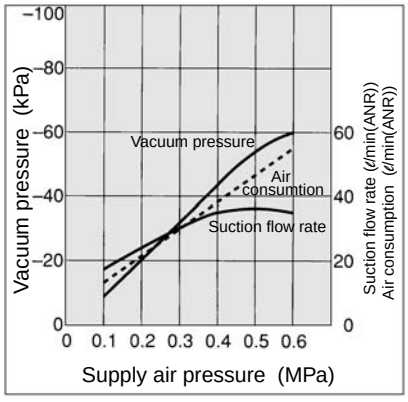
Flow characteristics



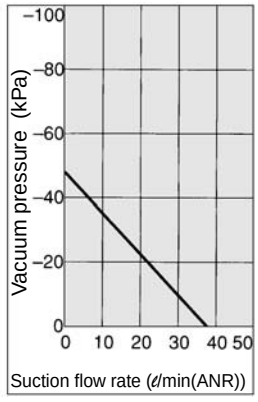
ZH10□L

Max. vacuum pressure: –48kPa

Exhaust characteristics



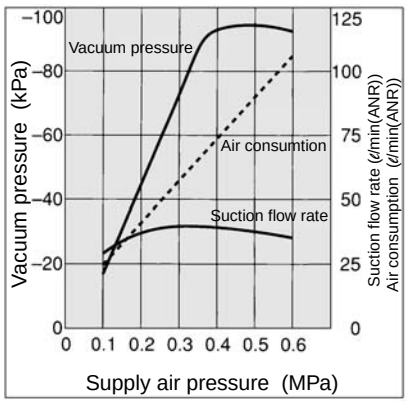
Flow characteristics



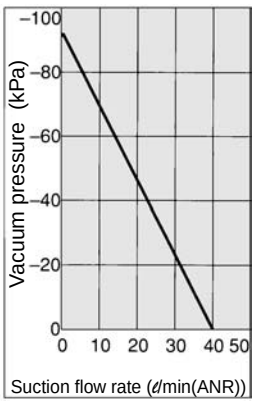
ZH13□S

Max. vacuum pressure: –88kPa

Exhaust characteristics



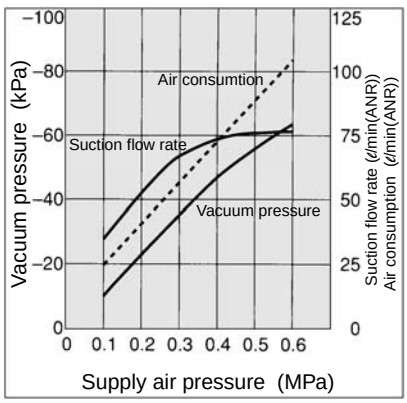
Flow characteristics



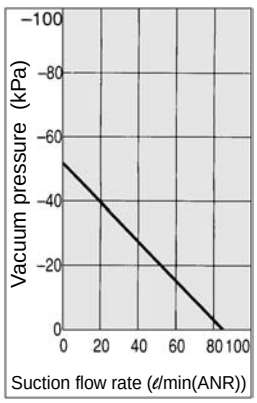
ZH13□L

Max. vacuum pressure: –48kPa

Exhaust characteristics



Flow characteristics



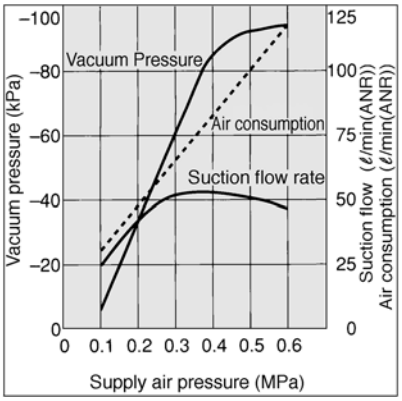
Exhaust Characteristics/Flow Characteristics

Flow characteristics: at 0.45MPa supply pressure

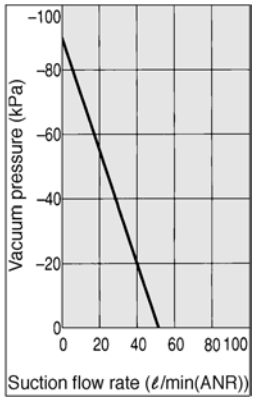
ZH15□S

Max. vacuum pressure: –88kPa

Exhaust characteristics



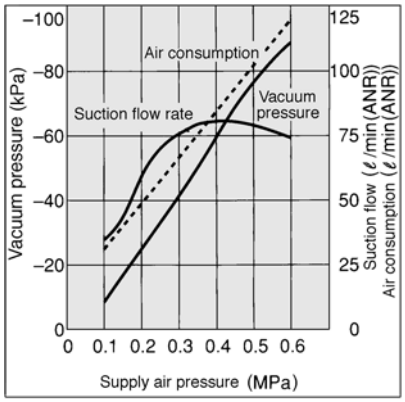
Flow characteristics



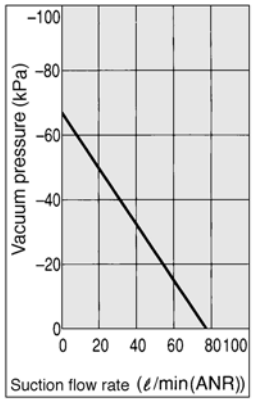
ZH15□L

Max. vacuum pressure: –53kPa

Exhaust characteristics



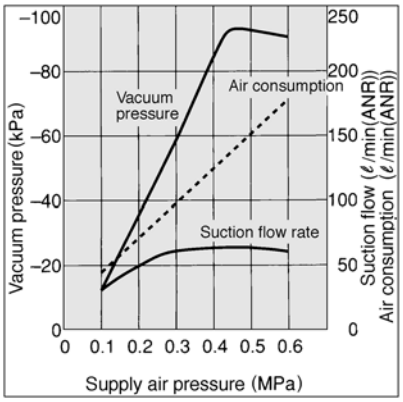
Flow characteristics



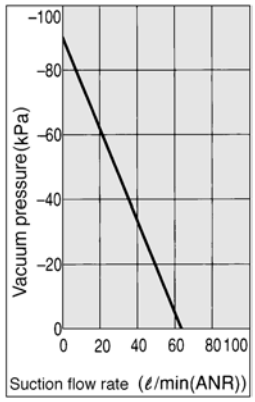
ZH18□S

Max. vacuum pressure: –88kPa

Exhaust characteristics



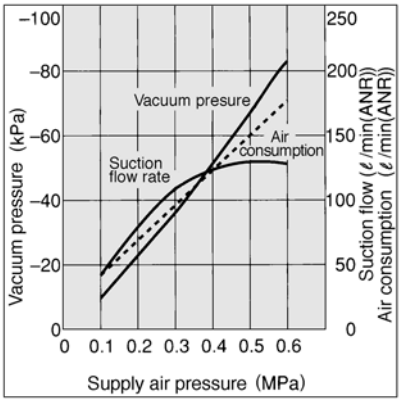
Flow characteristics



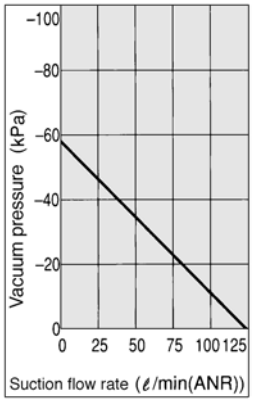
ZH18□L

Max. vacuum pressure: –53kPa

Exhaust characteristics



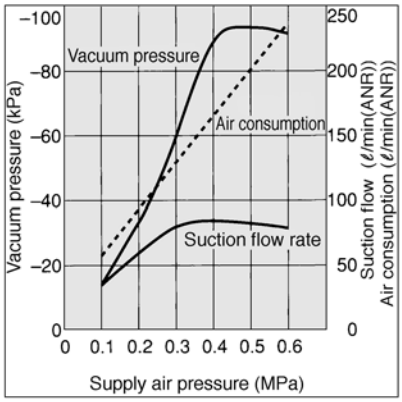
Flow characteristics



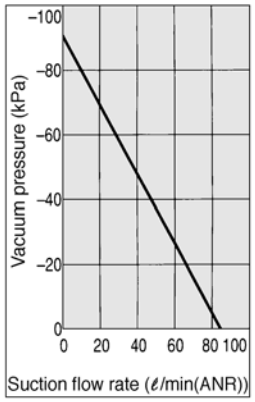
ZH20□S

Max. vacuum pressure: –88kPa

Exhaust characteristics



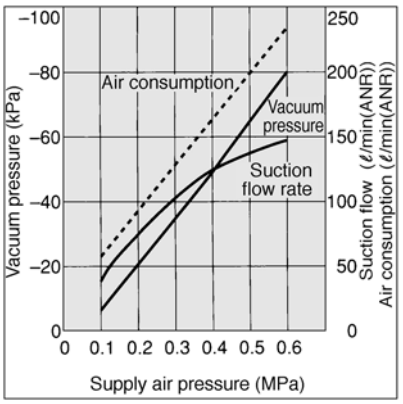
Flow characteristics



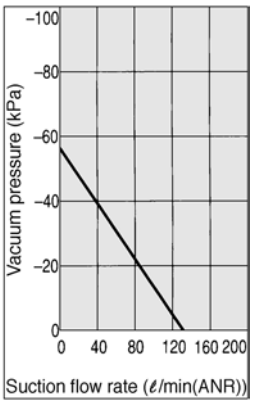
ZH20□L

Max. vacuum pressure: –53kPa

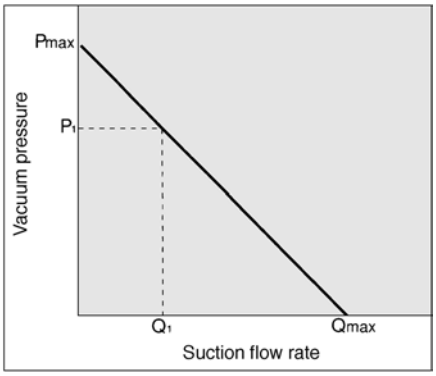
Exhaust characteristics



Flow characteristics



How to Read Graphs



Flow characteristics are expressed in ejector vacuum pressure and suction flow. If suction flow rate changes a change in vacuum pressure will also be expressed. Normally this relationship is expressed in ejector standard use. In graph, Pmax is max. vacuum pressure and Qmax is max. suction flow. The values are specified according to catalogue use. Changes in vacuum pressure are expressed in the below order.

①When ejector suction port is covered and made airtight, suction flow becomes 0 and vacuum pressure is at maximum value (Pmax).

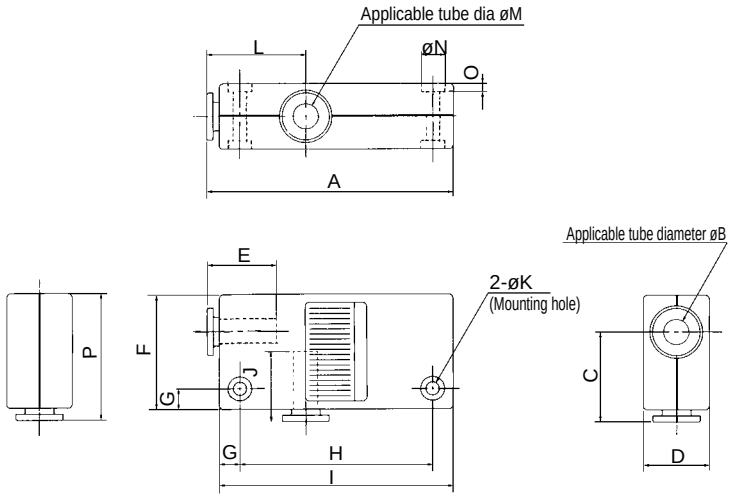
②When suction port is opened gradually, air can flow through, (air leakage), suction flow increases, but vacuum pressure decreases. (condition P1 and Q1)

③When suction port is opened further, suction flow moves to maximum value (Qmax), but vacuum pressure is near 0. (atmospheric pressure).

When vacuum port (vacuum piping) has no leakage, vacuum pressure becomes maximum, and vacuum pressure decreases as leakage increases when leakage value is the same as max. suction flow, vacuum pressure is near 0. In the case when ventirative or leaky work should be absorbed, please note that vacuum pressure will not be high.

Box Style (Built-in silencer)/ZH□B$^{S}_{L}$-□-□

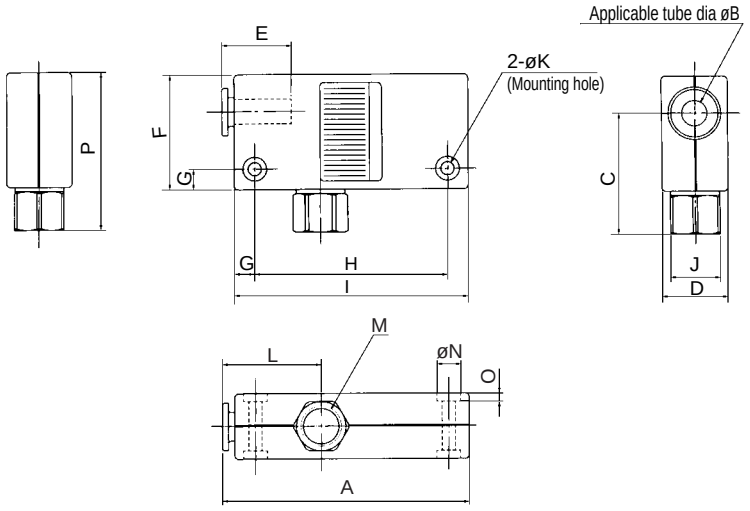
One-touch connection



Model	A	øB	C	D	E	F	G	H
ZH05BS-06-06	60	6	22	16	17	28	5	47
ZH05BL-06-06	60	6	22	16	17	28	5	47
ZH07BS-06-06	60	6	22	16	17	28	5	47
ZH07BL-06-06	60	6	22	16	17	28	5	47
ZH10BS-06-06	63	6	23	18	17	29	5	50
ZH10BL-06-06	63	6	23	18	17	29	5	50
ZH13BS-08-10	78	8	27.5	23	18.5	35	7	61
ZH13BL-08-10	78	8	27.5	23	18.5	35	7	61

Model	I	J	øK	L	øM	øN	O	P
ZH05BS-06-06	57	17	3.2	24	6	5.8	2	31
ZH05BL-06-06	57	17	3.2	24	6	5.8	2	31
ZH07BS-06-06	57	17	3.2	24	6	5.8	2	31
ZH07BL-06-06	57	17	3.2	24	6	5.8	2	31
ZH10BS-06-06	60	17	3.2	26	6	5.8	2	32
ZH10BL-06-06	60	17	3.2	26	6	5.8	2	32
ZH13BS-08-10	75	21	4.2	28	10	7.5	3	38.5
ZH13BL-08-10	75	21	4.2	28	10	7.5	3	38.5

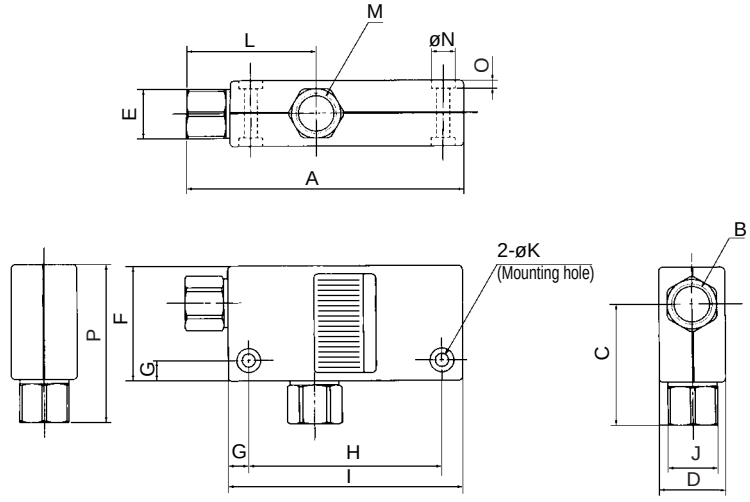
One-touch and Screw-in connection



Model	A	øB	C	D	E	F	G	H
ZH05BS-06-01	60	6	29.5	16	17	28	5	47
ZH05BL-06-01	60	6	29.5	16	17	28	5	47
ZH07BS-06-01	60	6	29.5	16	17	28	5	47
ZH07BL-06-01	60	6	29.5	16	17	28	5	47
ZH10BS-06-01	63	6	30.5	18	17	29	5	50
ZH10BL-06-01	63	6	30.5	18	17	29	5	50
ZH13BS-08-02	78	8	39	23	18.5	35	7	61
ZH13BL-08-02	78	8	39	23	18.5	35	7	61

Model	I	J	øK	L	M	øN	O	P
ZH05BS-06-01	57	12	3.2	24	Rc1/8	5.8	2	31
ZH05BL-06-01	57	12	3.2	24	Rc1/8	5.8	2	31
ZH07BS-06-01	57	12	3.2	24	Rc1/8	5.8	2	31
ZH07BL-06-01	57	12	3.2	24	Rc1/8	5.8	2	31
ZH10BS-06-01	60	12	3.2	26	Rc1/8	5.8	2	32
ZH10BL-06-01	60	12	3.2	26	Rc1/8	5.8	2	32
ZH13BS-08-02	75	17	4.2	28	Rc1/4	7.5	3	38.5
ZH13BL-08-02	75	17	4.2	28	Rc1/4	7.5	3	38.5

Screw-in connection

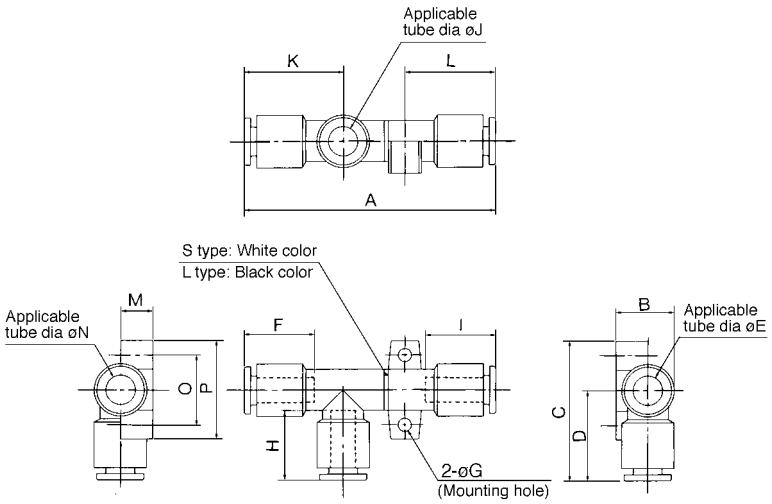


Model	A	B	C	D	E	F	G	H
ZH05BS-01-01	67.5	Rc1/8	29.5	16	12	28	5	47
ZH05BL-01-01	67.5	Rc1/8	29.5	16	12	28	5	47
ZH07BS-01-01	67.5	Rc1/8	29.5	16	12	28	5	47
ZH07BL-01-01	67.5	Rc1/8	29.5	16	12	28	5	47
ZH10BS-01-01	70.5	Rc1/8	30.5	18	12	29	5	50
ZH10BL-01-01	70.5	Rc1/8	30.5	18	12	29	5	50
ZH13BS-01-02	86.5	Rc1/8	39	18	14	35	7	61
ZH13BL-01-02	86.5	Rc1/8	39	18	14	35	7	61

Model	I	J	øK	L	M	øN	O	P
ZH05BS-01-01	57	12	3.2	31.5	Rc1/8	5.8	2	38.5
ZH05BL-01-01	57	12	3.2	31.5	Rc1/8	5.8	2	38.5
ZH07BS-01-01	57	12	3.2	31.5	Rc1/8	5.8	2	38.5
ZH07BL-01-01	57	12	3.2	31.5	Rc1/8	5.8	2	38.5
ZH10BS-01-01	60	12	3.2	33.5	Rc1/8	5.8	2	39.5
ZH10BL-01-01	60	12	3.2	33.5	Rc1/8	5.8	2	39.5
ZH13BS-01-02	75	17	4.2	36.5	Rc1/4	7.5	3	50
ZH13BL-01-02	75	17	4.2	36.5	Rc1/4	7.5	3	50

Body Ported Style (Without silencer) /ZH05D$^{S}_{L}$-□-□-□ to ZH15D$^{S}_{L}$-□-□-□

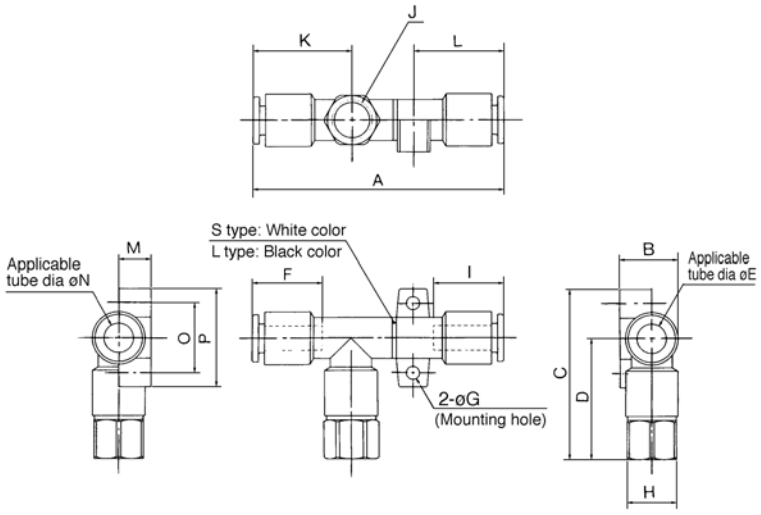
One-touch connection



Model	A	B	C	D	øE	F	øG	H
ZH05DS-06-06-06	58	14.2	34	22	6	17	3.2	17
ZH05DL-06-06-06	58	14.2	34	22	6	17	3.2	17
ZH07DS-06-06-06	61	14.2	34	22	6	17	3.2	17
ZH07DL-06-06-06	61	14.2	34	22	6	17	3.2	17
ZH10DS-06-06-08	66	17.2	37	23	6	17	4.2	17
ZH10DL-06-06-08	70	17.2	37	23	6	17	4.2	17
ZH13DS-08-10-10	74	20	42	27	8	18.5	4.2	21
ZH13DL-08-10-10	79	20	42	27	8	18.5	4.2	21
ZH15DS-10-12-12	93.3	22.45	47	29.5	10	21	4.2	22
ZH15DL-10-12-12	93.3	22.45	47	29.5	10	21	4.2	22

Model	I	øJ	K	L	M	øN	O	P
ZH05DS-06-06-06	17	6	24	21	7.8	6	17	24
ZH05DL-06-06-06	17	6	24	21	7.8	6	17	24
ZH07DS-06-06-06	17	6	24	22	7.8	6	17	24
ZH07DL-06-06-06	17	6	24	22	7.8	6	17	24
ZH10DS-06-06-08	18.5	6	26	24.5	9.6	8	20	28
ZH10DL-06-06-08	18.5	6	26	24.5	9.6	8	20	28
ZH13DS-08-10-10	21	10	28	26.5	10.7	10	22	30
ZH13DL-08-10-10	21	10	28	26.5	10.7	10	22	30
ZH15DS-10-12-12	22	12	31.5	32.8	12	12	27	35
ZH15DL-10-12-12	22	12	31.5	32.8	12	12	27	35

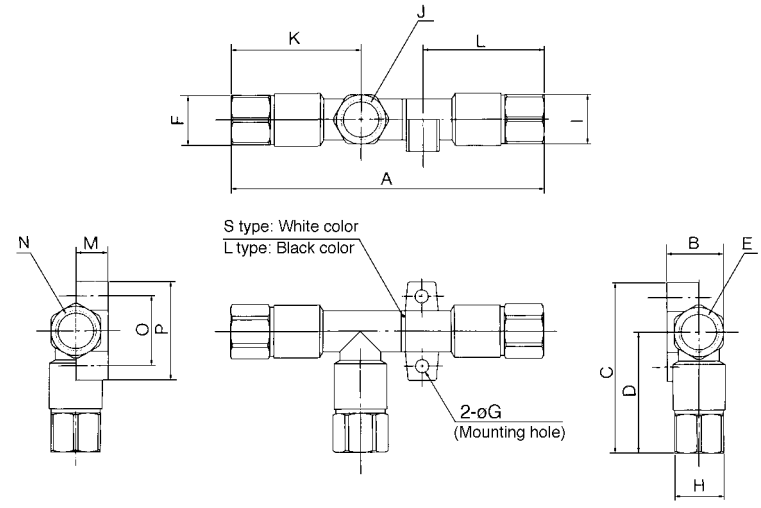
One-touch and Screw-in connection



Model	A	B	C	D	øE	F	øG	H
ZH05DS-06-01-06	58	14.5	41.5	29.5	6	17	3.2	12
ZH05DL-06-01-06	58	14.5	41.5	29.5	6	17	3.2	12
ZH07DS-06-01-06	61	14.5	41.5	29.5	6	17	3.2	12
ZH07DL-06-01-06	61	14.5	41.5	29.5	6	17	3.2	12
ZH10DS-06-01-08	66	17.4	44.5	30.5	6	17	4.2	12
ZH10DL-06-01-08	70	17.4	44.5	30.5	6	17	4.2	12
ZH13DS-08-02-10	74	20.2	54	39	8	18.5	4.2	17
ZH13DL-08-02-10	79	20.2	54	39	8	18.5	4.2	17
ZH15DS-10-03-12	93.3	22.45	58.5	41	10	21	4.2	19
ZH15DL-10-03-12	93.3	22.45	58.5	41	10	21	4.2	19

Model	I	J	K	L	M	øN	O	P
ZH05DS-06-01-06	17	Rc1/8	24	21	7.8	6	17	24
ZH05DL-06-01-06	17	Rc1/8	24	21	7.8	6	17	24
ZH07DS-06-01-06	17	Rc1/8	24	22	7.8	6	17	24
ZH07DL-06-01-06	17	Rc1/8	24	22	7.8	6	17	24
ZH10DS-06-01-08	17	Rc1/8	26	24.5	9.6	6	20	28
ZH10DL-06-01-08	17	Rc1/8	26	24.5	9.6	6	20	28
ZH13DS-08-02-10	21	Rc1/4	28	26.5	10.7	10	22	30
ZH13DL-08-02-10	21	Rc1/4	28	26.5	10.7	10	22	30
ZH15DS-10-03-12	22	Rc3/8	31.5	32.8	12	12	27	35
ZH15DL-10-03-12	22	Rc3/8	31.5	32.8	12	12	27	35

Screw-in connection

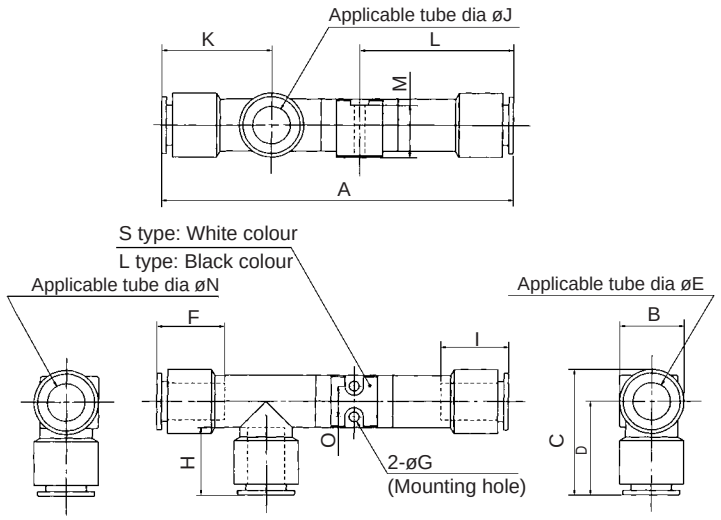


Model	A	B	C	D	E	F	øG	H
ZH05DS-01-01-01	73.5	14.5	41.5	29.5	Rc1/8	12	3.2	12
ZH05DL-01-01-01	73.5	14.5	41.5	29.5	Rc1/8	12	3.2	12
ZH07DS-01-01-01	76	14.5	41.5	29.5	Rc1/8	12	3.2	12
ZH07DL-01-01-01	76	14.5	41.5	29.5	Rc1/8	12	3.2	12
ZH10DS-01-01-01	82	17.4	44.5	30.5	Rc1/8	12	4.2	12
ZH10DL-01-01-01	86	17.4	44.5	30.5	Rc1/8	12	4.2	12
ZH13DS-01-02-02	94.5	20.2	54	39	Rc1/8	14	4.2	17
ZH13DL-01-02-02	99.5	20.2	54	39	Rc1/8	14	4.2	17
ZH15DS-02-03-03	116.5	22.45	58.5	41	Rc1/4	17	4.2	19
ZH15DL-02-03-03	116.5	22.45	58.5	41	Rc1/4	17	4.2	19

Model	I	J	K	L	M	N	O	P
ZH05DS-01-01-01	12	Rc1/8	31.5	28.5	7.8	Rc1/8	17	24
ZH05DL-01-01-01	12	Rc1/8	31.5	28.5	7.8	Rc1/8	17	24
ZH07DS-01-01-01	12	Rc1/8	31.5	29.5	7.8	Rc1/8	17	24
ZH07DL-01-01-01	12	Rc1/8	31.5	29.5	7.8	Rc1/8	17	24
ZH10DS-01-01-01	14	Rc1/8	33.5	33	9.6	Rc1/8	20	28
ZH10DL-01-01-01	14	Rc1/8	33.5	33	9.6	Rc1/8	20	28
ZH13DS-01-02-02	17	Rc1/4	36.5	38.5	10.7	Rc1/4	22	30
ZH13DL-01-02-02	17	Rc1/4	36.5	38.5	10.7	Rc1/4	22	30
ZH15DS-02-03-03	19	Rc3/8	43	44.5	12	Rc3/8	27	35
ZH15DL-02-03-03	19	Rc3/8	43	44.5	12	Rc3/8	27	35

Body Ported Style (Without silencer)/ZH18D$^{S}_{L}$-□-□-□, ZH20D$^{S}_{L}$-□-□-□

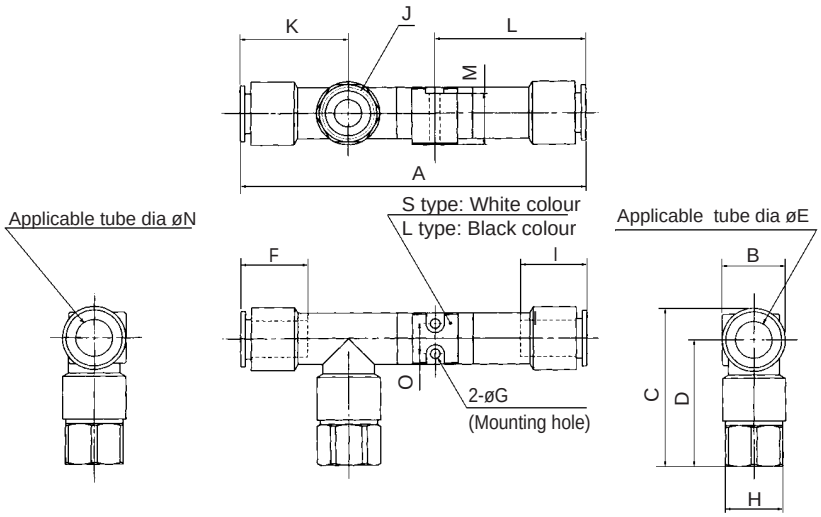
One-touch connection



Model	A	B	C	D	øE	F	øG	H
ZH18DS-12-12-12	114	20.95	40.95	30.5	ø12	22	ø3.5	22
ZH18DL-12-12-12	114	20.95	40.95	30.5	ø12	22	ø3.5	22
ZH20DS-12-16-16	124.6	26.5	48.75	35.5	ø12	22	ø3.5	24
ZH20DL-12-16-16	124.6	26.5	48.75	35.5	ø12	22	ø3.5	24

Model	I	øJ	K	L	M	øN	O
ZH18DS-12-12-12	22	ø12	35.5	50	17	ø12	10
ZH18DL-12-12-12	22	ø12	35.5	50	17	ø12	10
ZH20DS-12-16-16	24	ø16	38.5	54.3	21.7	ø16	12
ZH20DL-12-16-16	24	ø16	38.5	54.3	21.7	ø16	12

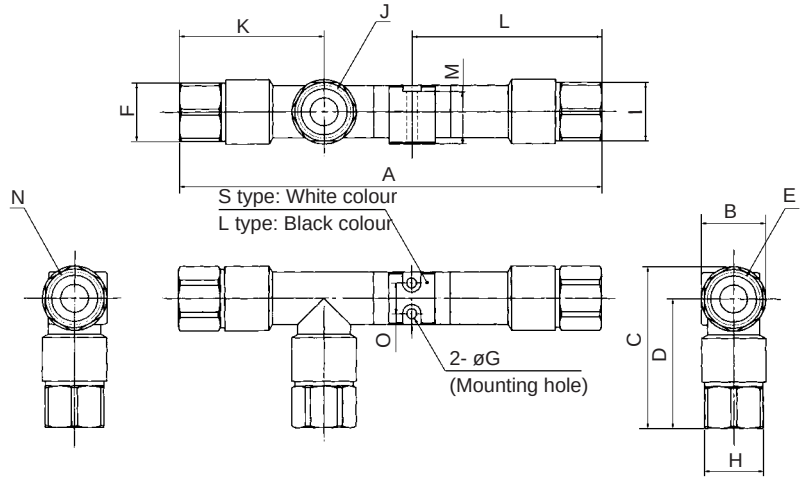
One-touch and Screw-in connection



Model	A	B	C	D	øE	F	øG	H
ZH18DS-12-03-12	114	20.95	52.45	42	ø12	22	ø3.5	19
ZH18DL-12-03-12	114	20.95	52.45	42	ø12	22	ø3.5	19
ZH20DS-12-04-16	124.6	26.5	63.75	50.5	ø12	22	ø3.5	24
ZH20DL-12-04-16	124.6	26.5	63.75	50.5	ø12	22	ø3.5	24

Model	I	J	K	L	M	øN	O
ZH18DS-12-03-12	22	Rc3/8	35.5	50	17	ø12	10
ZH18DL-12-03-12	22	Rc3/8	35.5	50	17	ø12	10
ZH20DS-12-04-16	24	Rc1/2	38.5	54.3	21.7	ø16	12
ZH20DL-12-04-16	24	Rc1/2	38.5	54.3	21.7	ø16	12

Screw-in connection

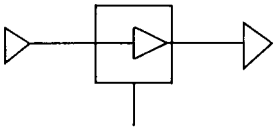


Model	A	B	C	D	E	F	øG	H
ZH18DS-03-03-03	137	20.95	52.45	42	Rc3/8	19	ø3.5	19
ZH18DL-03-03-03	137	20.95	52.45	42	Rc3/8	19	ø3.5	19
ZH20DS-03-04-04	151.1	26.5	63.75	50.5	Rc3/8	19	ø3.5	24
ZH20DL-03-04-04	151.1	26.5	63.75	50.5	Rc3/8	19	ø3.5	24

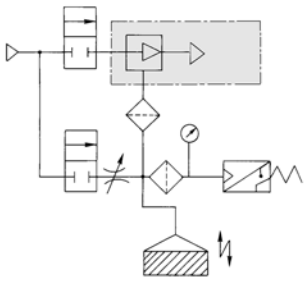
Model	I	J	K	L	M	N	O
ZH18DS-03-03-03	19	Rc3/8	47	61.5	17	Rc3/8	10
ZH18DL-03-03-03	19	Rc3/8	47	61.5	17	Rc3/8	10
ZH20DS-03-04-04	24	Rc1/2	50	69.3	21.7	Rc1/2	12
ZH20DL-03-04-04	24	Rc1/2	50	69.3	21.7	Rc1/2	12

Application Circuit Example

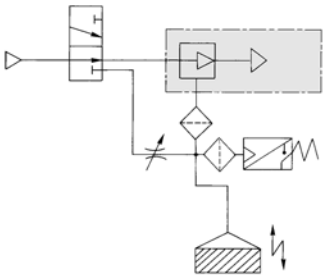
Basic Style



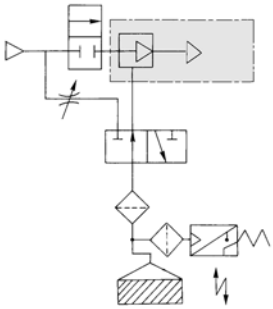
(a)**Full system**



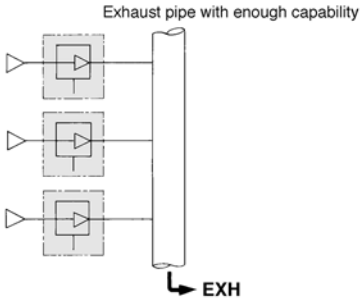
(b)**3 port valve selection**



(c)**Switching on the vacuum side**



(d)**Centralized exhaust style**



Diagrams a to d show the combination with peripherals.

⚠ Caution

Handling of application circuits

①Countermeasures for power outages

Select a supply valve for the ejector that is normally open or one that is equipped with a self-holding function.

②Using a small-diameter picking nozzle

For picking electronic parts or small precision parts, if the picking nozzle is approximately ø1mm in diameter, the vacuum remains high by being restricted by the nozzle. As a result, it will not be possible to verify it with the vacuum switch. In such a case, it is necessary to use an ejector that is suited to the nozzle and to select a vacuum switch with a favourable hysteresis and precision.

③Considerable leakage from the suction surface

If the workpiece is made of porous material or if there is air leakage from the area between the pad and the workpiece, use a nozzle with a large diameter and a large suction flow volume. If the amount of leakage is known based on the effective sectional area of the side with the leakage, the vacuum pressure can be estimated in accordance with the ejector's flow volume characteristics.

④Suction filter

To protect the ejectors and valves from dust, the use of a suction filter (ZFA, ZFB series) is recommended.

⑤Use of a vacuum switch

It is recommended that verification be made with a vacuum switch as much as possible.

⑥Vacuum release valve

To serve as a vacuum release valve, use a 2 port or 3 port valve. As for the performance of the valve, select a valve for a low vacuum. In addition, add a needle valve that can regulate the flow volume of the vacuum releasing air. Use the atmospheric pressure or a positive pressure for the vacuum releasing pressure.