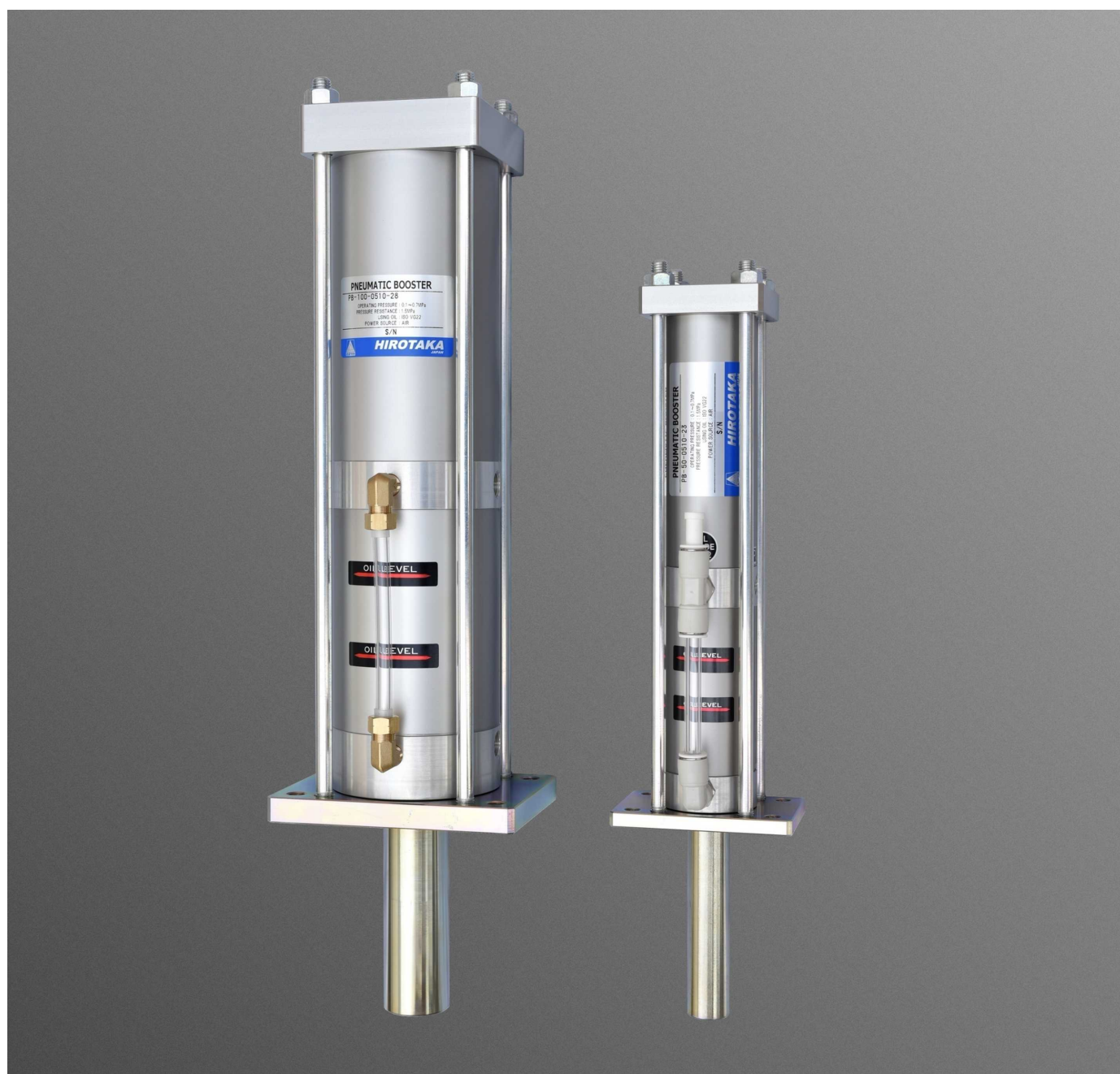




Air-hydro converter with booster

## PNEUMATIC BOOSTER

It is a product with a wide range of applications that can be converted to large capacity, high pressure only with air pressure.



**HIROTAKA MFG. CO.,LTD.**

Generates large capacity of low pressure and high pressure hydraulic pressure only with air pressure.

Simple mechanism that does not require a hydraulic pump, etc.

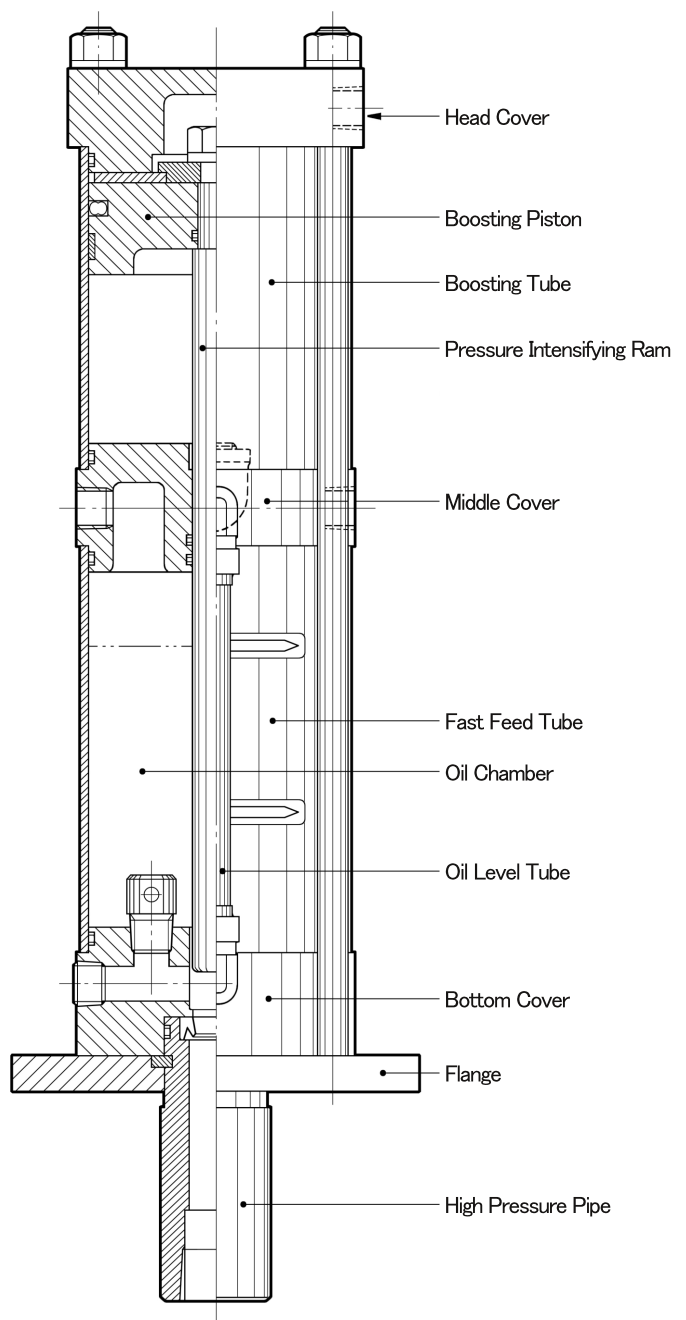
## Overview

The pneumatic booster is an air-hydro converter with booster that can efficiently generate a large amount of oil and high pressure hydraulic pressure with compressed air.

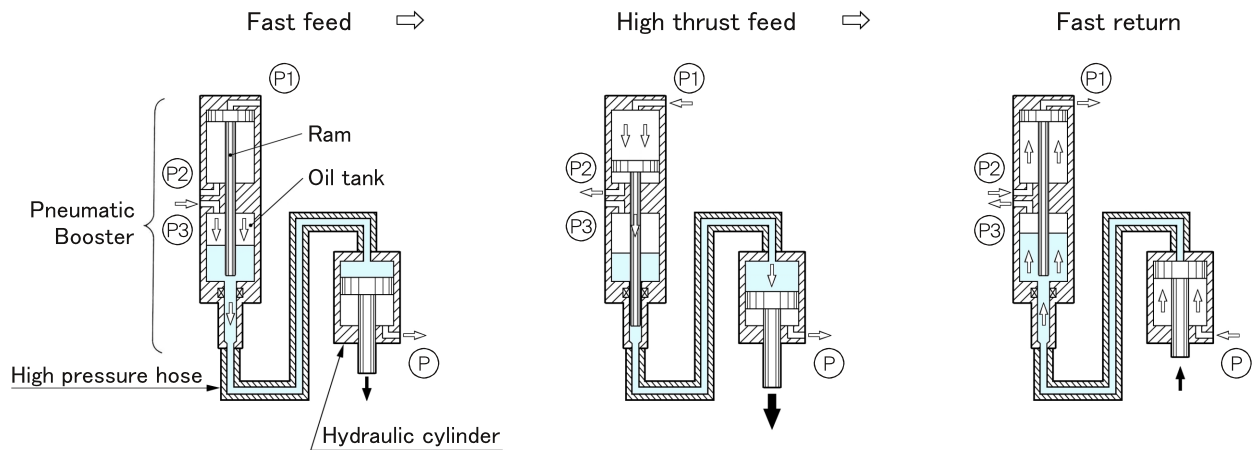
There is no need for a hydraulic pump or a hydraulic solenoid valve, and a commercially available hydraulic cylinder or hydraulic equipment can be operated with a pneumatic solenoid valve.

## Feature

- ① High pressure oil (Maximum 21 MPa) and low pressure large capacity oil can be obtained with air pressure alone.
- ② 2-pressure discharge operation can be easily performed with the pneumatic solenoid valve.
- ③ Air consumption is less than pneumatic cylinder to generate the same thrust.
- ④ Due to its unique structure, there is little air mixing, and stable operation can be continued without the need for the air release.
- ⑤ There is no trouble because the structure is simple.
- ⑥ Since the oil temperature does not rise, stable operation can be obtained.
- ⑦ The oil pressure can be changed steplessly by changing the air pressure.



## Structure and Action description



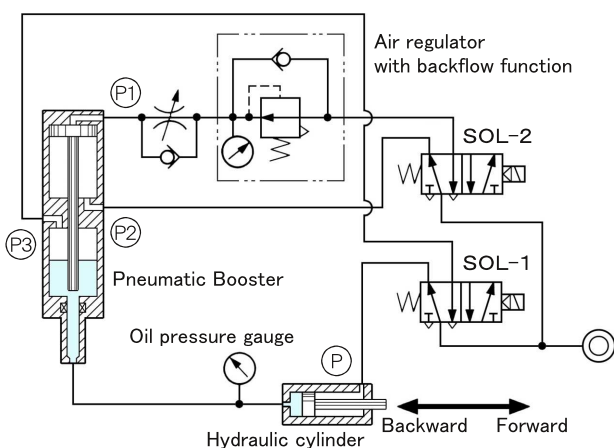
When the (P3) port is supplied with compressed air, the hydraulic cylinder is fast-forwarded by the oil in the oil tank. The oil pressure is the same as the air pressure, but the amount of oil flowing into the hydraulic cylinder is large, so the hydraulic cylinder moves forward at high speed.

When the compressed air is supplied to the (P1) port, the ram moves forward and high-pressure oil flows into the hydraulic cylinder to move forward with high thrust.

When the (P2) port is supplied with compressed air, the ram returns and the hydraulic cylinder returns quickly.

## Air circuit examples

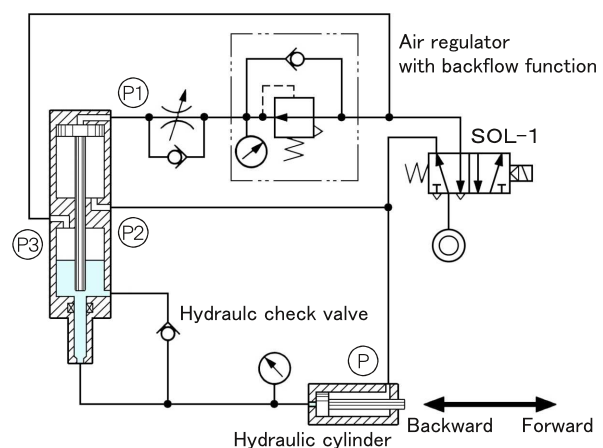
### Standard air circuit



Motion	SOL-1	SOL-2
Fast feed advance	ON	OFF
High thrust feed	ON	ON
Return	OFF	OFF

- When adjusting the speed of fast feed advance and return, attach speed controllers to (P) and (P3).
- If air bubbles are generated in the oil of the oil level gauge, attach a meter-out speed controller to (P1).
- Install the regulator when adjusting high thrust. (In order not to reduce the return thrust.)

### High thrust feed air circuit at start



This circuit is a circuit when high thrust is required only at the start such as removing the biting part at the start of advance movement and then moving in fast advance.

Motion	SOL-1
Fast feed advance	ON
High thrust feed	ON
Return	OFF

- Speed adjustment etc. are the same as the standard circuit. Note : This model number is custom-made, so please contact us before your ordering.
- The cracking pressure of the hydraulic check valve is recommended to be 0.05 MPa or less.

## Specifications

Model No.	(Theoretical value)						
	PB-50- □-23	PB-100- □-16	PB-100- □-28	PB-160- □-16	PB-160- □-28	PB-200- □-25	PB-300- □-29
Pneumatic cylinder diameter	φ 50	φ 100	φ 100	φ 160	φ 160	φ 200	φ 300
Booster ram diameter	φ 10	φ 25	φ 18	φ 40	φ 30	φ 40	φ 55
Pressure boosting ratio	1:25	1:16	1:30	1:16	1:28	1:25	1:29
Maximum generated oil pressure (at 0.7 MPa air pressure)	17 MPa	11 MPa	21 MPa	11 MPa	19 MPa	17 MPa	20 MPa
Fast feed discharge flow rate (at 0.7 MPa air pressure)	20L/min	63L/min	63L/min	295L/min	295L/min	452L/min	452L/min
High thrust feed discharge flow rate (at 0.7 MPa air pressure)	2.3L/min	14.7L/min	7.6L/min	31.8L/min	17.3L/min	37.3L/min	50L/min
Air supply port size	Rc1/4	Rc3/8	Rc3/8	Rc1/2	Rc1/2	Rc3/4	Rc1
Oil discharge port size	Rc1/2	Rc3/4	Rc3/4	Rc1 1/4	Rc1 1/4	Rc1 1/2	Rc1 1/2
Fluid	Air						
Hydraulic fluid	Standard mineral hydraulic fluid (ISO : VG22)						
Proof pressure (Air)	1.5MPa						
Operating pressure (Air)	0.1~0.7MPa						
Working temperature range	5~40°C						
Mounting type	Flange type						

Discharge flow rate and maximum generated oil pressure are the values of the Pneumatic Booster alone when there is no load.  
(It changes depending on the minimum operating pressure of the hydraulic cylinder, the magnitude of the load, the pressure drop,  
the thickness and length of the pipe, and other conditions.)

## Hydraulic cylinder thrust table at the time of high thrust feed

Unit : kN (Theoretical value)											
Operating pressure (MPa)		0.3		0.4		0.5		0.6		0.7	
		16 times	28 times	16 times	28 times	16 times	28 times	16 times	28 times	16 times	28 times
Bore size (mm)	Piston area (mm <sup>2</sup> )	4.8	8.4	6.4	11.2	8.0	14.0	9.6	16.8	11.2	19.6
32	804	3.8	6.7	5.1	9.0	6.4	11.2	7.7	13.5	9.0	15.7
40	1257	6.0	10.5	8.0	14.0	10.0	17.5	12.0	21.1	14.0	24.6
50	1963	9.4	16.5	12.5	21.9	15.7	27.4	18.8	32.9	21.9	38.4
63	3117	14.9	26.1	19.9	34.8	24.9	43.6	29.9	52.3	34.8	61.0
80	5027	24.1	42.2	32.1	56.2	40.1	70.3	48.2	84.4	56.2	98.5
100	7854	37.6	65.9	50.2	87.9	62.8	109.9	75.3	131.9	87.9	153.9
125	12272	58.8	103.0	78.5	137.4	98.1	171.7	117.7	206.1	137.4	240.5
160	20106	96.4	168.8	128.6	225.1	160.8	281.4	192.9	337.6	225.1	393.9
180	25447	122.1	213.7	162.8	285.0	203.5	356.2	244.2	427.4	284.9	498.6
200	31416	150.7	263.8	201.0	351.8	251.2	439.8	301.5	527.7	351.7	615.7
250	49087	235.5	412.3	314.1	549.7	392.6	687.1	471.1	824.6	549.6	962.0

For PB-50, multiply the thrust value of 28 times pressure intensifying ratio by 0.89.

For PB-100- 28 times, multiply the thrust value of 28 times pressure intensifying ratio by 1.08.

For PB-200, multiply the thrust value of 28 times pressure intensifying ratio by 0.89.

For PB-300, multiply the thrust value of 28 times pressure intensifying ratio by 1.03.

## Flow rate characteristics

Discharge flow rate of fast feed			Unit : L/min	
Load factor (%)	PB-100	PB-160		
30	53	247		
50	45	209		
70	34	161		

Discharge flow rate of high thrust feed				Unit : L/min	
Load factor (%)	PB-100-□-16	PB-100-□-28	PB-160-□-16	PB-160-□-28	
30	14.2	7.1	29.8	16.3	
50	13.6	6.8	28.5	15.5	
70	12.4	6.2	26.1	14.2	

※ The load factor when the operating pressure of the pneumatic booster is 0.7 MPa.

(It changes depending on the minimum operating pressure of the hydraulic cylinder, the size of the load mass, the pressure drop,  
the thickness and length of the pipe, and other conditions.)

Please contact us for the discharge flow of PB-50, 200 and 300.

## How to order

**PB - 100 - 10 15 - 28**

Pneumatic Booster

Example for model number

PB-100-1015-28  
 Bore size : 100 mm  
 Fast feed oil capacity : 280 cm<sup>3</sup>  
 High thrust feed oil capacity : 30 cm<sup>3</sup>  
 Pressure boosting ratio : 28 times

① Bore size	
Symbol	Bore size
50	50 mm
100	100 mm
160	160 mm
200	200 mm
300	300 mm

② Fast feed oil capacity						Unit: cm <sup>3</sup>
Model	PB-50-□	PB-100-□	PB-160-□	PB-200-□	PB-300-□	
Symbol	-23	-16(28)	-16(28)	-25	-29	
05	30	80	100	1500	3500	
10	80	280	600	3100	7000	
15	130	480	1100	4700	10600	
20	180	680	1600	6200	14100	
25	230	880	2100	7800	17600	

④ Pressure boosting ratio	
Bore size	Ratio
50 mm	23
100 mm	16
	28
160 mm	16
	28
200 mm	25
300 mm	29

The real boosting ratio of PB-100-□-28 is 30 times.  
 The real boosting ratio of PB-50-□-23 is 25 times.

③ High thrust feed oil capacity								Unit: cm <sup>3</sup>
Model	PB-50-□	PB-100-□	PB-100-□	PB-160-□	PB-160-□	PB-200-□	PB-300-□	
Symbol	-23	-16	-28	-16	-28	-25	-29	
05	2.5	22	10	60	30	60	110	
10	6.5	44	20	120	60	120	230	
15	10.5	66	30	180	90	180	350	
20	14.0	88	40	240	120	240	470	
25	17.5	110	50	310	150	310	590	

## Selection method

① Determines the total stroke of the hydraulic cylinder required to perform the work.  
 (Example : If the punch needs to be 70 mm away from the work to attach or detach the work, allow a margin and set the total stroke to 100 mm.)

② Determine the bore size of hydraulic cylinder.  
 (Example : If a high thrust of 40kN is required at an air pressure of 0.5MPa, use a cylinder bore size of 63mm that can produce a thrust of 43.6kN according to the page-3 hydraulic cylinder thrust table. In addition, the boosting ratio of pneumatic booster is 28 times.)

③ Determine the required high thrust stroke within the total stroke obtained from ①.  
 (Example : In the case of punching a metal with a plate thickness of 1.6 mm by a high thrust of 40kN in the previous section, it is theoretically 1.6 mm, but it should be 3 mm with a margin.)  
 ※ The high thrust feed oil capacity should be at least 1.5 times the net amount with a margin.

④ Determines the amount of oil for fast feed and high thrust feed oil capacity from ① ② ③.  
 Fast feed oil capacity  
 (Area cm<sup>2</sup> of  $\phi 63 \times 10 \text{ cm} = 312 \text{ cm}^2$ )  
 High thrust feed oil capacity  
 (Area cm<sup>2</sup> of  $\phi 63 \times 0.3 \text{ cm} = 9.3 \text{ cm}^2$ )

When piping with a hydraulic hose, add the amount of oil loss due to hose expansion to the amount of high thrust feed oil capacity. Refer to the table on page 8 for the amount of oil loss. Also, if the cylinder internal volume and piping internal volume are large, add the oil compression loss. Refer the next section for the amount of oil compression.

⑤ From the above, the hydraulic cylinder is determined a bore size of 63 mm and a total stroke of 100 mm. If there is no oil loss, the amount of fast feed oil capacity will be 480 cm<sup>3</sup> which is more than 312 cm<sup>3</sup> from table ②, the amount of high thrust feed oil capacity will be 10 cm<sup>3</sup> which is more than 9.3 cm<sup>3</sup> from table ③. The model number is decided PB-100-1505-28.

## Estimated amount of oil compression

V1 = Original volume (Inside volume of the cylinder and piping)

$\beta$  = Compression rate

P = Oil pressure (MPa)

$\Delta V$  = Estimated amount of oil compression

$$\Delta V = 10 \beta P V1$$

Oil temperature	20°C	40°C	60°C
$\beta$	$6.8 \times 10^{-5}$	$7.7 \times 10^{-5}$	$8.6 \times 10^{-5}$

## Air consumption volume

■ Symbol of fast feed oil capacity

Unit: L (ANR)

Model	Symbol	05	10	15	20	25
PB- 50-23times		0.8	1.7	2.6	3.4	4.3
PB-100-16times		4.6	8.0	11.4	14.8	18.1
PB-100-28times		4.8	8.2	11.7	15.1	18.6
PB-160-16times		13.7	22.2	30.8	39.4	47.9
PB-160-28times		14.0	22.7	31.4	40.2	48.9
PB-200-25times		36.9	55.4	73.8	91.7	110.0
PB-300-29times		85.1	126.0	168.0	209.0	250.0

■ Symbol of high thrust feed oil capacity

Unit: L (ANR)

Model	Symbol	05	10	15	20	25
PB- 50-23times		1.4	2.6	3.7	4.9	6.0
PB-100-16times		7.7	12.2	16.8	21.3	25.8
PB-100-28times		7.8	12.4	17.0	21.6	26.2
PB-160-16times		24.4	36.0	47.5	59.1	70.6
PB-160-28times		24.7	36.5	48.2	59.9	71.6
PB-200-25times		46.5	64.7	83.0	101.0	120.0
PB-300-29times		99.3	141.0	182.0	223.0	264.0

The values represent the theoretical air consumption volume for one reciprocating stroke using an air pressure of 0.5MPa, then converted to the atmospheric pressure.

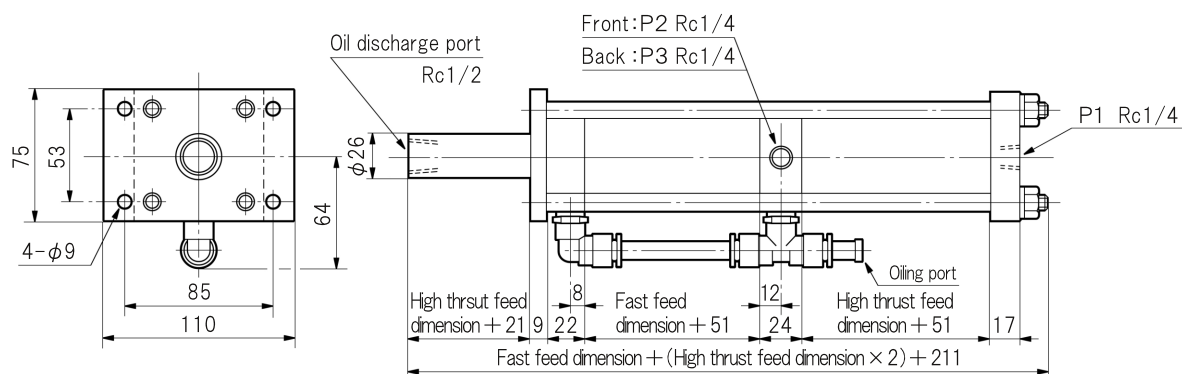
Example) PB-100-0510-28  
 Symbol of fast feed (05) = 4.8L  
 Symbol of high thrust feed (10)=12.4L

Air consumption volume  
 4.8L + 12.4L=17.2L



## Dimensions

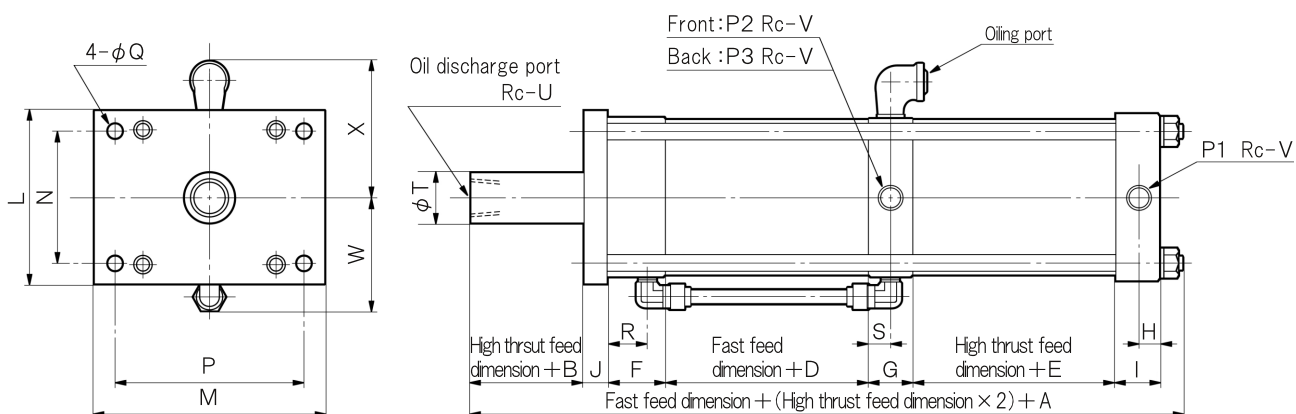
### PB - 50



(Unit: mm)

Symbol of fast feed oil capacity	Fast feed dimension
Symbol of high thrust feed oil capacity	High thrust feed dimension
05	50
10	100
15	150
20	200
25	250

### PB - 100 PB - 160 PB - 200



(Unit: mm)

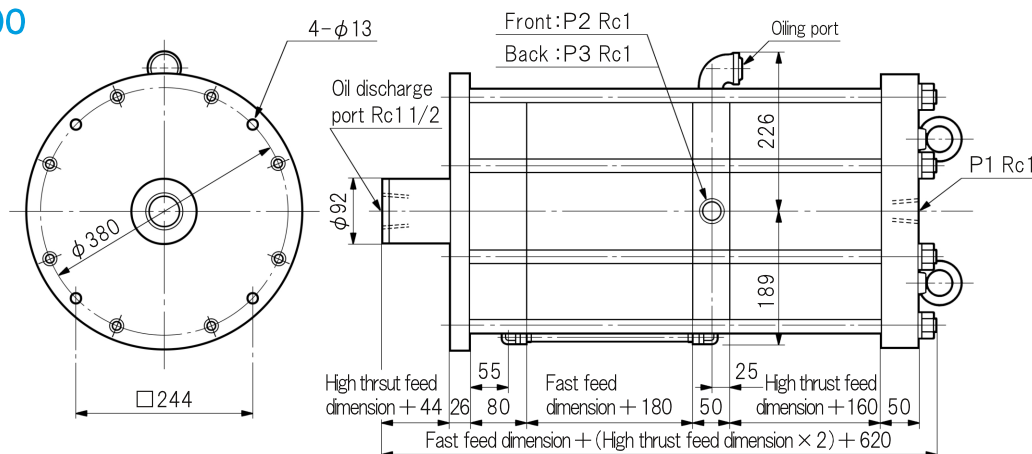
Symbol		A	B	D	E	F	G	H	I	J	L	M
Model	PB-100	340	29	90	90	40	30	15	30	16	120	160
	PB-160	459	40	120	120	59	39	24	44	15	180	220
	PB-200	610	48	180	155	80	45	27	50	22	225	280
Symbol		N	P	Q	R	S	T	U	V	W	X	
Model	PB-100	90	130	11	28	15	43	3/4	3/8	85	98	
	PB-160	140	190	11	39	19	50	11/4	1/2	118	143	
	PB-200	180	240	17	55	22	70	11/2	3/4	139	164	

(Unit: mm)

Symbol of fast feed oil capacity	Fast feed dimension
Symbol of high thrust feed oil capacity	High thrust feed dimension
05	50
10	100
15	150
20	200
25	250

## Dimensions

### PB - 300



(Unit: mm)

Symbol of fast feed oil capacity	Fast feed dimension
Symbol of high thrust feed oil capacity	High thrust feed dimension
05	50
10	100
15	150
20	200
25	250

## Mass

(Unit: kg)

Model	Symbol Basic weight	Symbol of fast feed oil capacity					Symbol of high thrust feed oil capacity				
		05	10	15	20	25	05	10	15	20	25
PB- 50-□-23	2.2	0.21	0.42	0.63	0.84	1.05	0.32	0.64	0.96	1.28	1.60
PB-100-□-16	8.6	0.52	1.04	1.56	2.08	2.60	0.95	1.90	2.85	3.80	4.75
PB-100-□-28	8.4	0.43	0.86	1.29	1.72	2.15	0.85	1.70	2.55	3.40	4.25
PB-160-□-16	22.3	1.11	2.22	3.33	4.44	5.55	1.34	2.68	4.02	5.36	6.70
PB-160-□-28	21.4	0.90	1.80	2.70	3.60	4.50	1.33	2.66	3.99	5.32	6.65
PB-200-□-25	110.0	3.50	7.00	10.5	14.0	17.5	3.50	7.00	10.5	14.0	17.5
PB-300-□-29	250.0	9.50	19.0	28.5	38.0	47.5	9.50	19.0	28.5	38.0	47.5

Example of weight for  
PB-100-1020-28

Basic weight = 8.4  
Fast feed oil capacity (10) = 0.86  
High thrust feed oil capacity (20) = 3.40  
Unit weight  
8.4 + 0.86 + 3.40 = 12.66kg

## Precautions for safe handling

### 1 Installation

Install the pneumatic booster vertically with the oil discharge port facing down.  
The lowest oil level of the pneumatic booster should be higher than the hydraulic cylinder.  
(To make it easier to remove air bubbles in oil.)  
However, if the amount of oil in the hydraulic piping is 50% or less of the amount of oil that fast feed the hydraulic cylinder, the pneumatic booster can be used on the lower side.  
(Bubbles in the piping are discharged in the pneumatic booster by reciprocating the hydraulic cylinder.)

### 2 Piping

It is recommended to exhaust the solenoid valve through the mist separator.

### 3 Hydraulic fluid

Standard mineral hydraulic fluid  
Use ISO viscosity grade of VG22 or VG32.

Oil brand	Product name • Viscosity
Royal Dutch Shell	Tellus S2V 22 or 32
Exxon Mobil	DTE 22 or 24

### 4 Lubrication

Remove the plug of the oiling port and refuel with the lubrication oiler.



### 5 Required amount of oil

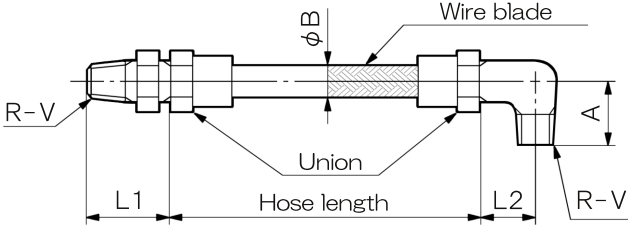
(Unit: L)

Model	Symbol of fast feed oil capacity				
	05	10	15	20	25
PB- 50	0.2	0.3	0.4	0.5	0.6
PB-100	0.8	1.2	1.6	2.0	2.4
PB-160	2.4	3.4	4.4	5.4	6.3
PB-200	5.2	6.7	8.2	9.7	11.2
PB-300	12.2	15.7	19.3	22.8	26.3

※ The amount of oil only for the pneumatic booster.  
Does not include the amount of oil in the hydraulic piping, etc.  
The amount is slightly higher.

# Related products

Hydraulic cylinder	Stop valve
<p>These cylinder goes well with the pneumatic booster. Can be used for both pneumatic and hydraulic.</p>  <p>Look at the individual catalog.</p>	<p>Use in combination with circuits that require emergency stop, intermediate stop, and inching.</p>  <p>Look at the individual catalog.</p>

Hydraulic hose																																																														
<p>High pressure hose with little elongation even under high pressure. (Maximun working pressure 24MPa)</p>																																																														
<div> <div>How to order</div> <div> <div>KHP-</div> <div>1/4</div> <div>1000</div> <div>T</div> <div>-</div> <div>L</div> <div>G</div> </div> <div> <div>①</div> <div>②</div> <div>③</div> <div>④</div> <div>⑤</div> </div> </div> <div> <div>① Both end fittings male tapered (V diameter)</div> <div>② Hose length (mm) (Order pitch 50 mm, Maximum 2000 mm)</div> <div>③ Left side adapter } T ...Straight L ...Elbow</div> <div>④ Right side adapter }</div> <div>⑤ Wire blade</div> <div> <div>Nil With wire blade</div> <div>G With wire blade</div> </div> </div> <div> <div>Dimention</div>  <div>(Unit: mm)</div> <table> <tr> <td>V</td><td>1/4</td><td>3/8</td><td>1/2</td><td>3/4</td><td>1</td><td>1 1/4</td><td>1 1/2</td><td>2</td></tr> <tr> <td>A</td><td>26</td><td>30</td><td>36</td><td>43</td><td>50</td><td>58</td><td>63</td><td>75</td></tr> <tr> <td>φ B</td><td>15.0</td><td>18.5</td><td>23.0</td><td>29.5</td><td>37.0</td><td>48.4</td><td>55.3</td><td>70.5</td></tr> <tr> <td>L1</td><td>27</td><td>30</td><td>36</td><td>41</td><td>43</td><td>50</td><td>51</td><td>60</td></tr> <tr> <td>L2</td><td>15</td><td>17</td><td>20</td><td>24</td><td>27</td><td>34</td><td>36</td><td>46</td></tr> <tr> <td>Minimum bend radius</td><td>70</td><td>90</td><td>110</td><td>170</td><td>220</td><td>330</td><td>400</td><td>470</td></tr> </table> </div>									V	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	A	26	30	36	43	50	58	63	75	φ B	15.0	18.5	23.0	29.5	37.0	48.4	55.3	70.5	L1	27	30	36	41	43	50	51	60	L2	15	17	20	24	27	34	36	46	Minimum bend radius	70	90	110	170	220	330	400	470
V	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2																																																						
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Minimum bend radius	70	90	110	170	220	330	400	470																																																						
<div>Amount of oil loss due to expansion of hydraulic hose</div> <div>(Unit: cm<sup>3</sup>)</div> <table> <tr> <th>Pressure \ Model</th><th>KHP-1/4</th><th>KHP-3/8</th><th>KHP-1/2</th><th>KHP-3/4</th><th>KHP-1</th><th>KHP-1 1/4</th><th>KHP-1 1/2</th><th>KHP-2</th></tr> <tr> <td>5 MPa</td><td>0.5</td><td>0.7</td><td>0.8</td><td>0.9</td><td>1.2</td><td>1.5</td><td>1.7</td><td>2.0</td></tr> <tr> <td>10 MPa</td><td>1.0</td><td>1.3</td><td>1.4</td><td>1.8</td><td>2.3</td><td>3.0</td><td>3.3</td><td>4.0</td></tr> <tr> <td>15 MPa</td><td>1.5</td><td>2.0</td><td>2.2</td><td>2.7</td><td>3.5</td><td>4.5</td><td>5.0</td><td>6.0</td></tr> <tr> <td>20 MPa</td><td>2.0</td><td>2.5</td><td>2.8</td><td>3.6</td><td>4.6</td><td>5.9</td><td>6.6</td><td>8.0</td></tr> </table> <div>The value are the theoretical oil loss per 1 m of length for each pressure.</div>									Pressure \ Model	KHP-1/4	KHP-3/8	KHP-1/2	KHP-3/4	KHP-1	KHP-1 1/4	KHP-1 1/2	KHP-2	5 MPa	0.5	0.7	0.8	0.9	1.2	1.5	1.7	2.0	10 MPa	1.0	1.3	1.4	1.8	2.3	3.0	3.3	4.0	15 MPa	1.5	2.0	2.2	2.7	3.5	4.5	5.0	6.0	20 MPa	2.0	2.5	2.8	3.6	4.6	5.9	6.6	8.0									
Pressure \ Model	KHP-1/4	KHP-3/8	KHP-1/2	KHP-3/4	KHP-1	KHP-1 1/4	KHP-1 1/2	KHP-2																																																						
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