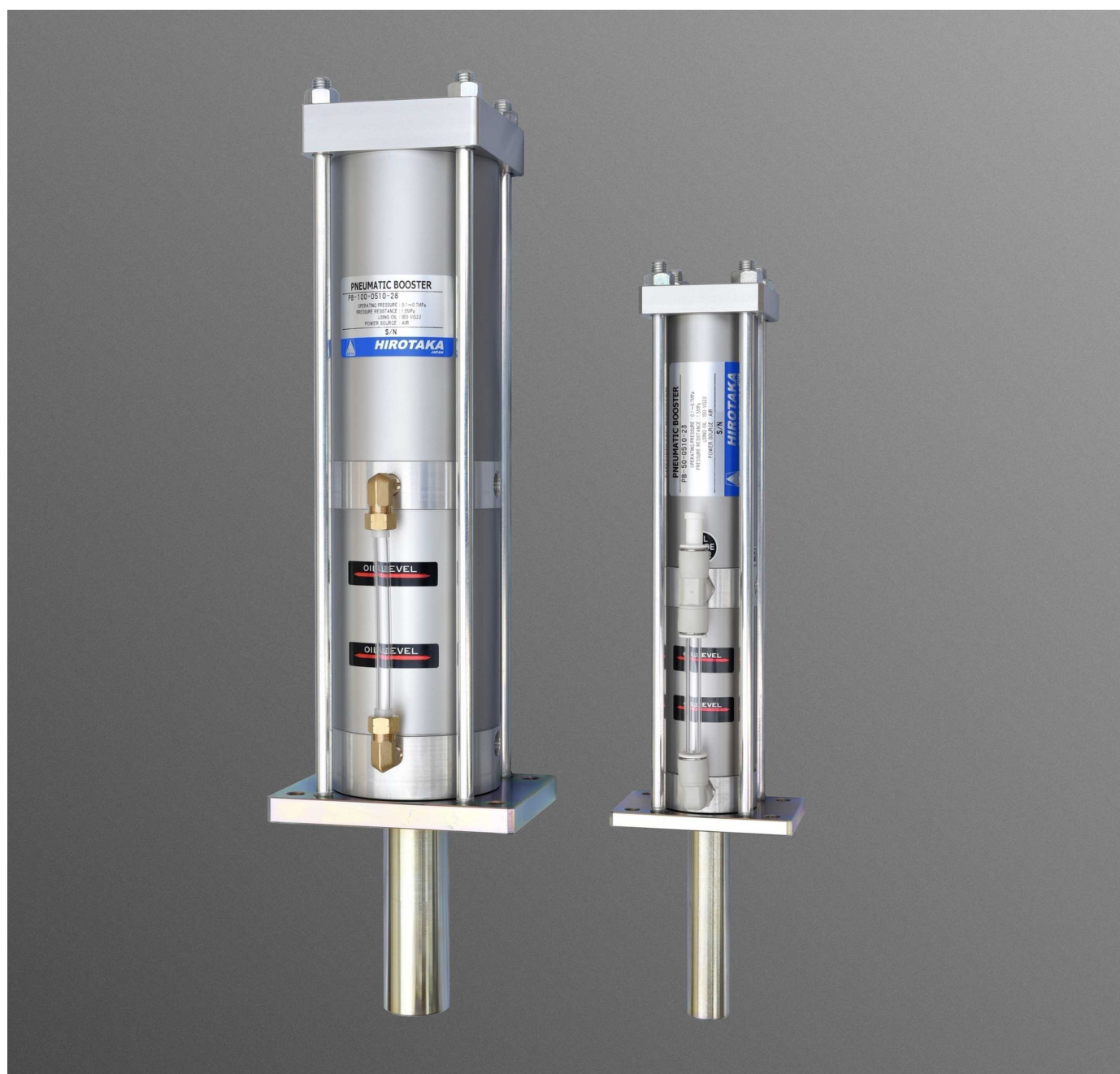




Air-hydro converter with booster

## 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.

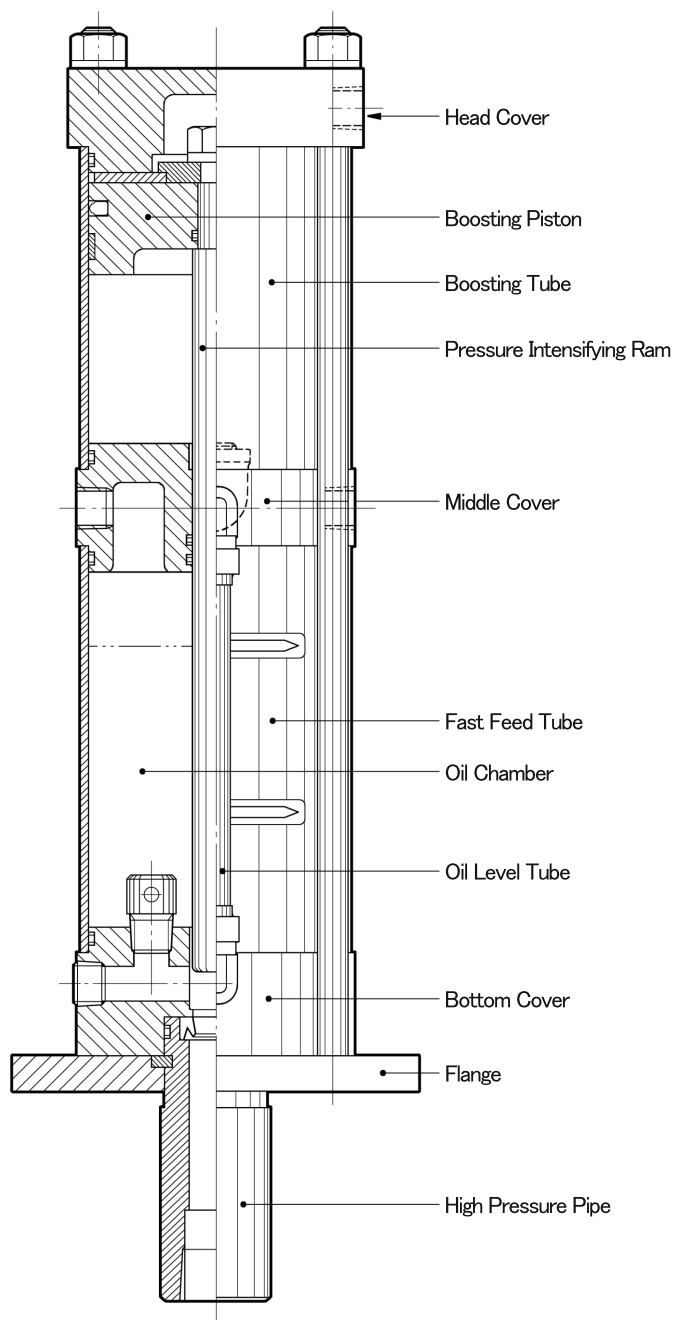
## Overview

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.

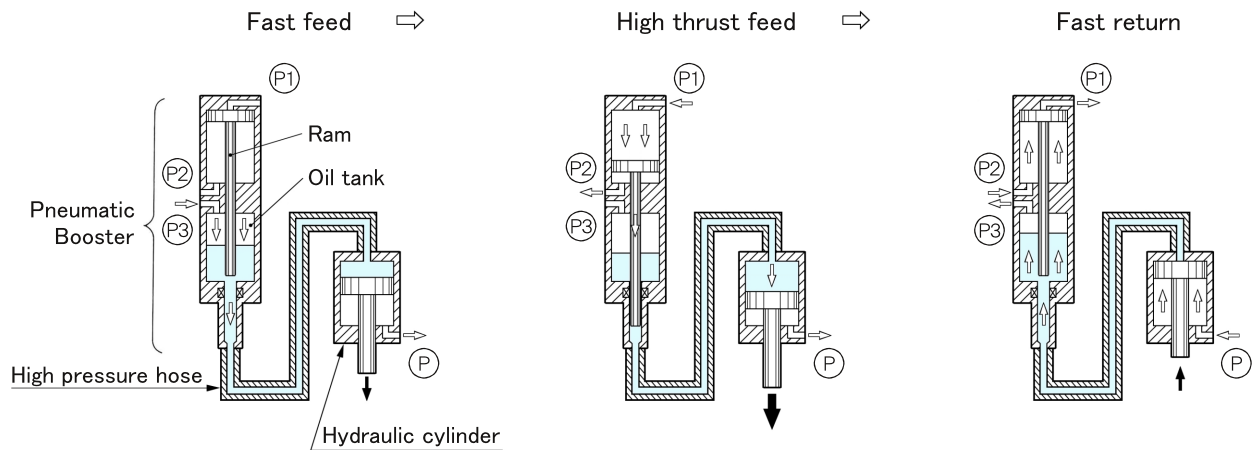
There is no need for a hydraulic pump or a hydraulic solenoid valve, and a commercially available hydraulic cylinder or hydraulic equipment can be operated with a pneumatic solenoid valve.

## 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



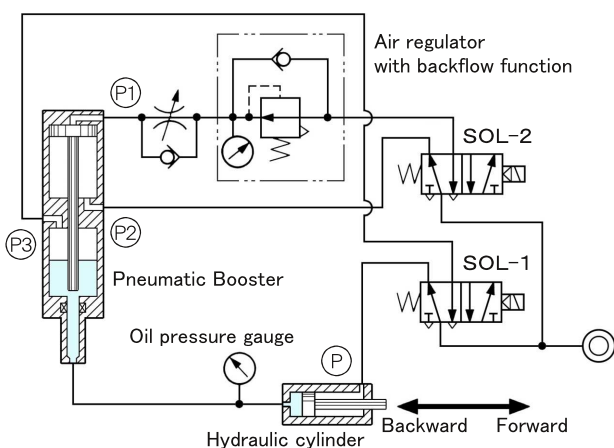
When the (P3) port is supplied with compressed air, the hydraulic cylinder is fast-forwarded by the oil in the oil tank.  
The oil pressure is the same as the air pressure, but the amount of oil flowing into the hydraulic cylinder is large, so the hydraulic cylinder moves forward at high speed.

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

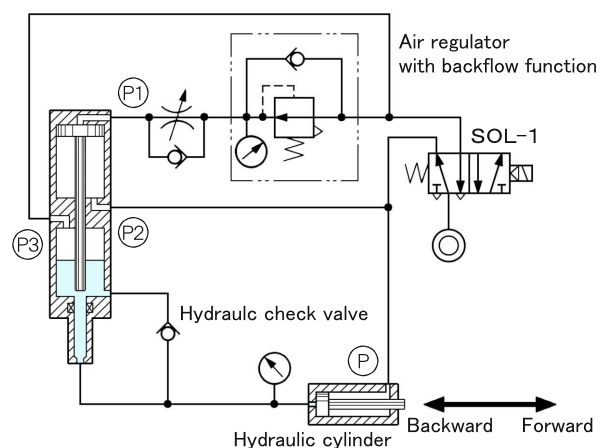
### Standard air circuit



| 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

| (Theoretical value)                                               |                                               |                 |                 |                 |                 |                 |                 |
|-------------------------------------------------------------------|-----------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Model number                                                      | PB-50-<br>□-23                                | PB-100-<br>□-16 | PB-100-<br>□-28 | PB-160-<br>□-16 | PB-160-<br>□-28 | PB-200-<br>□-25 | PB-300-<br>□-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<br>(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<br>(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<br>(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<br>(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 |
| Pressure boosting ratio       |                                |          |          |          |          |          |          |          |          |          |          |
| Oil pressure (MPa)            |                                |          |          |          |          |          |          |          |          |          |          |
| 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 boosting ratio by 0.89.  
For PB-100- 28 times, multiply the thrust value of 28 times pressure boosting ratio by 1.08.  
For PB-200, multiply the thrust value of 28 times pressure boosting ratio by 0.89.  
For PB-300, multiply the thrust value of 28 times pressure boosting ratio by 1.03.

## Flow rate characteristics

| Discharge flow rate of fast feed Unit : L/min |        |        | Discharge flow rate of high thrust feed Unit : L/min |             |             |             |             |
|-----------------------------------------------|--------|--------|------------------------------------------------------|-------------|-------------|-------------|-------------|
| Load factor (%)                               | PB-100 | PB-160 | Load factor (%)                                      | PB-100-□-16 | PB-100-□-28 | PB-160-□-16 | PB-160-□-28 |
| 30                                            | 53     | 247    | 30                                                   | 14.2        | 7.1         | 29.8        | 16.3        |
| 50                                            | 45     | 209    | 50                                                   | 13.6        | 6.8         | 28.5        | 15.5        |
| 70                                            | 34     | 161    | 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> |
|--------------------------|---------|----------|----------|----------|----------|-----------------------|
| P/N                      | 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> |
|---------------------------------|---------|----------|----------|----------|----------|----------|----------|-----------------------|
| P/N                             | 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      |                       |

## Model number 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  $\phi 63 \times 10 \text{ cm} = 312 \text{ cm}^3$ )  
 High thrust feed oil capacity  
 (Area cm<sup>2</sup> of  $\phi 63 \times 0.3 \text{ cm} = 9.3 \text{ cm}^3$ )

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 No.      | 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 No.      | 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.

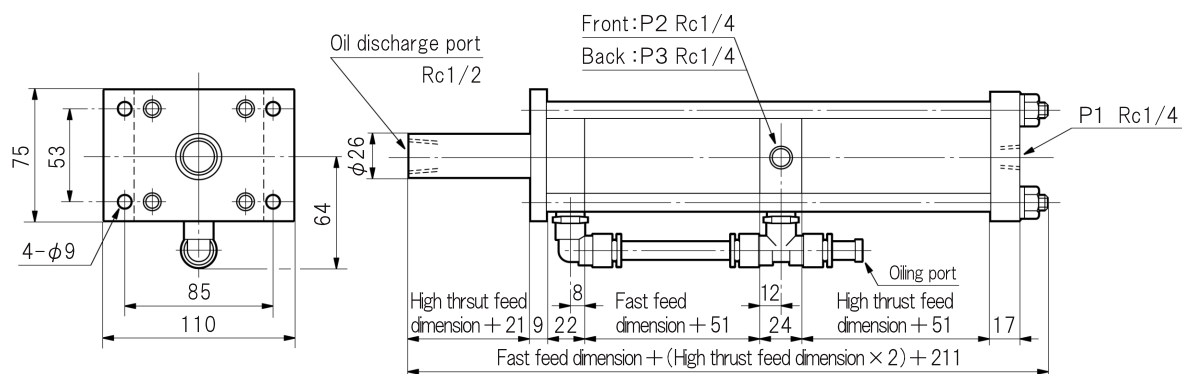
Example) PB-100-0510-28  
 Symbol of fast feed (05) = 4.8L  
 Symbol of high thrust feed (10)=12.4L

Air consumption volume  
 4.8L + 12.4L=17.2L



## Dimensions

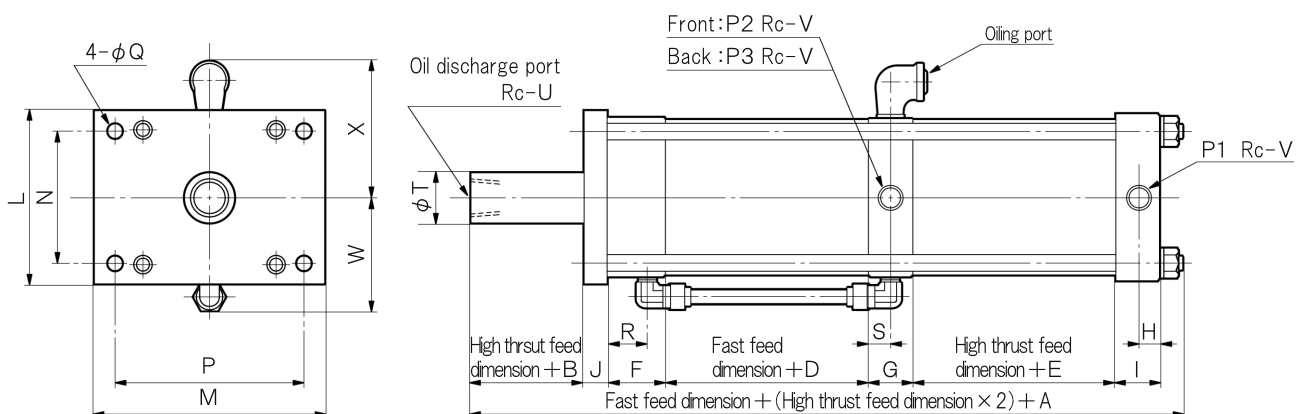
### PB - 50



(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)

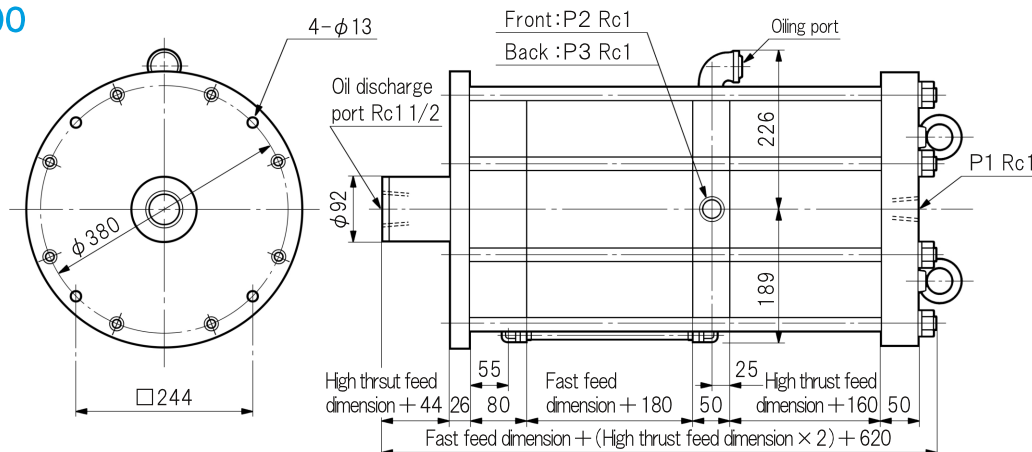
| Symbol<br>Model No. | A   | B   | D   | E   | F  | G  | H    | I   | J   | L   | M   |
|---------------------|-----|-----|-----|-----|----|----|------|-----|-----|-----|-----|
| PB-100              | 340 | 29  | 90  | 90  | 40 | 30 | 15   | 30  | 16  | 120 | 160 |
| PB-160              | 459 | 40  | 120 | 120 | 59 | 39 | 24   | 44  | 15  | 180 | 220 |
| PB-200              | 610 | 48  | 180 | 155 | 80 | 45 | 27   | 50  | 22  | 225 | 280 |
| Symbol<br>Model No. | N   | P   | Q   | R   | S  | T  | U    | V   | W   | X   |     |
| 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 number | Symbol<br>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 No. | 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

These cylinder goes well with the pneumatic booster.  
Can be used for both pneumatic and hydraulic.



Look at the individual catalog.

## Stop valve

Use in combination with circuits that require emergency stop, intermediate stop, and inching.



Look at the individual catalog.

## Hydraulic hose

High pressure hose with little elongation even under high pressure.  
(Maximum working pressure 24MPa)

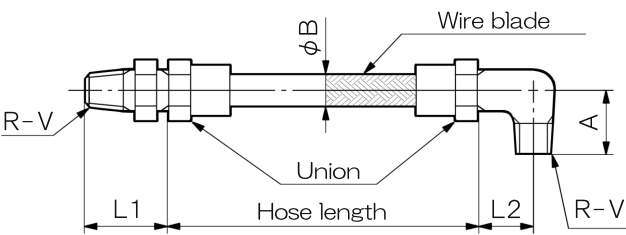
How to order

**KHP-1/4 1000 T-L G**

① ② ③ ④ ⑤

- ① Both end fittings male tapered (V diameter)
- ② Hose length (mm) (Order pitch 50 mm, Maximum 2000 mm)
- ③ Left side adapter } T ...Straight L ...Elbow
- ④ Right side adapter }
- ⑤ Wire blade
  - Nil With wire blade
  - G With wire blade

Dimension



(Unit: mm)

| 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   |
| phi 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  |

Amount of oil loss due to expansion of hydraulic hose

(Unit: cm<sup>3</sup>)

| Pressure | P/N | 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   |

The value are the theoretical oil loss per 1 m of length for each pressure.





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**●LINE UP●**

**PNEUMATIC POWER CYLINDER**

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