# Large-flow rate air-oil units which convert pneumatic pressure to hydraulic pressure to realize stable speed control

- Easy speed control.
- A model suitable for purpose of use can be selected.
- High control performance.
- Space-saving design.

## Main Body Specifications

| Item \ Control valve / Compound valve | | With flow control valve (with pressure compensation) | | | | With throttle valve | | | | Converter block | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | With skip valve/ stop valve | With skip valve | With stop valve | —— | With skip valve/ stop valve | With skip valve | With stop valve | —— | With stop valve | —— |
| Working pressure range | Main pressure | 0.2 to 1 MPa | | | | 0.05 to 1 MPa | | | | 0 to 1 MPa | |
| | Pilot pressure | 0.4×main pressure+0.2 MPa to 0.7 MPa | | | | | | | | | |
| Proof test pressure | | 1.5 MPa | | | | | | | | | |
| Working fluid | | Petroleum-based fluid ($10\times10^{-6}$ to $100\times10^{-6}$ m²/s) | | | | | | | | | |
| Fluid/ambient temperature | | −5 to +50℃ (No freezing) | | | | | | | | | |
| Flow rate limit (Note 1) | | ϕ100: 85 ℓ /min ϕ160: 226 ℓ /min | | | | | | | | | |
| Min. control flow rate (Note 2) | | 10 ℓ /min | | | | | | | | — | |
| Pressure compensation capacity | | Flow rate change caused by load fluctuation of 60% or less is within ±10%. | | | | — | | | | — | |
| Installing direction | | Perpendicular direction | | | | | | | | | |

(Note 1) Flow rate at converter fluid surface speed of 200 mm/s. If the unit is used at a higher flow rate, the controllability will be considerably degraded.
(Note 2) When the viscosity of hydraulic fluid is $100\times10^{-6}$ m²/s

## Converter Capacity

| Bore \ Capacity | 1 ℓ | 1.5 ℓ | 2 ℓ | 3 ℓ | 4 ℓ | 5 ℓ | 7.5 ℓ | 10 ℓ | 12.5 ℓ | 15 ℓ | 20 ℓ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ϕ100 | ○ | ○ | ○ | ○ | ○ | ○ | — | — | — | — | — |
| ϕ160 | — | — | — | ○ | — | ○ | ○ | ○ | ○ | ○ | ○ |

## Basic Weight

Unit: kg

| Capacity \ Bore | ϕ100 | ϕ160 |
|---|---|---|
| 1 ℓ | 6.3 | — |
| 1.5 ℓ | 6.7 | — |
| 2 ℓ | 7.3 | — |
| 3 ℓ | 8.2 | 12.5 |
| 4 ℓ | 9.1 | — |
| 5 ℓ | 10.0 | 13.8 |
| 7.5 ℓ | — | 15.4 |
| 10 ℓ | — | 17.0 |
| 12.5 ℓ | — | 18.6 |
| 15 ℓ | — | 20.2 |
| 20 ℓ | — | 23.5 |

## Additional Weight

Unit: kg

| | | |
|---|---|---|
| Control valve | Flow control valve | 2.4 |
| | Throttle valve | 1.9 |
| Compound valve | Skip valve | 0.4 |
| | Stop valve | 0.4 |

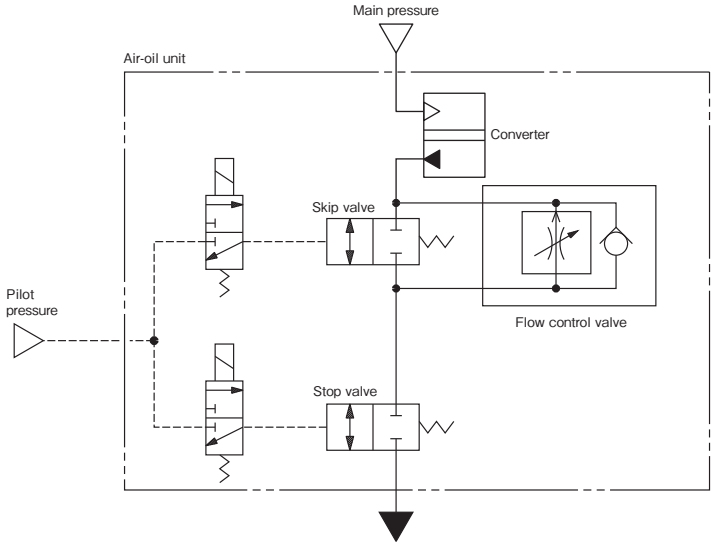
Calculation formula:
Air-oil unit weight (kg)= basic weight+additional weight
Calculation example:
Air-oil unit inner diameter 100 mm, converter capacity 3 ℓ, with flow control valve, skip valve and stop valve
8.2+2.4+0.4+0.4 =11.4 (kg)

## Solenoid Specifications: Skip valve/stop valve

| | | |
|---|---|---|
| Rated voltage | | 100 V AC 50/60Hz·200 V AC 50/60Hz·24 V DC |
| Allowable voltage range | | ±10% |
| Insulation class | | Class B |
| Starting current | 100 V AC | 0.10 A |
| | 200 V AC | 0.05 A |
| | 24 V DC | 0.36 A |
| Holding current | 100 V AC | 0.10 A |
| | 200 V AC | 0.05 A |
| | 24 V DC | 0.36 A |
| Power consumption | 100 V AC | 10 VA |
| | 200 V AC | 10 VA |
| | 24 V DC | 8.6 W |

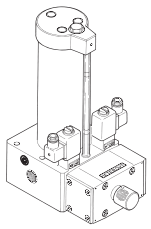
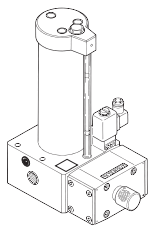
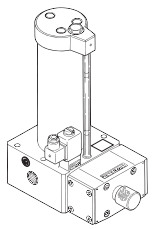
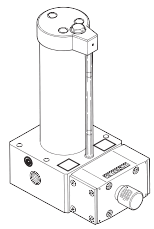
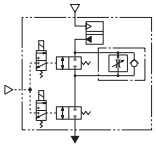
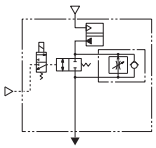
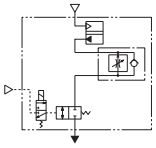
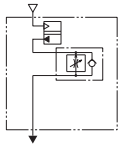


## Internal Circuit




The above figure is the circuit diagram of AHU2-***-***-FDA0.

## Outline of Models

| Control valve | | | With flow control valve (with pressure compensation) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Compound valve | | | With skip valve/stop valve | | | | With skip valve | | With stop valve | | — |
| Use | | | ・Intermediate stop<br>・Inching<br>・2-step speed switching (fast/slow)<br>・Emergency stop | | | | ・2-step speed switching (fast/slow) | | ・Intermediate stop<br>・Inching<br>・Emergency stop | | ・Speed control |
| | Converter bore | Converter capacity symbol | Effective capacity | | | | | | | | |
| Appearance | φ100 | 010 | 1 ℓ |  | | |  | |  | |  |
| | | 015 | 1.5 ℓ | | | | | | | | |
| | | 020 | 2 ℓ | | | | | | | | |
| | | 030 | 3 ℓ | | | | | | | | |
| | | 040 | 4 ℓ | | | | | | | | |
| | | 050 | 5 ℓ | | | | | | | | |
| | φ160 | 030 | 3 ℓ | | | | | | | | |
| | | 050 | 5 ℓ | | | | | | | | |
| | | 075 | 7.5 ℓ | | | | | | | | |
| | | 100 | 10 ℓ | | | | | | | | |
| | | 125 | 12.5 ℓ | | | | | | | | |
| | | 150 | 15 ℓ | | | | | | | | |
| | | 200 | 20 ℓ | | | | | | | | |
| Symbol<br>●These diagrams show meter-out circuits. On meter-in circuits, the flow control valve and throttle valve are positioned in different directions.<br>●NC skip valve and stop valve are used in these diagrams. | | | |  | | |  | |  | |  |
| Compound valve | Skip valve | N.C(normally closed) | ○ | — | — | ○ | ○ | — | — | — | — |
| | | N.O(normally open) | — | ○ | ○ | — | — | ○ | — | — | — |
| | Stop valve | N.C(normally closed) | ○ | — | — | — | — | — | ○ | — | — |
| | | N.O(normally open) | — | ○ | — | ○ | — | — | — | ○ | — |
| Combination symbol | | | FDA | FDB | FDC | FDD | FKA | FKB | FTA | FTB | FNO |

### Model Number

When placing an order, specify the model number shown below.

●Air-oil units

With control valve

AHU2 – ❶100 – ❷030 – ❸F ❹D ❺B ❻1 ❼2 – ❽L

Combination symbol

Without control valve

AHU2 – ❶100 – ❷030 – ❸❹❺O T A – ❼2 ❽L

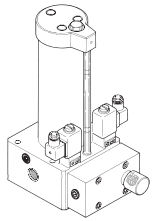
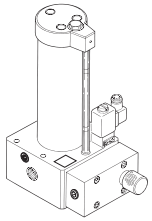
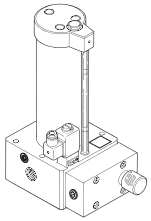
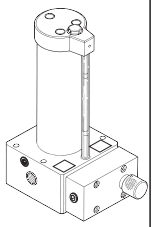
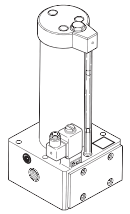
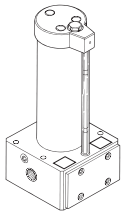
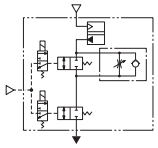
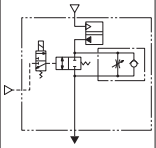
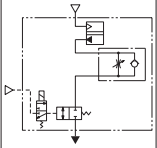
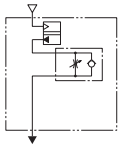
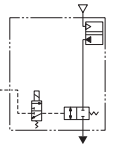
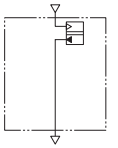
Combination symbol

●Converter only

AHU2 – ❶100 – ❷030

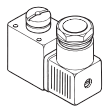
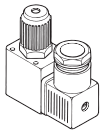
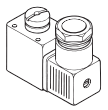
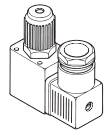
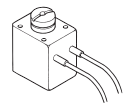
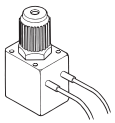
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ❶ | Converter bore mm | | | | ❺ | Combination of compound valve | | |
| | 100 | φ100 | | | | Symbol | skip valve | stop valve |
| | 160 | φ160 | | | | A | NC | NC |
| ❷ | Converter capacity | | | | | B | NO | NO |
| | 010 | 1 ℓ | 075 | 7.5 ℓ | | C | NO | NC |
| | 015 | 1.5 ℓ | 100 | 10 ℓ | | D | NC | NO |
| | 020 | 2 ℓ | 125 | 12.5 ℓ | | O | — | — |
| | 030 | 3 ℓ | 150 | 15 ℓ | ❻ | Control method of control valves (flow control valve and throttle valve) | | |
| | 040 | 4 ℓ | 200 | 20 ℓ | | 0 | Meter-out control | |
| | 050 | 5 ℓ | | | | 1 | Meter-in control | |
| ❸ | Control valve | | | | ❼ | Solenoid voltage | | |
| | F | With flow control valve | | | | 1 | 100 V AC 50/60Hz | |
| | S | With throttle valve | | | | 2 | 200 V AC 50/60Hz | |
| | O | Without control valve | | | | 8 | 24 V DC | |
| ❹ | Compound valve | | | | ❽ | Solenoid accessories | | |
| | D | With skip valve/stop valve | | | | No symbol | DIN socket type | |
| | K | With skip valve | | | | L | DIN socket (with orange lamp) | |
| | T | With stop valve | | | | R | Lead wire type | |
| | N | Without skip valve/stop valve | | | | | | |



| With throttle valve | | | | | | | | | Converter | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| With skip valve/stop valve | | | | With skip valve | | With stop valve | | — | With stop valve | | Converter only |
| ・Intermediate stop<br>・Inching<br>・2-step speed switching (fast/slow)<br>・Emergency stop | | | | ・2-step speed switching (fast/slow) | | ・Intermediate stop<br>・Inching<br>・Emergency stop | | ・Speed control | ・Intermediate stop<br>・Inching<br>・Emergency stop | | — |
|  | | | |  | |  | |  |  | |  |
|  | | | |  | |  | |  |  | |  |
| ○ | — | — | ○ | ○ | — | — | — | — | — | — | — |
| — | ○ | ○ | — | — | ○ | — | — | — | — | — | — |
| ○ | — | ○ | — | — | — | ○ | — | — | ○ | — | — |
| — | ○ | — | ○ | — | — | — | ○ | — | — | ○ | — |
| SDA | SDB | SDC | SDD | SKA | SKB | STA | STB | SNO | OTA | OTB | No symbol |

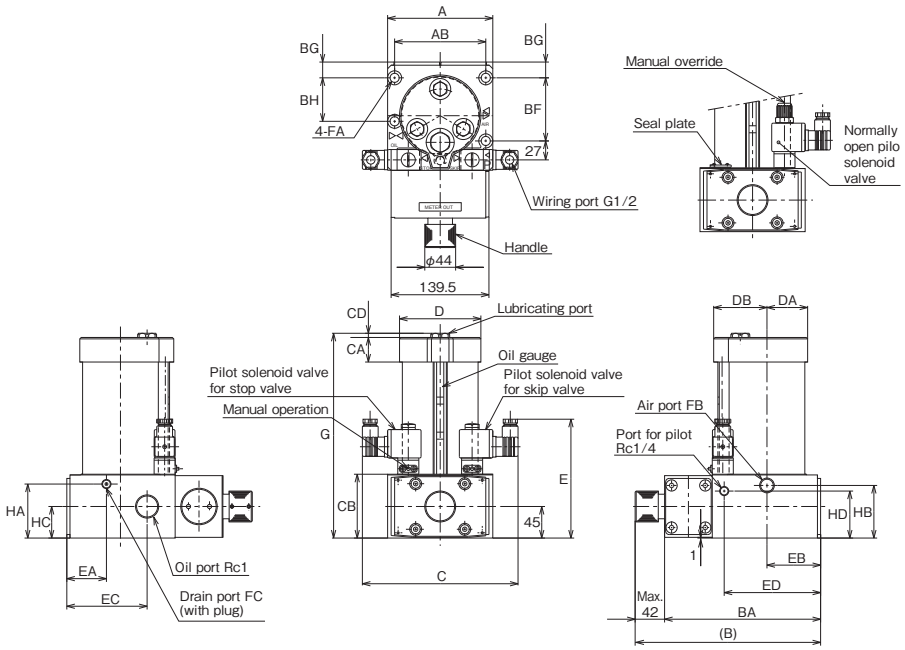
●To change the compound valve type from normally closed to normally open, it is necessary to replace the solenoid valve with a proper one. The solenoid valves vary in shape.

## Accessories: Solenoid

| No symbol: DIN socket type | | L: DIN socket type (with orange lamp) | | R: Lead wire type | |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| Normally closed type | Normally open type | Normally closed type | Normally open type | Normally closed type | Normally open type |

## With flow control valve

● When only the skip valve is normally open




- This drawing shows the appearance of AHU2-100.
- This drawing shows the appearance of a unit with skip valve and stop valve. A unit with skip valve or stop valve only is provided with a seal plate.
- The skip valve and stop valve shown in this drawing are normally closed. The pilot solenoid valves for normally open valves have different shapes.
- The meter-out and meter-in units have the same appearance.

## Dimensional Table

| Symbol / Bore | A | AB | B | BA | BF | BG | BH | C | CA | CB | CD | D | DA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ϕ100 | 150 | 130 | 264.5 | 222.5 | 90 | 22.5 | 62 | 222 | 35 | 91 | 6 | ϕ116 | 58 |
| ϕ160 | 200 | 166 | 314.5 | 272.5 | 130 | 32.5 | 130 | 242 | 40 | 100 | 8 | ϕ176 | 88 |

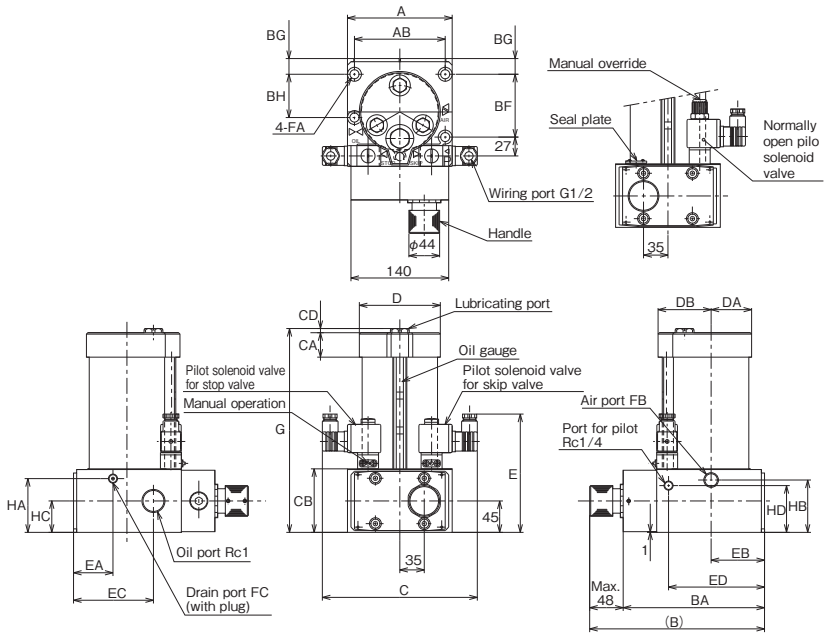
| Symbol / Bore | DB | E | EA | EB | EC | ED | FA | FB | FC | HA | HB | HC | HD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ϕ100 | 76 | 170 | 56.5 | 76.5 | 114.5 | 137.5 | ϕ13 | Rc1/2 | Rc1/4 | 77 | 75 | 45 | 67 |
| ϕ160 | 107 | 179 | 57.5 | 97.5 | 99.5 | 186.5 | ϕ18 | Rc3/4 | Rc1/2 | 80 | 78 | 45 | 68 |

| Symbol / Bore | G | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 ℓ | 1.5 ℓ | 2 ℓ | 3 ℓ | 4 ℓ | 5 ℓ | 7.5 ℓ | 10 ℓ | 12.5 ℓ | 15 ℓ | 20 ℓ |
| ϕ100 | 392 | 462 | 532 | 672 | 812 | 952 | — | — | — | — | — |
| ϕ160 | — | — | — | 428 | — | 533 | 655.5 | 798 | 929 | 1062 | 1326 |



## With throttle valve

● Meter-in control
When only the skip valve is normally open




- This drawing shows the appearance of AHU2-100.
- This drawing shows the appearance of a unit with skip valve and stop valve. A unit with skip valve or stop valve only is provided with a seal plate.
- The skip valve and stop valve shown in this drawing are normally closed. The pilot solenoid valves for normally open valves have different shapes.
- This drawing shows the appearance of a meter-out unit.

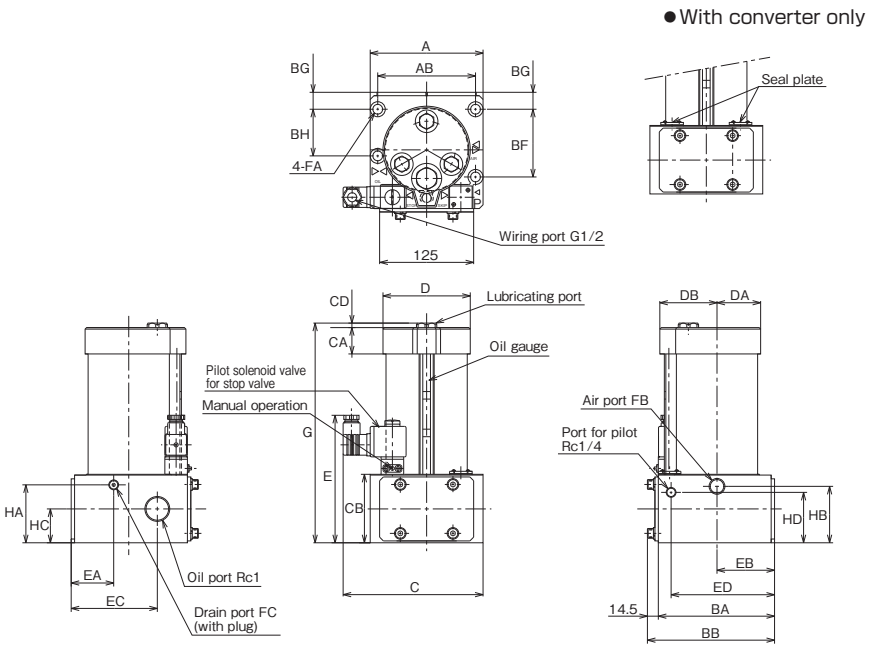
## Dimensional Table

| Symbol / Bore | A | AB | B | BA | BF | BG | BH | C | CA | CB | CD | D | DA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ϕ100 | 150 | 130 | 250.5 | 202.5 | 90 | 22.5 | 62 | 222 | 35 | 91 | 6 | ϕ116 | 58 |
| ϕ160 | 200 | 166 | 300.5 | 252.5 | 130 | 32.5 | 130 | 242 | 40 | 100 | 8 | ϕ176 | 88 |

| Symbol / Bore | DB | E | EA | EB | EC | ED | FA | FB | FC | HA | HB | HC | HD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ϕ100 | 76 | 170 | 56.5 | 76.5 | 114.5 | 137.5 | ϕ13 | Rc1/2 | Rc1/4 | 77 | 75 | 45 | 67 |
| ϕ160 | 107 | 179 | 57.5 | 97.5 | 99.5 | 186.5 | ϕ18 | Rc3/4 | Rc1/2 | 80 | 78 | 45 | 68 |

| Symbol / Bore | G | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 ℓ | 1.5 ℓ | 2 ℓ | 3 ℓ | 4 ℓ | 5 ℓ | 7.5 ℓ | 10 ℓ | 12.5 ℓ | 15 ℓ | 20 ℓ |
| ϕ100 | 392 | 462 | 532 | 672 | 812 | 952 | — | — | — | — | — |
| ϕ160 | — | — | — | 428 | — | 533 | 655.5 | 798 | 929 | 1062 | 1326 |

## Converter




- This drawing shows the appearance of AHU2-100.
- The stop valve shown in the drawing is normally closed. The pilot solenoid valves for normally open valves have different shapes.

## Dimensional Table

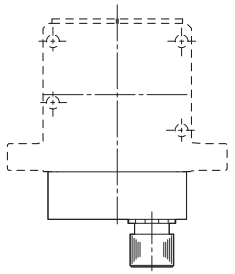
| Symbol / Bore | A | AB | BA | BB | BF | BG | BH | C | CA | CB | CD | D | DA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ϕ100 | 150 | 130 | 154.5 | 169 | 90 | 22.5 | 62 | 186 | 35 | 91 | 6 | ϕ116 | 58 |
| ϕ160 | 200 | 166 | 204.5 | 219 | 130 | 32.5 | 130 | 221 | 40 | 100 | 8 | ϕ176 | 88 |

| Symbol / Bore | DB | E | EA | EB | EC | ED | FA | FB | FC | HA | HB | HC | HD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ϕ100 | 76 | 170 | 56.5 | 76.5 | 114.5 | 137.5 | ϕ13 | Rc1/2 | Rc1/4 | 77 | 75 | 45 | 67 |
| ϕ160 | 107 | 179 | 57.5 | 97.5 | 99.5 | 186.5 | ϕ18 | Rc3/4 | Rc1/2 | 80 | 78 | 45 | 68 |

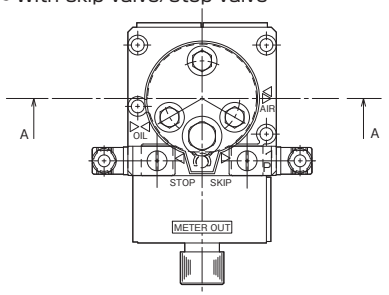
| Symbol / Bore | G | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 ℓ | 1.5 ℓ | 2 ℓ | 3 ℓ | 4 ℓ | 5 ℓ | 7.5 ℓ | 10 ℓ | 12.5 ℓ | 15 ℓ | 20 ℓ |
| ϕ100 | 392 | 462 | 532 | 672 | 812 | 952 | — | — | — | — | — |
| ϕ160 | — | — | — | 428 | — | 533 | 655.5 | 798 | 929 | 1062 | 1326 |



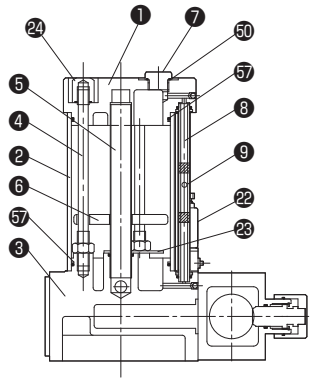
(With throttle valve)



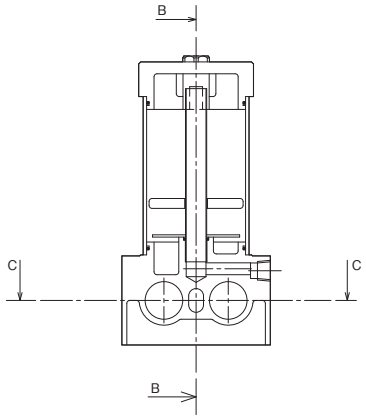

With flow control valve
● With skip valve/stop valve




Section B-B

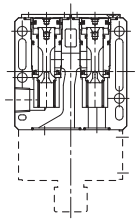



Section A-A

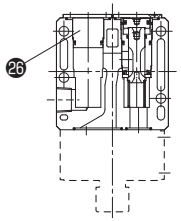



- This drawing shows the appearance of AHU2-100. (AHU2-160 has an almost identical internal structure.)
- This drawing shows the appearance of a unit with skip valve and stop valve. A unit with skip valve or stop valve only is provided with a seal plate.
- The skip valve and stop valve shown in this drawing are normally closed. The pilot solenoid valves for normally open valves have different shapes.
- The meter-out and meter-in units have the same appearance. (When the unit has a throttle valve, the handle is located at another position.)

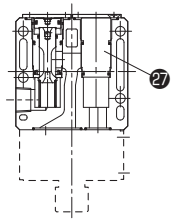
Section C-C
(Section of compound valve block)



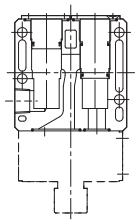
●With skip valve/stop valve (with flow control valve /with throttle valve)



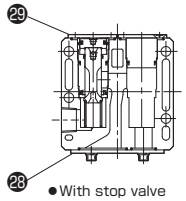

●With skip valve (with flow control valve /with throttle valve)



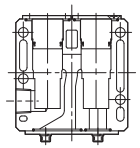

●With stop valve (with flow control valve /with throttle valve)



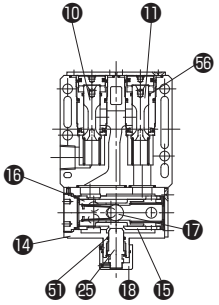
●Without compound valve (with flow control valve /with throttle valve)




●With stop valve (without control valve)

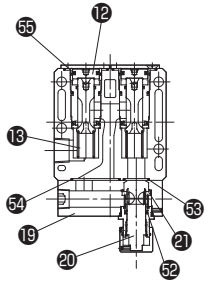


●Converter only (without control valve /compound valve)




●With flow control valve

Section C-C
(Section of control valve block)




●With throttle valve





## Parts List

| No. | Name | Material | Qty. |
|---|---|---|---|
| ❶ | Pneumatic cover | Aluminum alloy | 1 |
| ❷ | Tube | Aluminum alloy | 1 |
| ❸ | Hydraulic cover | Aluminum alloy | 1 |
| ❹ | Tie rod | Carbon steel for machine structural use | 3 |
| ❺ | Pneumatic piping | Stainless steel | 1 |
| ❻ | Float | Foamed resin | 1 |
| ❼ | Lubricating plug | Rolled steel for general structure | 1 |
| ❽ | Oil gauge tube | Acrylic (Note) | 1 |
| ❾ | Display bulb | — | 1 |
| ❿ | Spool (for stop valve) | Stainless steel | — |

| No. | Name | Material | Qty. |
|---|---|---|---|
| ⓫ | Spool (for skip valve) | Stainless steel | — |
| ⓬ | Piston | Aluminum alloy | — |
| ⓭ | Spring | Stainless steel | — |
| ⓮ | Flow control valve body | Aluminum alloy | 1 |
| ⓯ | Sleeve | Aluminum alloy | 1 |
| ⓰ | Spool | Stainless steel | 1 |
| ⓱ | Steel ball | High-carbon chromium bearing steel | 1 |
| ⓲ | Handle | Aluminum alloy | 1 |
| ⓳ | Throttle valve body | Aluminum alloy | 1 |
| ⓴ | Throttle | Stainless steel | 1 |

| No. | Name | Material | Qty. |
|---|---|---|---|
| ㉑ | Check valve | Steel alloy | 1 |
| ㉒ | Pilot solenoid valve | — | — |
| ㉓ | Baffle plate | Rolled steel for general structure | 1 |
| ㉔ | Tie rod nut | Carbon steel for machine structural use | 3 |
| ㉕ | Needle | Stainless steel | 1 |
| ㉖ | Block A | Aluminum alloy | — |
| ㉗ | Block B | Aluminum alloy | — |
| ㉘ | Plate | Cold rolled steel | 1 |
| ㉙ | Plate A | Cold rolled steel | 2 |

Note) Only for AHU2-160-200, an urethane tube is used, and the upper and lower ends are connected with joints.

## Seal List

| No. | Name | Material | Type | Qty. |
|---|---|---|---|---|
| ㊿ | O-ring for lubricating plug | Nitrile rubber | φ100:S-22,φ160:S-28 | 1 |
| 51 | Seal for needle | Nitrile rubber | PS-20 | 1 |
| 52 | Seal for throttle | Nitrile rubber | PS-25 | 1 |
| 53 | O-ring | Nitrile rubber | G-30 | 1 |

| No. | Name | Material | Type | Qty. |
|---|---|---|---|---|
| 54 | O-ring | Nitrile rubber | G-50 | 1 |
| 55 | Seal for piston | Nitrile rubber | GLY-28 | — |
| 56 | Seal for spool | Nitrile rubber | PS-22A | — |
| 57 | O-ring for tube | Nitrile rubber | φ100:G-95,φ160:G-150 | 2 |