

PNEUMATIC EQUIPMENT

HIGH OUTPUT AVAILABLE EASILY

- ◆ ACCURATE OUTPUT.
- ◆ SWITCH SET AVAILABLE (OPTION).
- ◆ PRESSURE SWITCH SET AVAILABLE (OPTION).
- ◆ NON-LUBRICATION TYPE.
- ◆ CONVENIENT FOR MAINTENANCE.

PNEUMERLOCK

CLAMPING ELEMENT

PNEUMATIC TOGGLE PRESS

CAT. **A11**-124d

C O N T E N T S

PNEUMERLOCK

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DIRECT PRESSURE TYPE BOOSTER

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DIRECT PRESSURE TYPE BOOSTER SET

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PRE-PRESSURE TYPE BOOSTER

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LE2 CLAMPING ELEMENT

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FEATURES

HIGH OUTPUT AVAILABLE EASILY

The high output of 0.15 ~ 4.5 tons is optionally available with non-phase by adjusting air pressure with an air regulator.

PLENTIFUL TYPES

For Neumerlock, there are direct pressure type and pre-pressure type. With the combination of clamp head, the wide movement ranging from small to large stroke is available.

ACCURATE OUTPUT

As oil pressure is applied to output, the balanced, accurate force is always available.

SWITCH SET AVAILABLE (OPTION)

For the detection of stroke, piston backwardness, oil reduction, application limit, etc., the working can be easily confirmed with the equipment of switch. Switch can be mounted on standard booster even later.

Applicable model code:
NBH3-40 · NBH3-60 · NBH3-60-130 · PBE(H)3-40
· PBE(H)3-60

PRESSURE SWITCH SET AVAILABLE (OPTION)

When Neumerlock is pressurized, the output can be easily confirmed with the detection of pressure.

NON-LUBRICATION TYPE

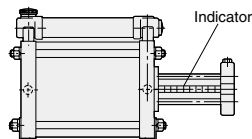
Lubrication is unnecessary for air pressure side of booster.

Applicable model code:
NBH3-40 · NBH3-60 · NBH3-60-130 · PBE(H)3-40
· PBE(H)3-60

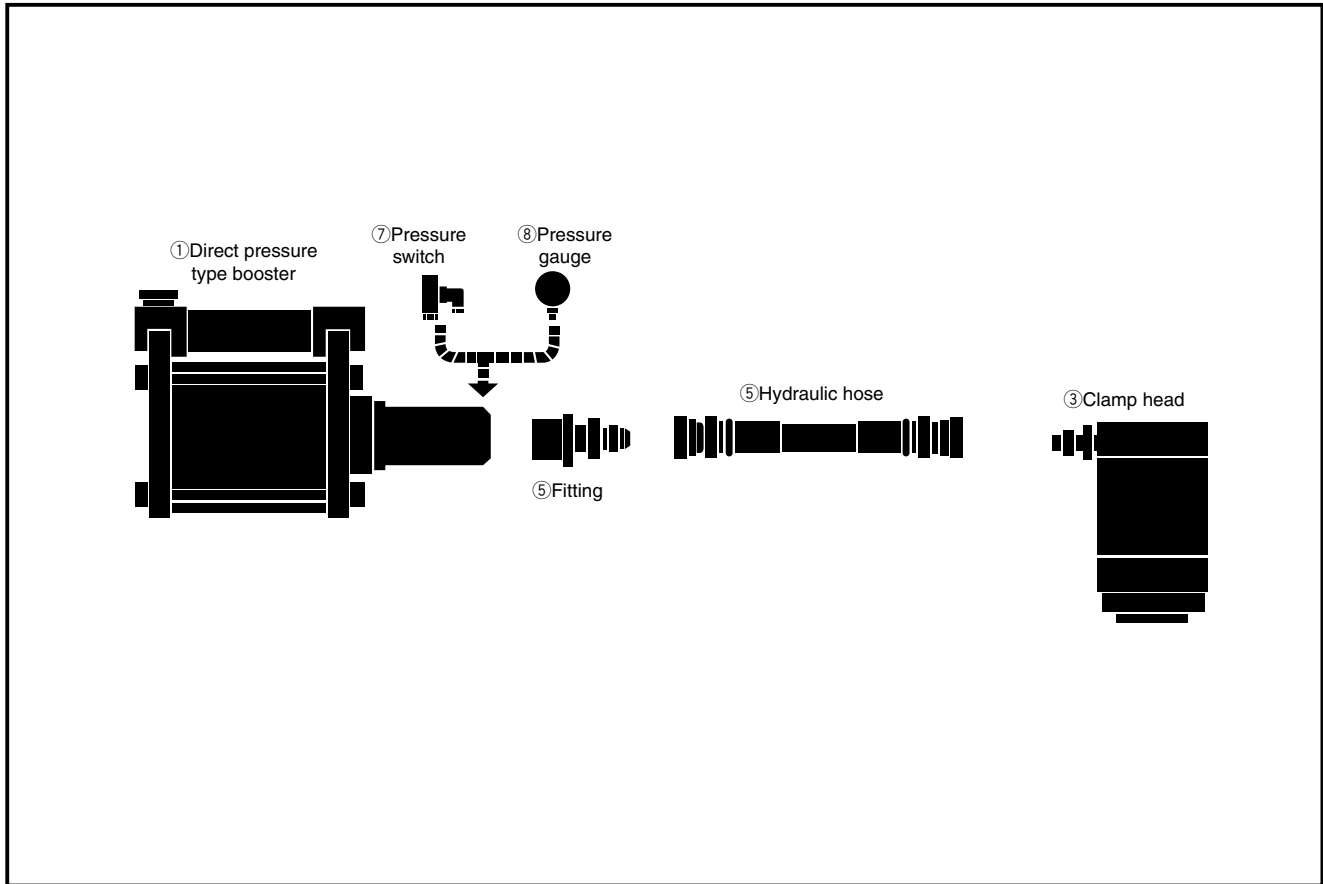
CONVENIENT FOR MAINTENANCE

The maintenance is convenient as the oil consumption of clamp head can be found on sight with indicator of booster.

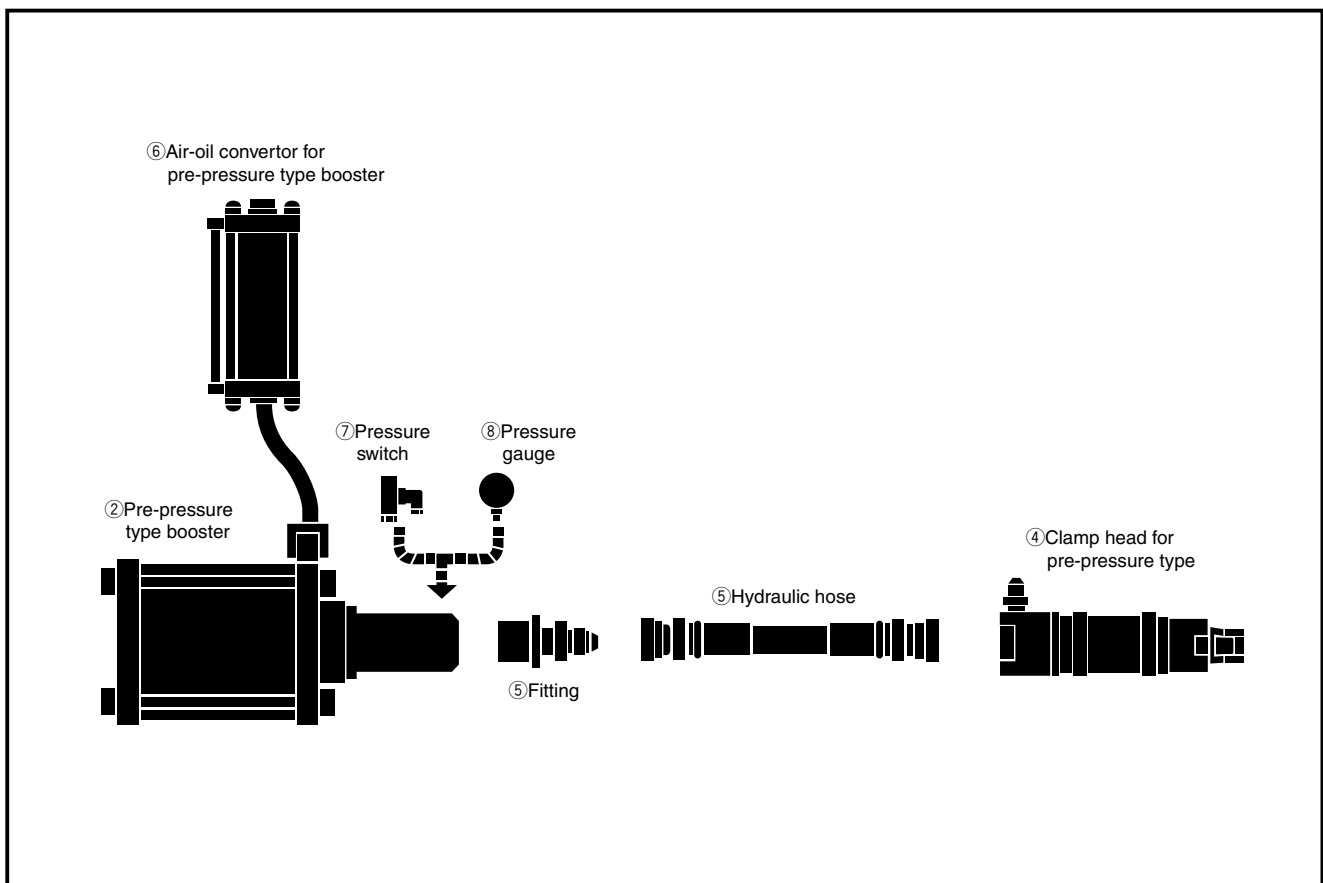
Applicable model code: NBH-80 · PBE(H)-80



COMBINATION OF DIRECT PRESSURE TYPE BOOSTER

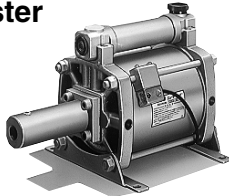


COMBINATION OF PRE-PRESSURE TYPE BOOSTER



TYPE OUTLINE · CODE

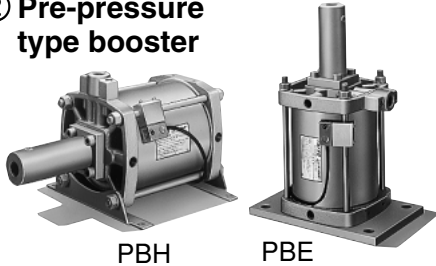
① Direct pressure type booster



| Model code | Operating air pressure range MPa | Boosting range | Theoretical output oil pressure at max. air pressure MPa | Output oil capacity cm ³ |
|-------------|----------------------------------|----------------|--|-------------------------------------|
| NBH3-40 | 0.2~1 | 11 | 10.8 | 77 |
| NBH3-60 | 0.2~0.7 | 25 | 17.5 | 77 |
| NBH3-60-130 | 0.2~0.7 | 25 | 17.5 | 130 |
| *NBH-80 | 0.2~0.7 | 25 | 17.5 | 176 |
| *NBH-100 | 0.2~0.7 | 25 | 17.5 | 304 |

For *-marked models, switch can not be mounted.

② Pre-pressure type booster



PBH

PBE

| Model code | Operating air pressure range MPa | Boosting range | Theoretical output oil pressure at max. air pressure MPa | Output oil capacity cm ³ |
|------------------|----------------------------------|----------------|--|-------------------------------------|
| PBH3-40, PBE3-40 | 0.2~1 | 11 | 10.8 | 77 |
| PBH3-60, PBE3-60 | 0.2~0.7 | 25 | 17.5 | 77 |
| *PBH-80, *PBE-80 | 0.2~0.7 | 25 | 17.5 | 176 |

For *-marked models, switch can not be mounted.

③ Clamp head



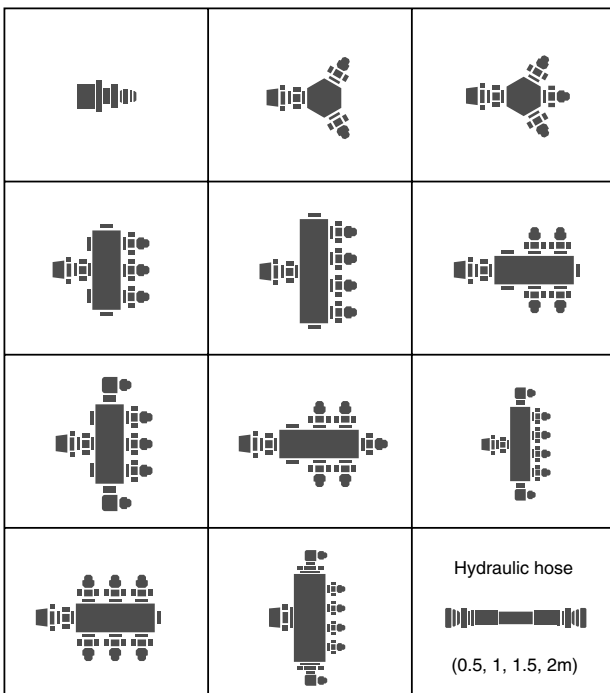
| Model code | Effective stroke mm | Effective piston area cm ² | Max. stroke volume cm ³ |
|------------|---------------------|---------------------------------------|------------------------------------|
| LHD | 6 | 5.7 | 4 |
| LHC | 7 | 13 | 10.4 |
| LHA | 12 | 14 | 18.2 |
| LHA-25 | 24 | 14 | 35 |
| LHA-40 | 38 | 14 | 56 |
| LHAS-2 | 20 | 26.4 | 61.3 |

④ Clamp head for pre-pressure type



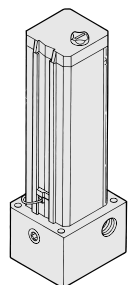
| Model code | Max. stroke mm | Piston area (Push) cm ² | Max. oil pressure (Push) MPa | Max. stroke oil capacity (Push) cm ³ | Piston area (Push) cm ² | Max. air pressure (Pull) MPa | Max. stroke capacity (Pull) cm ³ |
|------------|----------------------------------|------------------------------------|------------------------------|---|------------------------------------|------------------------------|---|
| LHF-28-60 | 62 ⁰ _{-1.5} | 6.1 | 17.5 | 38 | 4.1 | 1 | 25.7 |
| LHF-40-80 | 82 ⁰ _{-1.5} | 12.5 | 17.5 | 103 | 5.4 | 1 | 45.1 |
| LHF-50-100 | 103 ⁰ _{-2.0} | 19.5 | 17.5 | 201 | 7.0 | 1 | 72.1 |

⑤ Fitting · Hydraulic hose



⑥ Air-oil convertor for pre-pressure type booster

| Model code | Oil capacity (ℓ) |
|--------------|------------------|
| AHU2-063-001 | 0.16 |
| AHU2-063-002 | 0.25 |
| AHU2-063-004 | 0.4 |
| AHU2-063-006 | 0.63 |
| AHU2-063-010 | 1 |
| AHU2-063-016 | 1.6 |



⑦ Pressure switch (For high pressure)

| Model code | Port size | Set pressure range MPa |
|------------|-------------------------------|------------------------|
| 0882100 | G ¹ / ₄ | 0.5~7MPa |
| 0882200 | | 1~16MPa |
| 0882300 | | 2.5~25MPa |
| 0882400 | | 4~40MPa |

⑧ Pressure gauge

| Model code | Port size | Remarks |
|------------|-------------------------------|---------------------------|
| PG150Q-2 | R ¹ / ₄ | 15MPa |
| PG250Q-2 | | 25MPa |
| PG150Q-2G | | 15MPa (With glycerine) |
| PG250Q-2G | | 25MPa (With glycerine) |

System is designed to convert air pressure to high oil pressure with booster for the high power application of small clamp head.

- It is appropriate for work hoisting performance or clamp head with high output needed for all strokes.
- High output of 0.15~4.5 tons is available optionally with non-phase by adjusting air pressure with an air regulator.
- As oil pressure is used, the balanced, accurate force is always available.

SPECIFICATIONS

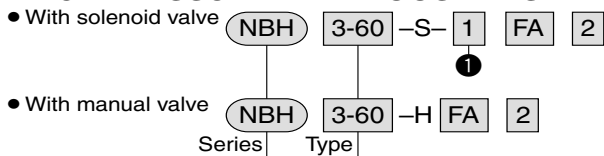
| Item | Model code | NBH3-40 | NBH3-60 | NBH3-60-130 | NBH-80 | NBH-100 |
|--|-----------------------------|--|------------|-------------|--------|---------|
| Boosting ratio | | 11 | 25 | 25 | 25 | 25 |
| Output oil capacity (cm ³) | | 77 | 77 | 130 | 176 | 304 |
| Theoretical output oil pressure at max. air pressure | | 10.8MPa | 17.5MPa | | | |
| Working oil | | Cosmo Mighty Super 10 (Cosmo Oil) | | | | |
| Temperature range | | +5~+60°C | | | | |
| Air pressure | Working fluid | Air | | | | |
| | Lubrication | Unnecessary (But possible) | | Necessary | | |
| | Pressure range | 0.2~1MPa | 0.2~0.7MPa | | | |
| | Recommended lubricating oil | JIS K2213-1 (Natural turbine oil ISO VG32) or equivalent | | | | |
| Weight (kg) | | 9.5 | 15 | 17 | 41 | 92 |
| With reed switch | | Available | | None | | |
| Related instruments | | Pressure switch · Pressure gauge | | | | |

MODEL CODE For order, specify the following code.

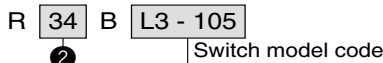
DIRECT PRESSURE TYPE BOOSTER



DIRECT PRESSURE TYPE BOOSTER SET



SWITCH-BRACKET ASSEMBLY

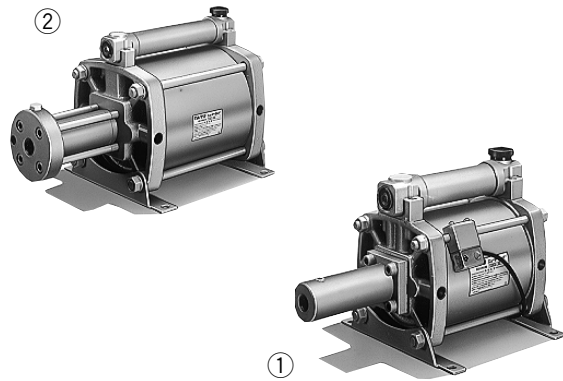


Select applicable switches out of the IRON PROXIMITY SWITCH SPECIFICATIONS

| ① | Solenoid valve voltage | | ② | Booster model code | |
|---|------------------------|------------------|-------------|--------------------|---------|
| | 1 | AC100V (50/60Hz) | | 34 | NBH3-40 |
| 2 | AC200V (50/60Hz) | 35 | NBH3-60 | | |
| 8 | DC24V | | NBH3-60-130 | | |

DELIVERY INFORMATION

- It is delivered with reed switch not mounted.
- It is delivered with working fluid (Cosmo Mighty Super 10) NBH-80 2 ℓ, NBH-100 3 ℓ.
- For NBH-80/NBH-100, there is no model with reed switch.



①NBH3-60 ②NBH-80

IRON PROXIMITY SWITCH SPECIFICATIONS

| Kind | With contact | | | |
|-------------------------------|--|-------------|----------------------------|-------------|
| | [FA] L3-101 | [FB] L3-105 | [FC] L3-241 | [FD] L3-245 |
| Switch symbol | AC:80~220V | | DC:20~28V | |
| Load voltage range | 2~20mA | | 3~50mA | |
| Load current range | 2VA | | 1.5W | |
| Maximum open / close capacity | Present | | Present | |
| Contact protective circuit | Neon lamp (lights up during ON) | | LED (lights up during OFF) | |
| Indicating lamp | 0.3mm ² 2-core, outside diameter φ5.3mm | | Rear wiring | |
| Wiring method | 1m | 5m | 1m | 5m |
| Code length | Small relay·Programmable controller | | | |
| Applied load | | | | |

ACTUAL OUTPUT

Unit: kN

| Booster | Clamp head | Operating air pressure MPa | | | | | | | | |
|-------------|-------------------|----------------------------|------|------|------|------|------|------|------|------|
| | | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 |
| NBH3-40 | LHA-LHA-25-LHA-40 | 2.7 | 4.1 | 5.5 | 6.9 | 8.2 | 9.6 | 11.0 | 12.4 | 13.5 |
| | LHAS-2 | 5.1 | 7.8 | 10.4 | 12.9 | 15.5 | 18.1 | 20.7 | 23.3 | 25.6 |
| | LHC | 2.5 | 3.8 | 5.1 | 6.4 | 7.7 | 8.9 | 10.2 | 11.5 | 12.6 |
| | LHD | 1.1 | 1.7 | 2.3 | 2.8 | 3.3 | 3.9 | 4.5 | 5.0 | 5.5 |
| NBH3-60 | LHA-LHA-25-LHA-40 | 6.2 | 9.3 | 12.3 | 15.5 | 18.5 | 21.7 | - | - | - |
| NBH3-60-130 | LHAS-2 | 11.7 | 17.5 | 23.3 | 29.1 | 35.0 | 40.8 | - | - | - |
| NBH-80 | LHC | 5.7 | 8.6 | 11.5 | 14.3 | 17.3 | 20.1 | - | - | - |
| NBH-100 | LHD | 2.5 | 3.8 | 5.0 | 6.3 | 7.6 | 8.8 | - | - | - |

AIR CONSUMPTION

Unit: Nℓ/1 Reciprocating motion

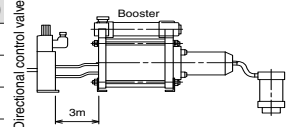
| Booster | Operating air pressure MPa | | | | | | | | |
|-------------|----------------------------|-----|------|-----|------|-----|-----|-----|------|
| | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 |
| NBH3-40 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 21.8 |
| NBH3-60 | 13.5 | 18 | 22.5 | 27 | 31.5 | 36 | - | - | - |
| NBH3-60-130 | 21.5 | 29 | 36 | 43 | 50 | 57 | - | - | - |
| NBH-80 | 31.5 | 42 | 52.5 | 63 | 73.5 | 84 | - | - | - |
| NBH-100 | 60 | 80 | 100 | 120 | 140 | 160 | - | - | - |

(Note) The above air consumption indicates the atmospheric pressure converted from air capacity in 1 reciprocating motion with respective air pressure by booster.

WORKING VELOCITY OF CLAMP HEAD

Unit: sec

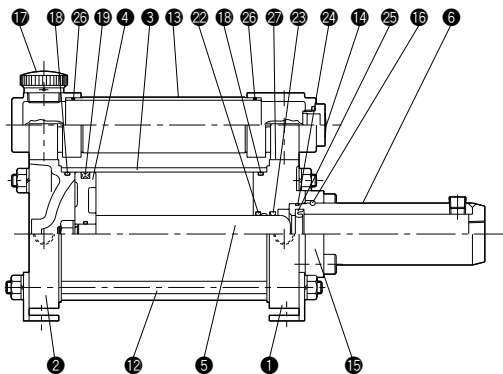
| Booster | Common for all clamp heads | |
|-------------|----------------------------|--------------------|
| | Stroke time (Push) | Stroke time (Pull) |
| NBH3-40 | 1 | 1 |
| NBH3-60 | 1.5 | 1.5 |
| NBH3-60-130 | 1.8 | 1.8 |
| NBH-80 | 2 | 2 |
| NBH-100 | 3.5 | 3.5 |



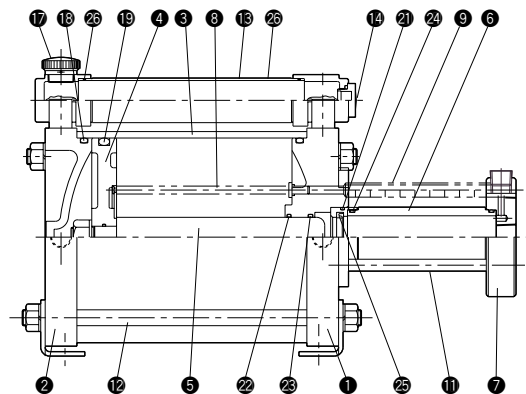
The working velocity of clamp head varies depending on booster to be used. The above table indicates the stroke time (push) and (pull) for the piping length of about 3m between booster and directional control valve. Based on the stroke time, the cycle time shall be set. For the direct pressure type booster set (product on order), it shall also be set according to the stroke time.

SECTIONAL DRAWINGS

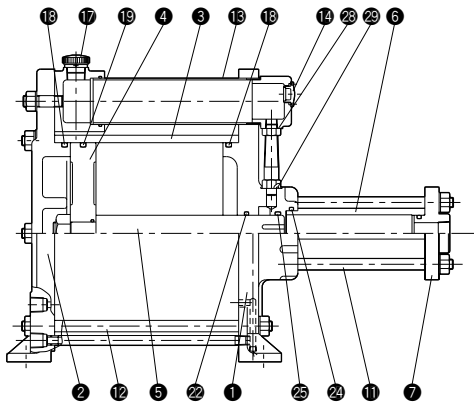
● NBH3-40/NBH3-60/NBH3-60-130



● NBH-80



● NBH-100



PARTS LIST

| No. | Name | Material | Q'ty |
|-----|-----------------------------------|--|------|
| ① | Hydraulic cylinder mounting cover | Gray cast iron | 1 |
| ② | Pneumatic cylinder cover | Gray cast iron | 1 |
| ③ | Pneumatic cylinder body | Aluminum alloy (NBH3-40-60) Carbon steel (NBH-80-100) | 1 |
| ④ | Pneumatic piston | Gray cast iron | 1 |
| ⑤ | Hydraulic piston | Carbon steel | 1 |
| ⑥ | Hydraulic cylinder body | Carbon steel | 1 |
| ⑦ | Hydraulic cap | Rolled steel | 1 |
| ⑧ | Indicator rod | Carbon steel | 1 |
| ⑨ | Indicator pipe | Resin | 1 |

| No. | Name | Material | Q'ty |
|-----|-------------------|--|------|
| ⑪ | Hydraulic tie rod | Chrome molybdenum steel | 4 |
| ⑫ | Pneumatic tie rod | Rolled steel | 4 |
| ⑬ | Reserve tube | Aluminum alloy (NBH3-40-60-NBH-80) Carbon steel (NBH-100) | 1 |
| ⑭ | Oil pot | Resin | 1 |
| ⑮ | Flange | Rolled steel | 1 |
| ⑯ | Ring | Hard steel wire | 1 |
| ⑰ | Lubricating plug | Resin | 1 |

SEAL LIST

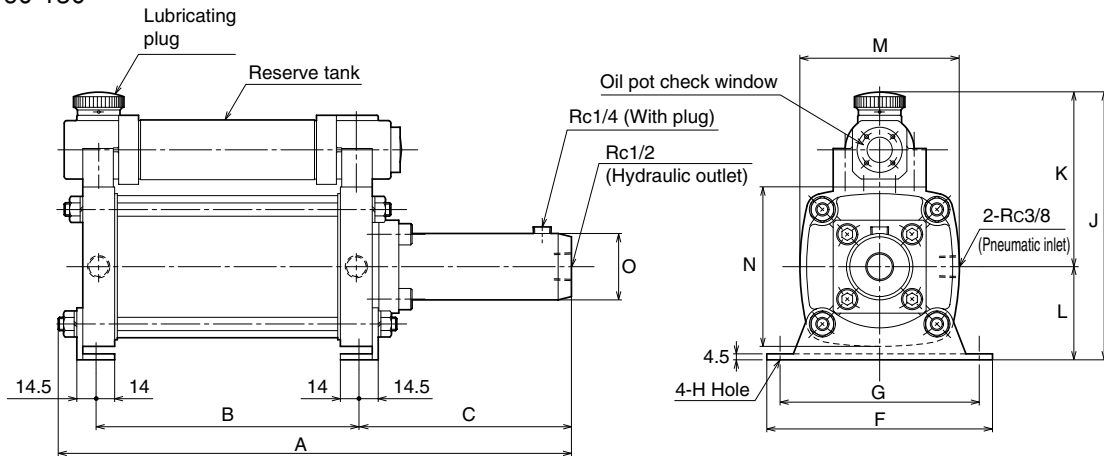
| Name | ⑬ | ⑰ | ⑲ | ⑳ | ㉑ | ㉒ | ㉓ | ㉔ | ㉕ | ㉖ | ㉗ | ㉘ |
|---------------------|----------------------|-----------------------|----------------|----------------|----------------|---------------------------------------|----------------|---------------------|---------------------|---------------------|-----------------|----------------|
| | Cylinder body gasket | Pneumatic piston seal | Gland gasket | Rod seal | Rod seal | Hydraulic cylinder body gasket | Hydraulic seal | Reserve tube gasket | Reserve tube gasket | Oil pipe nut gasket | Oil pipe gasket | |
| Material | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber |
| Quantity | 2 | 1 | 1 | 1 | 1 | 1(2)*1 | 1 | 2(1)*2 | 2 | 1 | 1 | |
| NBH3-40 | G95 | DXP100 | — | P30 | PS-30 | S46 | IDU-30 | AS568 030 | P15 | — | — | |
| NBH3-60-NBH3-60-130 | G145 | DXP150 | — | P30 | PS-30 | S46 | IDU-30 | AS568 030 | P15 | — | — | |
| NBH-80 | G190 | P185 | G55 | P40 | PS-40 | G50 | IDU-40 | AS568 030 | P15 | — | — | |
| NBH-100 | AS568 448 | AS568 448 | — | AS568 329 | — | AS568 ³²⁹ / ₃₃₃ | AS568 329 | G65 | — | P14 | P14 | |

● Numerical value in parenthesis *1 is that of NBH-80.
● Numerical value in parenthesis *2 is that of NBH-100.

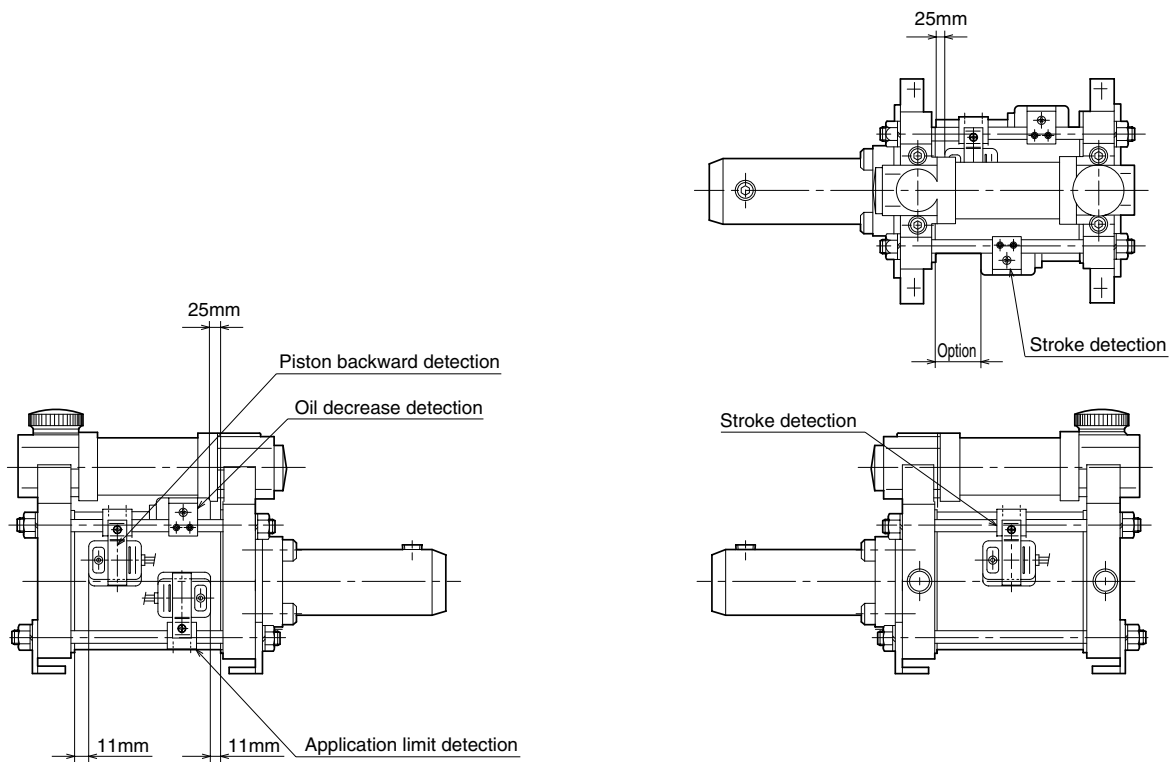
DIMENSIONAL DRAWINGS

Unit: mm

NBH3-40
NBH3-60
NBH3-60-130



SWITCH SET MOUNTING DIMENSION



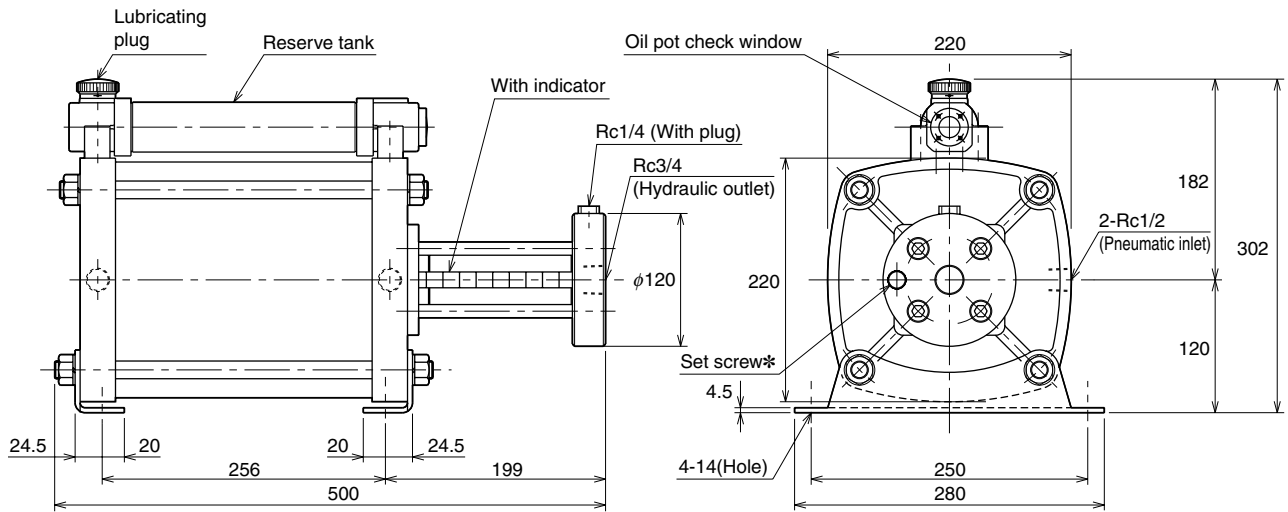
DIMENSIONAL TABLE

| Symbol Model code | A | B | C | F | G | H | J | K | L | M | N | O |
|----------------------|-----|-----|-----|-----|-----|----|-----|-----|----|-----|-----|-----|
| NBH3-40 | 389 | 198 | 160 | 170 | 150 | 9 | 202 | 132 | 70 | 120 | 120 | φ50 |
| NBH3-60 | 387 | 198 | 160 | 250 | 220 | 11 | 252 | 157 | 95 | 170 | 170 | φ50 |
| NBH3-60-130 | 537 | 273 | 235 | 250 | 220 | 11 | 252 | 157 | 95 | 170 | 170 | φ50 |

DIMENSIONAL DRAWINGS

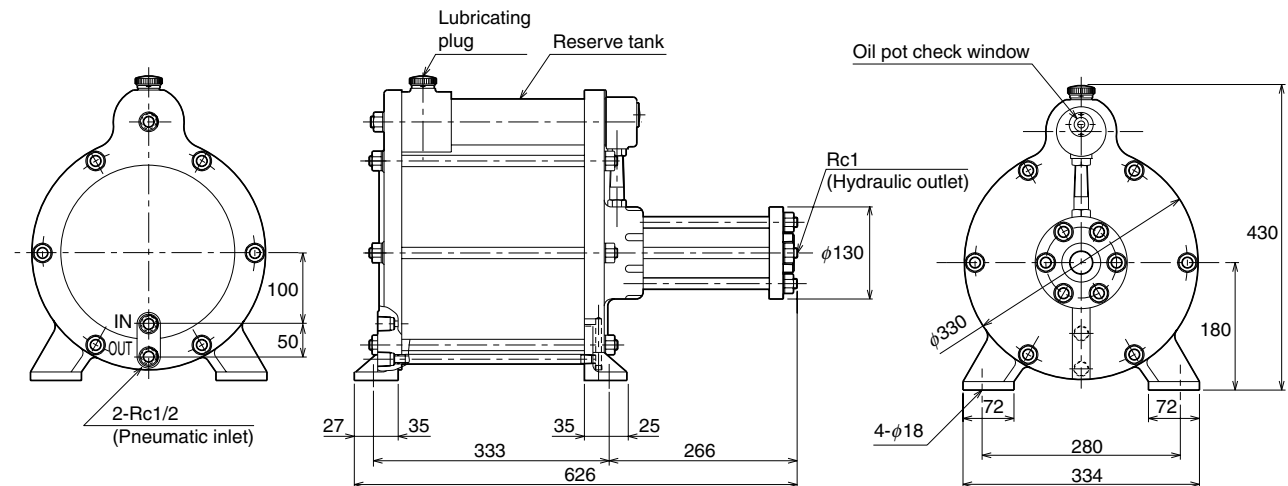
Unit: mm

NBH-80



Note*) Do not loosen the set screw of the end of indicator. (the indicator will loose and bolt out)

NBH-100



A set of booster, regulator, solenoid valve, manual valve located on one bed is produced on order.

SPECIFICATIONS

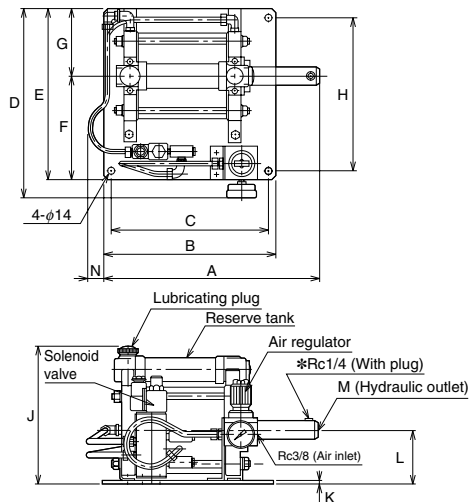
| Model code | NBH3-40-S | NBH3-60-S | NBH3-60-130-S | NBH-80-S | NBH3-40-H | NBH3-60-H | NBH3-60-130-H |
|--|---|--|---------------|----------|-----------------------|----------------------------|---------------|
| Boosting ratio | 11 | 25 | 25 | 25 | 11 | 25 | 25 |
| Output oil capacity (cm ³) | 77 | 77 | 130 | 176 | 77 | 77 | 130 |
| Theoretical output oil pressure at max. air pressure | 11.1MPa | 17.5MPa | | | 11.1MPa | 17.5MPa | |
| Working oil | Cosmo Mighty Super 10 (Cosmo oil) | | | | | | |
| Temperature range | +5~+60°C | | | | | | |
| Air Pressure | Working fluid | Air | | | | | |
| | Lubrication | Unnecessary (But possible) | | | Necessary | Unnecessary (But possible) | |
| | Pressure range | 0.2~1MPa | 0.2~0.7MPa | | | 0.2~1MPa | 0.2~0.7MPa |
| | Recommended lubricating oil | JIS K2213-1 (Natural turbine oil ISO VG32) or equivalent | | | | | |
| Weight | 15 | 22 | 25 | 54 | 15 | 22 | 25 |
| With reed switch | Available | | | None | Available | | |
| Applied valve | Solenoid valve 5ER-8E (5 port 2 position Air return type) Rated power supply : AC100V (50/60Hz), AC200V (50/60Hz), DC24V | | | | Manual valve (4PN-20) | | |
| Accessories | Pressure switch · Pressure gauge | | | | | | |

DIMENSIONAL DRAWINGS

Unit: mm

WITH SOLENOID VALVE

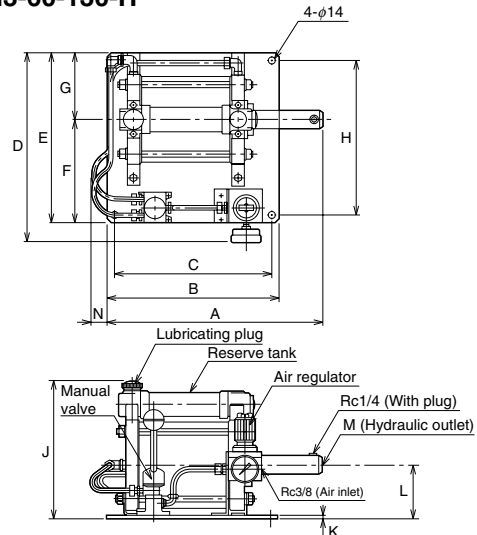
NBH3-40-S NBH3-60-S NBH3-60-130-S NBH-80-S



- For models NBH3-40-S·NBH3-60-S·NBH3-60-130-S·NBH-80-S, the style of set assembled on bed in the above drawings is indicated.
- For NBH-80-S, the external view of booster varies from that in the above drawings. * NBH-80-S is G1/4 (with plug).

WITH MANUAL VALVE

NBH3-40-H NBH3-60-H
NBH3-60-130-H



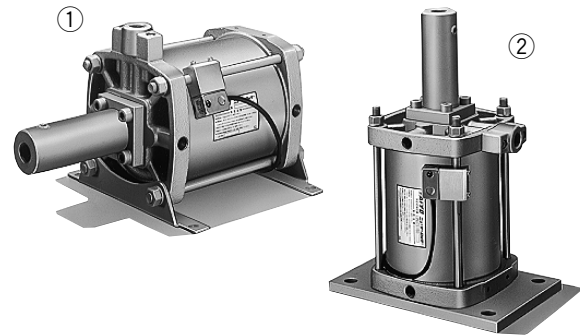
- For models NBH3-40-H·NBH3-60-H·NBH3-60-130H, the style of set assembled on bed in the above drawings is indicated.

DIMENSIONAL TABLE

| Symbol | A | B | C | D | E | F | G | H | J | K | L | M | N |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|--------------------------------|----|
| NBH3-40-S | 404 | 300 | 270 | 286 | 250 | 165 | 85 | 220 | 208 | 6 | 76 | Rc ¹ / ₂ | 35 |
| NBH3-60-S | 404 | 320 | 290 | 356 | 320 | 195 | 125 | 290 | 261 | 6 | 101 | Rc ¹ / ₂ | 30 |
| NBH3-60-130-S | 553 | 400 | 370 | 356 | 320 | 195 | 125 | 290 | 261 | 6 | 101 | Rc ¹ / ₂ | — |
| NBH-80-S | 520 | 400 | 370 | 430 | 440 | 275 | 165 | 410 | 313 | 8 | 128 | Rc ³ / ₄ | — |
| NBH3-40-H | 404 | 300 | 270 | 286 | 250 | 165 | 85 | 220 | 221 | 6 | 76 | Rc ¹ / ₂ | 35 |
| NBH3-60-H | 404 | 320 | 290 | 356 | 320 | 195 | 125 | 290 | 261 | 6 | 101 | Rc ¹ / ₂ | 30 |
| NBH3-60-130-H | 553 | 400 | 370 | 356 | 320 | 195 | 125 | 290 | 261 | 6 | 101 | Rc ¹ / ₂ | — |

System is designed to convert air pressure to high oil pressure with booster for the high power application of small clamp head.

- It is appropriate for working to pressurize after work is moved with long-stroke clamp head or hydraulic cylinder.
- High output is available optionally with non-phase by adjusting air pressure with an air regulator.
- As oil pressure is used, the balanced, accurate force is always available.



①PBH3-60 ②PBE3-60

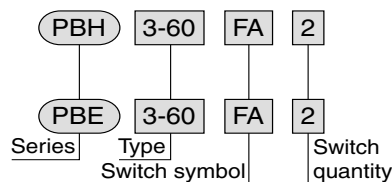
SPECIFICATIONS

| Item | Model code | PBH3-40-PBE3-40 | PBH3-60-PBE3-60 | PBH-80-PBE-80 |
|--|-----------------------------|--|-----------------|---------------|
| Boosting ratio | | 11 | 25 | 25 |
| Output oil capacity (cm ³) | | 77 | 77 | 176 |
| Theoretical output oil pressure at max. air pressure | | 11.1MPa | 17.5MPa | |
| Working oil | | Cosmo Mighty 10 (Cosmo Oil)/Duffny Spintex Oil 10 (Idemitsu Kosan)/Spinesso 10 (Esso Standard) | | |
| Temperature range | | +5~+60°C | | |
| Air pressure | Working fluid | Air | | |
| | Lubrication | Unnecessary (But possible) | | Necessary |
| | Pressure range | 0.2~1MPa | 0.2~0.7MPa | |
| | Recommended lubricating oil | JIS K2213-1 (Additive turbine oil ISO VG32) or equivalent | | |
| Weight (kg) | PBH (Foot type) | 9 | 14.5 | 40 |
| | PBE (Cap flange type) | 10.5 | 19 | 48 |
| With reed switch | | Available | | None |
| Accessories | | Pressure switch · Pressure gauge | | |

MODEL CODE For order, specify the following code.

PRE-PRESSURE TYPE BOOSTER

- Foot type



- Cap flange type

SWITCH-BRACKET ASSEMBLY

| | | | |
|--------------------|----|--|----------|
| R | 34 | B | L3 - 105 |
| Booster model code | | Switch model code | |
| 34 PB * 3-40 | | Select applicable switches out of the IRON PROXIMITY SWITCH SPECIFICATIONS | |
| 35 PB * 3-60 | | | |

DELIVERY INFORMATION

- It is delivered with reed switch not mounted.
- For PBH-80/PBE-80, there is no model with reed switch.
- It is delivered with working fluid (Cosmo Mighty Super 10) NBH-80 2 ℓ , NBH-100 3 ℓ .

IRON PROXIMITY SWITCH SPECIFICATIONS

| Kind | With contact | | | |
|-------------------------------|--|-----------|----------------------------|-----------|
| | FA L3-101 | FB L3-105 | FC L3-241 | FD L3-245 |
| Switch symbol | FA | FB | FC | FD |
| Load voltage range | AC:80~220V | | DC:20~28V | |
| Load current range | 2~20mA | | 3~50mA | |
| Maximum open / close capacity | 2VA | | 1.5W | |
| Contact protective circuit | Present | | Present | |
| Indicating lamp | Neon lamp (lights up during ON) | | LED (lights up during OFF) | |
| Wiring method | 0.3mm ² 2-core, outside diameter φ5.3mm Rear wiring | | | |
| Code length | 1m | 5m | 1m | 5m |
| Applied load | Small relay·Programmable controller | | | |

ACTUAL OUTPUT

Unit: kN

| Booster | Clamp head | Operating air pressure MPa | | | | | | | | | |
|--------------------|-------------------|----------------------------|------|------|------|------|------|------|------|------|--|
| | | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 | |
| PBH3-40 PBE3-40 | LHA-LHA-25-LHA-40 | 2.7 | 4.1 | 5.5 | 6.9 | 8.2 | 9.6 | 11.0 | 12.4 | 13.5 | |
| | LHAS-2 | 5.1 | 7.8 | 10.4 | 12.9 | 15.5 | 18.1 | 20.7 | 23.3 | 25.6 | |
| | LHC | 2.5 | 3.8 | 5.1 | 6.4 | 7.7 | 8.9 | 10.2 | 11.5 | 12.6 | |
| | LHD | 1.1 | 1.7 | 2.3 | 2.8 | 3.3 | 3.9 | 4.5 | 5.0 | 5.5 | |
| | LHF-28-60 | 1.2 | 1.8 | 2.4 | 3.0 | 3.6 | 4.2 | 4.8 | 5.4 | 5.9 | |
| | LHF-40-80 | 2.4 | 3.7 | 4.9 | 6.2 | 7.4 | 8.6 | 9.8 | 11.0 | 12.2 | |
| PBH3-60 PBE3-60 | LHA-LHA-25-LHA-40 | 6.2 | 9.3 | 12.5 | 15.5 | 18.5 | 21.7 | - | - | - | |
| | LHAS-2 | 11.7 | 17.5 | 23.3 | 29.1 | 35.0 | 40.8 | - | - | - | |
| | LHC | 5.7 | 8.6 | 11.5 | 14.3 | 17.3 | 20.1 | - | - | - | |
| | LHD | 2.5 | 3.8 | 5.0 | 6.3 | 7.6 | 8.8 | - | - | - | |
| | LHF-28-60 | 2.7 | 4.0 | 5.4 | 6.8 | 8.0 | 9.4 | - | - | - | |
| | LHF-40-80 | 5.5 | 8.2 | 11.1 | 13.8 | 16.6 | 19.3 | - | - | - | |
| PBH-80 PBE-80 | LHF-50-100 | 8.6 | 12.9 | 17.3 | 21.6 | 25.9 | 30.1 | - | - | - | |

AIR CONSUMPTION

Unit: Nℓ/1 Reciprocating motion

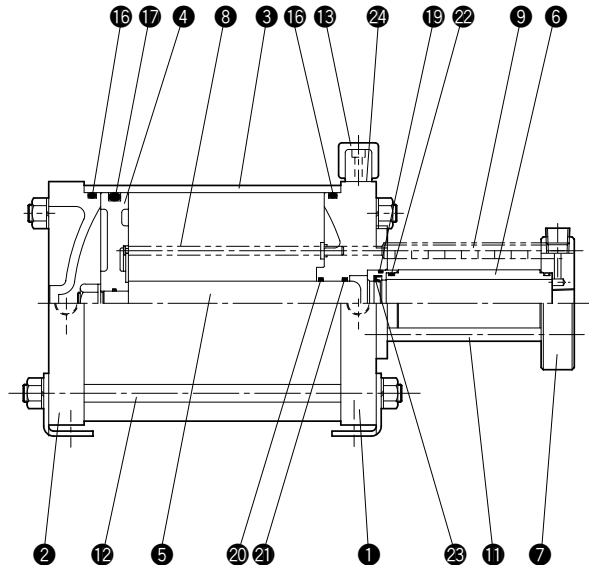
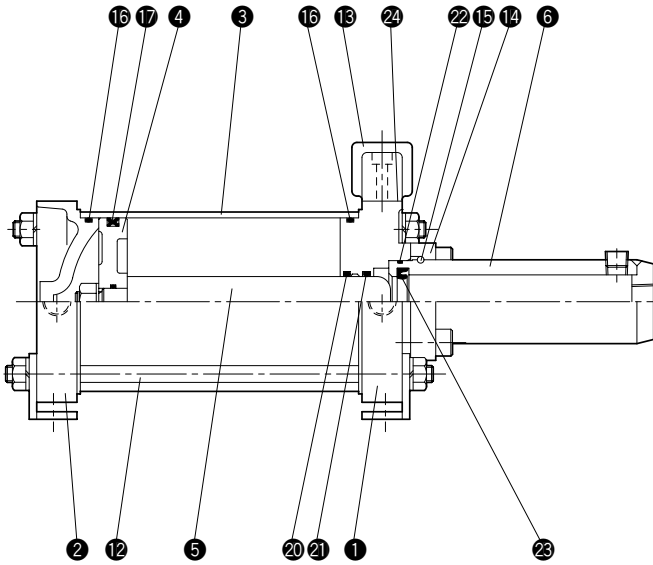
| Booster | Operating air pressure MPa | | | | | | | | | |
|-----------------|----------------------------|-----|------|-----|------|-----|-----|-----|------|--|
| | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 | |
| PBH3-40-PBE3-40 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 21.8 | |
| PBH3-60-PBE3-60 | 13.5 | 18 | 22.5 | 27 | 31.5 | 36 | - | - | - | |
| PBH-80-PBE-80 | 31.5 | 42 | 52.5 | 63 | 73.5 | 84 | - | - | - | |

(Note) The above air consumption indicates the atmospheric pressure converted from air capacity in 1 reciprocating motion with respective air pressure by booster.

SECTIONAL DRAWINGS

- PBH3-40 · PBE3-40
- PBH3-60 · PBE3-60

- PBH-80 · PBE-80



- The above drawings are the sectional drawings of PBH type (foot type).

PARTS LIST

| No. | Name | Material | Q'ty |
|-----|-----------------------------------|---|------|
| ① | Hydraulic cylinder mounting cover | Gray cast iron | 1 |
| ② | Pneumatic cylinder cover | Gray cast iron | 1 |
| ③ | Pneumatic cylinder body | Aluminum alloy (PB*-40-60) Carbon steel (PB*-80) | 1 |
| ④ | Pneumatic piston | Gray cast iron | 1 |
| ⑤ | Hydraulic piston | Carbon steel | 1 |
| ⑥ | Hydraulic cylinder body | Carbon steel | 1 |
| ⑦ | Hydraulic cap | Rolled steel | 1 |

| No. | Name | Material | Q'ty |
|-----|----------------------------|----------------------------------|------|
| ⑧ | Indicator rod | Carbon steel | 1 |
| ⑨ | Indicator pipe | Resin | 1 |
| ⑩ | Hydraulic tie rod | Chrome molybdenum steel (PB*-80) | 4 |
| ⑫ | Pneumatic tie rod | Rolled steel | 4 |
| ⑬ | Pre-pressure chamber joint | Aluminum alloy casting | 1 |
| ⑭ | Flange | Rolled steel | 1 |
| ⑮ | Ring | Hard steel wire | 1 |

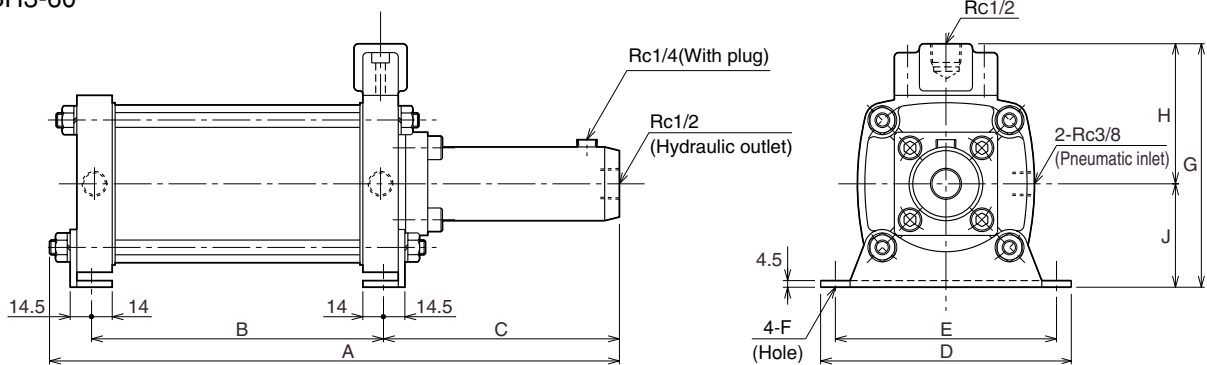
SEAL LIST

| Name | ⑬ | ⑭ | ⑮ | ⑯ | ⑰ | ⑱ | ⑲ | ⑳ |
|-----------------|----------------------|-----------------------|----------------|----------------|----------------|--------------------------------|----------------|-----------------------------------|
| Name | Cylinder body gasket | Pneumatic piston seal | Gland gasket | Rod seal | Rod seal | Hydraulic cylinder body gasket | Hydraulic seal | Pre-pressure chamber joint gasket |
| Material | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber | Nitrile rubber |
| Model code | Quantity | 2 | 1 | 1 | 1 | 1 | 1 | 2 |
| PBH3-40-PBE3-40 | G95 | DXP100 | — | P30 | PS-30 | S46 | IDU-30 | P15 |
| PBH3-60-PBE3-60 | G145 | DXP150 | — | P30 | PS-30 | S46 | IDU-30 | P15 |
| PBH-80-PBE-80 | G190 | P185 | G55 | P40 | PS-40 | G50 | IDU-40 | P15 |

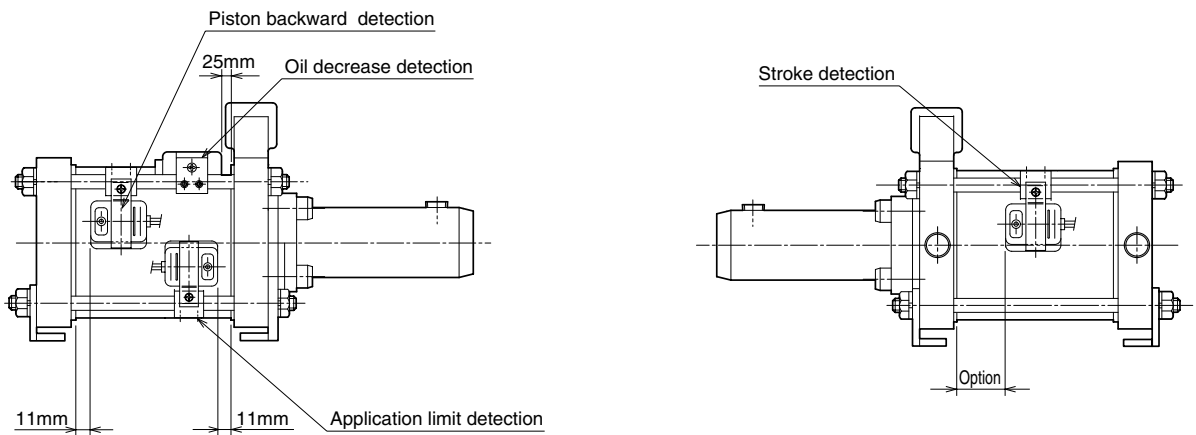
DIMENSIONAL DRAWINGS

Unit: mm

PBH3-40
PBH3-60

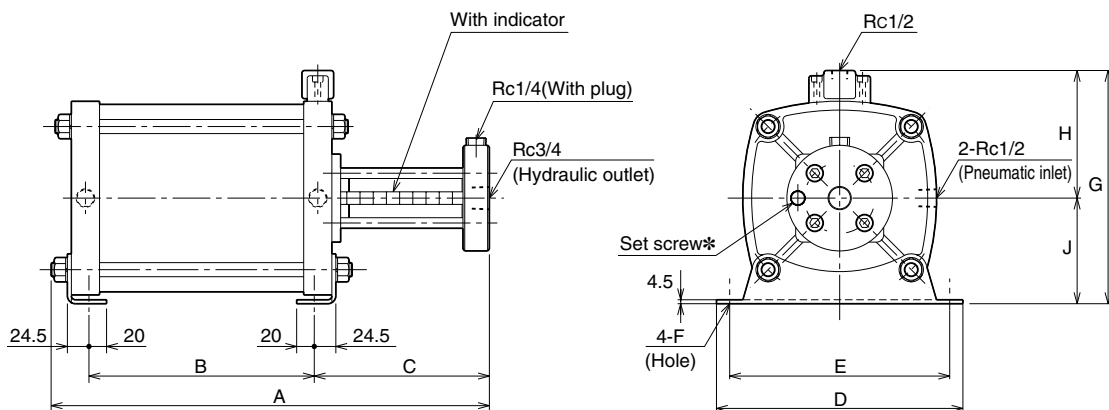


SWITCH SET MOUNTING DIMENSION



Please refer "HOW TO MOUNT SWITCH" (p.21) for switch mounting.

PBH-80



Note*) Do not loosen the set screw of the end of indicator. (the indicator will loose and bolt out)

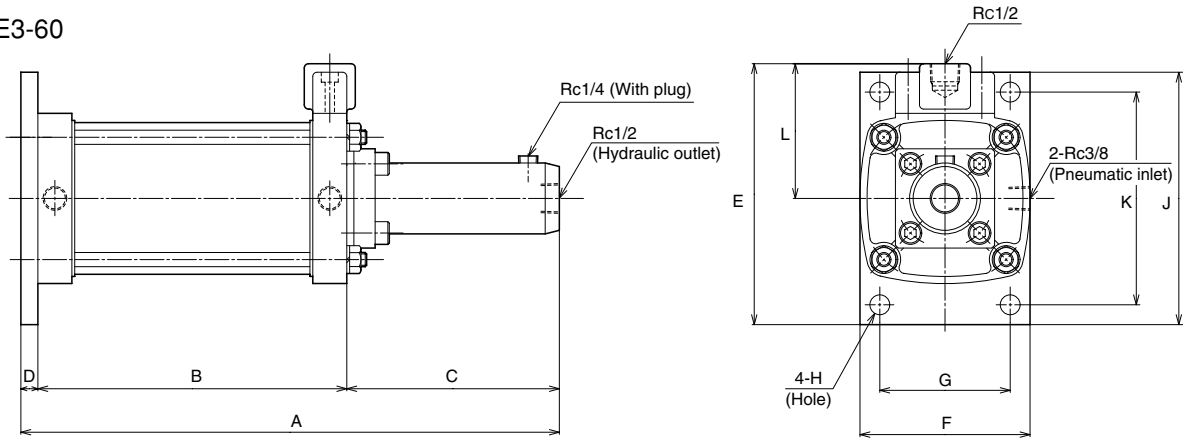
DIMENSIONAL TABLE

| Symbol Model code | A | B | C | D | E | F | G | H | J |
|----------------------|-----|-----|-----|-----|-----|----|-----|-----|-----|
| PBH3-40 | 384 | 198 | 160 | 170 | 150 | 9 | 165 | 95 | 70 |
| PBH3-60 | 387 | 198 | 160 | 250 | 220 | 11 | 215 | 120 | 95 |
| PBH-80 | 498 | 256 | 199 | 280 | 250 | 14 | 265 | 145 | 120 |

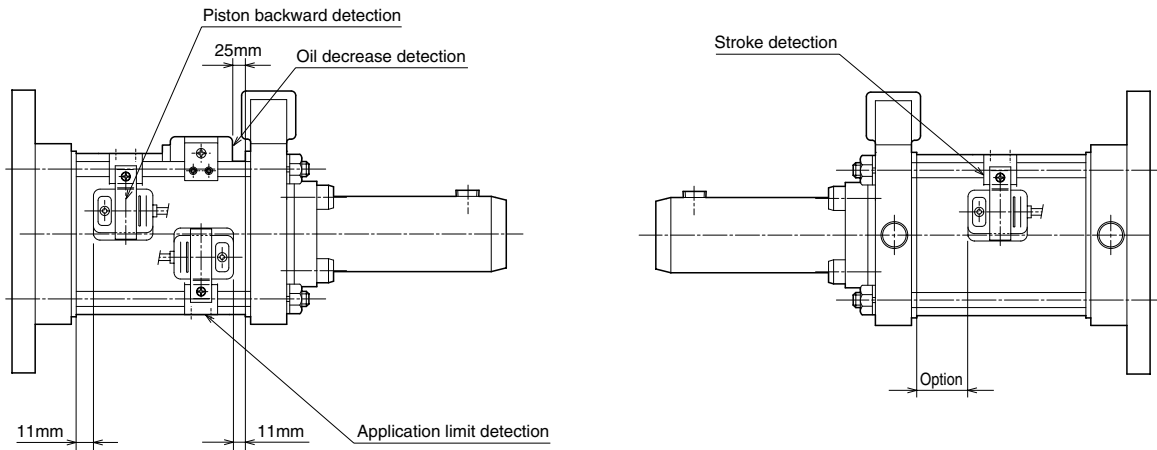
DIMENSIONAL DRAWINGS

Unit: mm

PBE3-40
PBE3-60

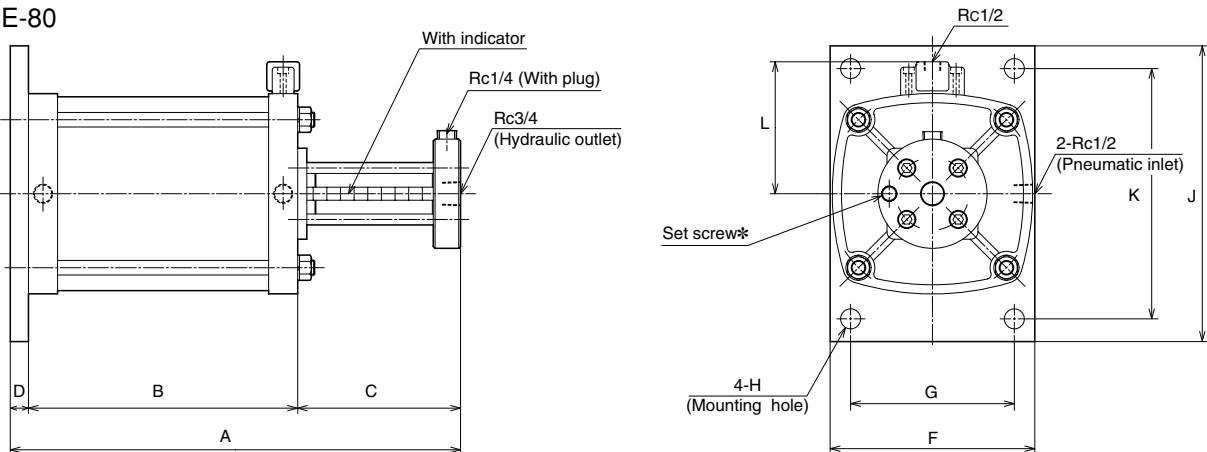


SWITCH SET MOUNTING DIMENSION



Please refer "HOW TO MOUNT SWITCH" (p.21) for switch mounting.

PBE-80



Note*) Do not loosen the set screw of the end of indicator. (the indicator will loose and bolt out)

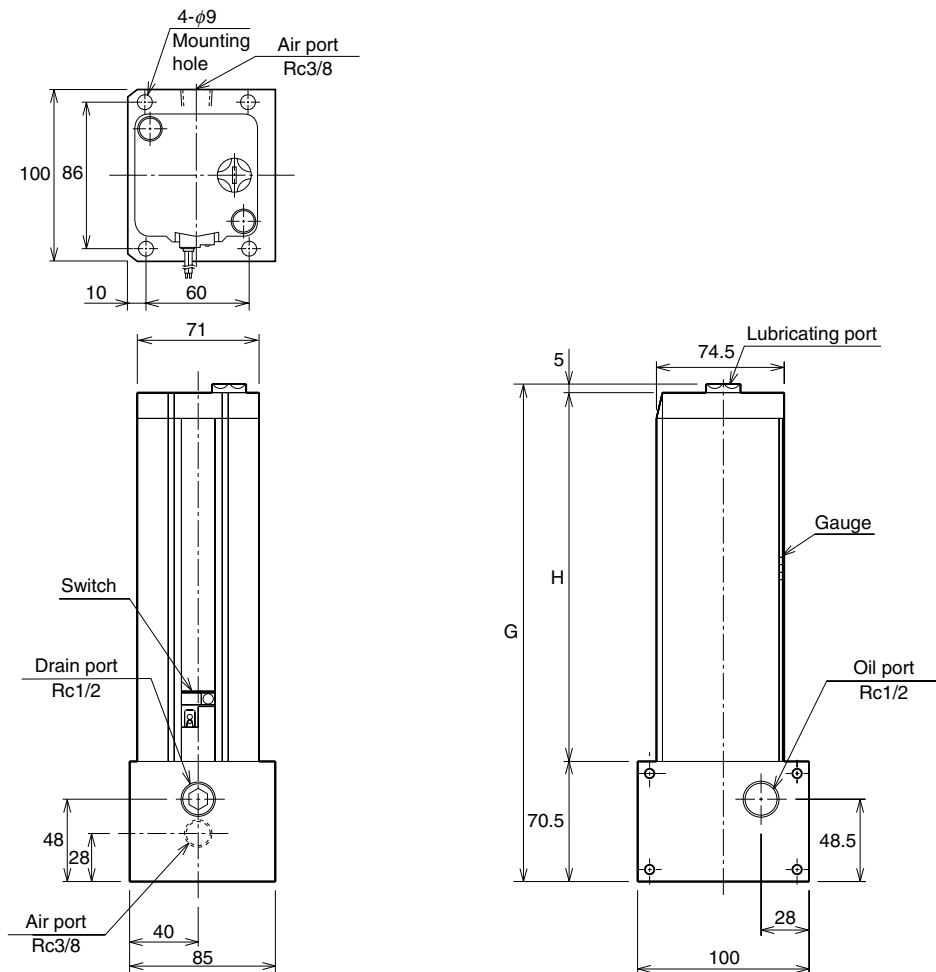
DIMENSIONAL TABLE

| Symbol Model code | A | B | C | D | E | F | G | H | J | K | L |
|----------------------|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|
| PBE3-40 | 380 | 218 | 150 | 12 | 184 | 120 | 92 | φ14 | 178 | 150 | 95 |
| PBE3-60 | 382 | 218 | 150 | 14 | 254 | 175 | 134 | φ18 | 270 | 220 | 120 |
| PBE-80 | 495 | 296 | 179 | 20 | - | 225 | 180 | φ22 | 325 | 275 | 145 |

DIMENSIONAL DRAWINGS/AHU2

Unit: mm

● CONVERTOR



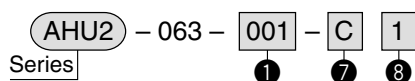
DIMENSIONAL TABLE

| Symbol Bore | G | | | | | | H | | | | | |
|----------------|--------|--------|-------|--------|-----|-------|--------|--------|-------|--------|-------|-------|
| | 0.16 l | 0.25 l | 0.4 l | 0.63 l | 1 l | 1.6 l | 0.16 l | 0.25 l | 0.4 l | 0.63 l | 1 l | 1.6 l |
| φ63 | 218 | 245 | 290 | 358 | 468 | 648 | 142.5 | 169.5 | 214.5 | 282.5 | 392.5 | 572.5 |

MODEL CODE

For order, specify the following code.

● CONVERTOR



| 1 | Convertor capacity | |
|-----|--------------------|--------------------|
| | 001 | 0.16 l |
| 002 | 0.25 l | |
| 004 | 0.4 l | |
| 006 | 0.63 l | |
| 010 | 1 l | |
| 016 | 1.6 l | |
| 7 | Switch symbol | |
| | C | ZR3(With lamp)1.5m |
| 8 | Switch quantity | |

- Single acting cylinder of spring return type.
- Clamp head can be selected according to application as there are six types.



①LHD ②LHC ③LHA ④LHA-25 ⑤LHA-40 ⑥LHAS-2

SPECIFICATIONS

| Item \ Model code | LHD | LHC | LHA | LHA-25 | LHA-40 | LHAS-2 |
|--|-----------------------------------|------|------|--------|--------|--------|
| Max. operating pressure | 17.5MPa | | | | | |
| Proof test pressure | 26.2MPa | | | | | |
| Temperature range | +5~+60°C | | | | | |
| Structure of cushioning | None | | | | | |
| Working Oil | Cosmo Mighty Super 10 (Cosmo Oil) | | | | | |
| Effective stroke (mm) | 6 | 7 | 12 | 24 | 38 | 20 |
| Effective piston area (mm ²) | 570 | 1340 | 1460 | 1460 | 1460 | 2640 |
| Max. stroke volume (cm ³) | 4 | 10.7 | 19 | 36.5 | 58.4 | 60.7 |
| Spring mounting load N | 31.4 | 56.9 | 113 | 134 | 101 | 127 |
| Max. spring load N | 72.6 | 90.2 | 196 | 226 | 274 | 255 |
| Weight (kg) | 0.5 | 1 | 2 | 2.2 | 2.5 | 5.2 |

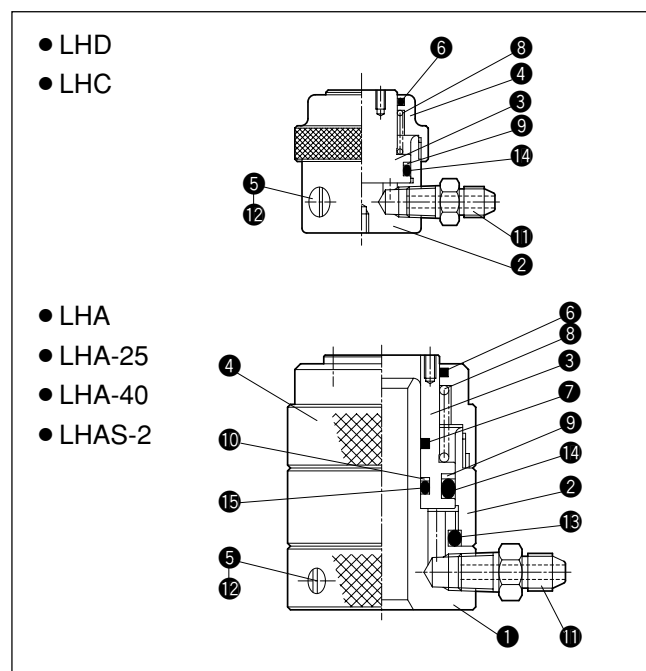
- The clamp head is the single acting cylinder of spring return type. As there is no force to return other tools, the external spring or outer force shall be applied for the return of tools.
- As the cylinder stop method can not be adopted, it shall be used at less than the effective stroke.
- Due to the inertia of load, please make sure the hydraulic pressure which risen in the cylinder is under the proof test pressure.

PARTS LIST

- Numerical value in parenthesis is that of LHAS-2.

| No. | Name | Material | Q'ty |
|-----|--------------------------------|----------------|------|
| ① | Upper cover | Rolled steel | 1 |
| ② | Cylinder | Rolled steel | 1 |
| ③ | Piston | Carbon steel | 1 |
| ④ | Lower cover | Rolled steel | 1 |
| ⑤ | Air vent | Rolled steel | 1(2) |
| ⑥ | Lower cover wiper | Tanned leather | 1 |
| ⑦ | Piston wiper | Tanned leather | 1 |
| ⑧ | Return spring | Piano wire | 1 |
| ⑨ | Back-up ring for piston shield | Fluoric resin | 1 |
| ⑩ | Back-up ring for piston | Fluoric resin | 1 |
| ⑪ | Hydraulic joint | Rolled steel | 1 |

SECTIONAL DRAWINGS



- LHD
- LHC

- LHA
- LHA-25
- LHA-40
- LHAS-2

SEAL LIST

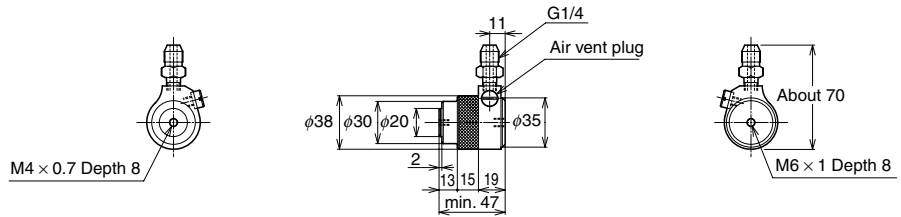
| Name | ⑫ | ⑬ | ⑭ | ⑮ |
|-------------------|-----------------|--------------------|----------------------|---------------|
| | Air vent O-ring | Upper cover O-ring | Piston shield O-ring | Piston O-ring |
| Model code \ Q'ty | 1 | 1 | 1 | 1 |
| LHD | P-7 | — | AS568 211 | — |
| LHC | P-7 | — | AS568 220 | — |
| LHA | P-7 | AS568 327 | AS568 326 | AS568 215 |
| LHA-25 | P-7 | AS568 327 | AS568 326 | AS568 215 |
| LHA-40 | P-7 | AS568 327 | AS568 326 | AS568 215 |
| LHAS-2 | P-7 | AS568 335 | AS568 333 | AS568 327 |

Note) For piston shield O-ring, piston O-ring, a back-up ring for respective size is mounted.

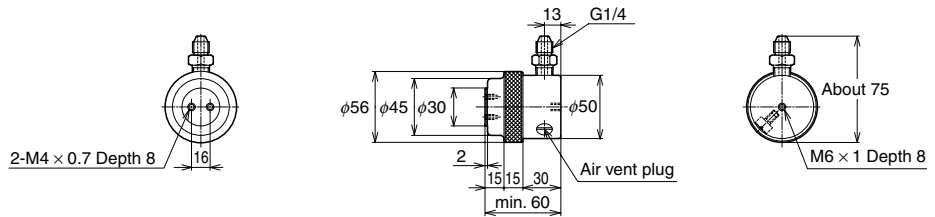
DIMENSIONAL DRAWINGS

Unit: mm

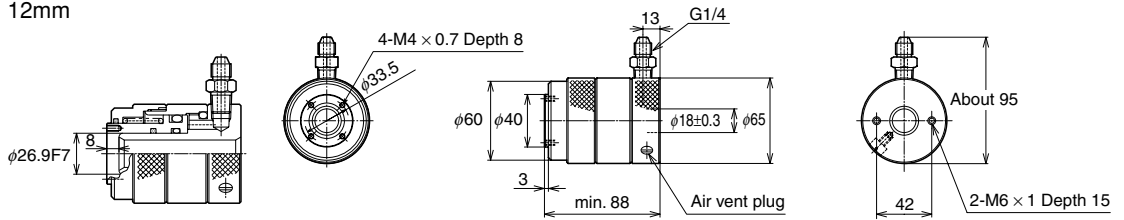
LHD
Effective stroke: 6mm



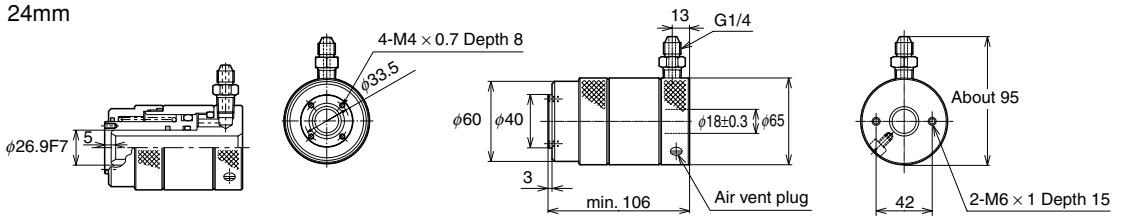
LHC
Effective stroke: 7mm



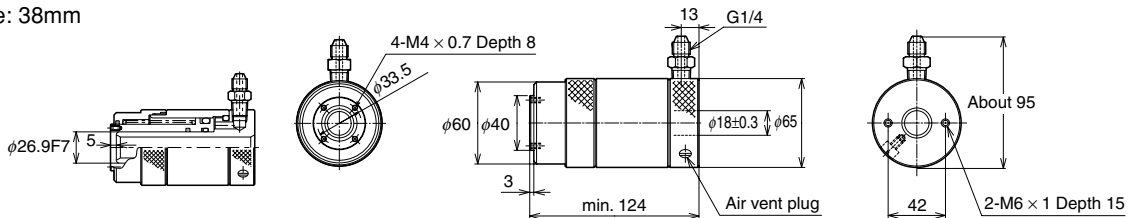
LHA
Effective stroke: 12mm



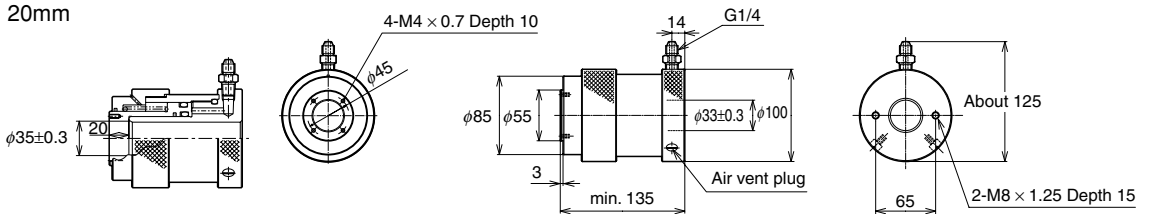
LHA-25
Effective stroke: 24mm



LHA-40
Effective stroke: 38mm

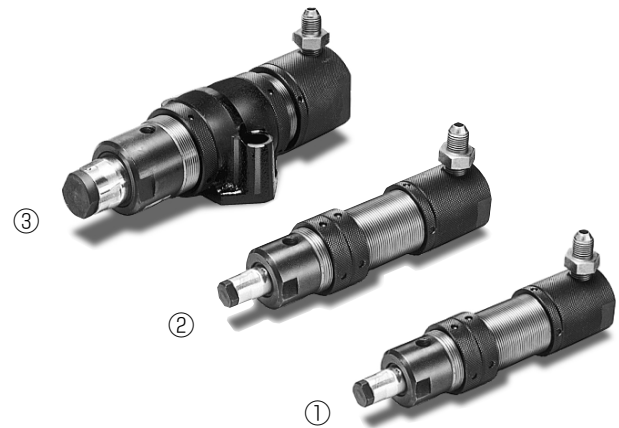


LHAS-2
Effective stroke: 20mm



CLAMP HEAD FOR PRE-PRESSURE TYPE BOOSTER

- Hydraulic single acting cylinder of air return type.
- Clamp head for pre-pressure type can be selected according to the application as there are three types.



①LHF-28-60 ②LHF-40-80 ③LHF-50-100

SPECIFICATIONS

| Item | Model code | LHF-28-60 | LHF-40-80 | LHF-50-100 |
|--|------------|----------------------------------|---------------------------------|----------------------------------|
| Proof test pressure (push) | | 26.2MPa | | |
| Temperature range | | +5~+60°C | | |
| Structure of cushioning | | None | | |
| Working oil | | Cosmo Mighty Super10 (Cosmo Oil) | | |
| Max. stroke | | 62 ⁰ _{-1.5} | 82 ⁰ _{-1.5} | 103 ⁰ _{-2.0} |
| Piston area (push) (mm ²) | | 610 | 1250 | 1950 |
| Max. working oil pressure (push) MPa | | 17.5 | 17.5 | 17.5 |
| Max. stroke oil capacity (push) (cm ³) | | 38 | 103 | 201 |
| Piston area (pull) (mm ²) | | 410 | 540 | 700 |
| Max. working air pressure (pull) MPa | | 1 | 1 | 1 |
| Max. stroke volume (pull) (cm ³) | | 25.7 | 43.2 | 72.1 |
| Weight (kg) | | 1.1 | 2.3 | 4.3 |
| Applied bracket | | D3600 V3600 H3600 | D4800 V4800 H4800 | D6000 V6000 H6000 |

- For calculating the air consumption (pull), multiply the above max. stroke volume (pull) by (gauge pressure +1).
- As the cylinder stop method can not be adopted, it shall be used at less than the max. stroke.

Note) In max. stroke, the output power will be 0 (zero). And the lower cover will be in danger of breakage, due to not well set up in strength by bump.

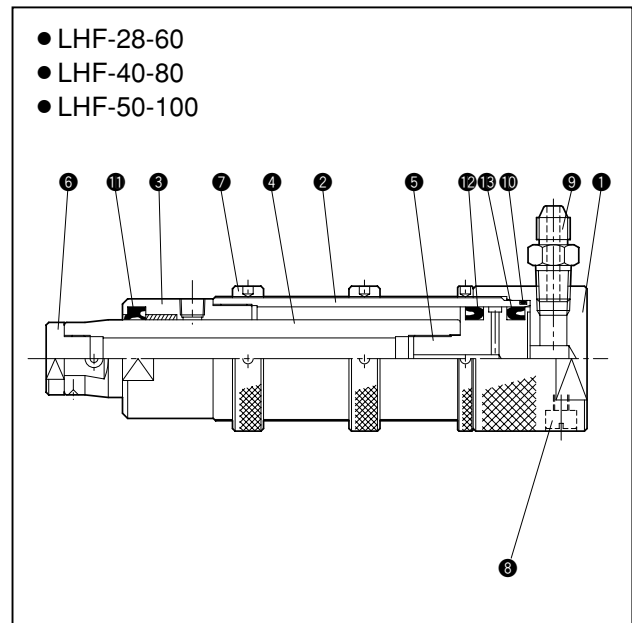
- Hydraulic single acting cylinder of air return type with clamp head designed specially for pre-pressure type booster. The return of clamp head with tools attached shall be performed with return spring and other mechanism.
- Due to the inertia of load, please make sure the hydraulic pressure which risen in the cylinder is under the proof test pressure.

PARTS LIST

| No. | Name | Material | Q'ty |
|-----|--------------------|--------------|------|
| ① | Upper cover | Carbon steel | 1 |
| ② | Tube | Carbon steel | 1 |
| ③ | Lower cover | Carbon steel | 1 |
| ④ | Rod | Carbon steel | 1 |
| ⑤ | Piston | Carbon steel | 1 |
| ⑥ | Rod end attachment | Carbon steel | 1 |
| ⑦ | Clamp ring | Carbon steel | 2 |
| ⑧ | Air vent plug | Rolled steel | 1 |
| ⑨ | Hydraulic joint | Rolled steel | 1 |

SECTIONAL DRAWINGS

- LHF-28-60
- LHF-40-80
- LHF-50-100

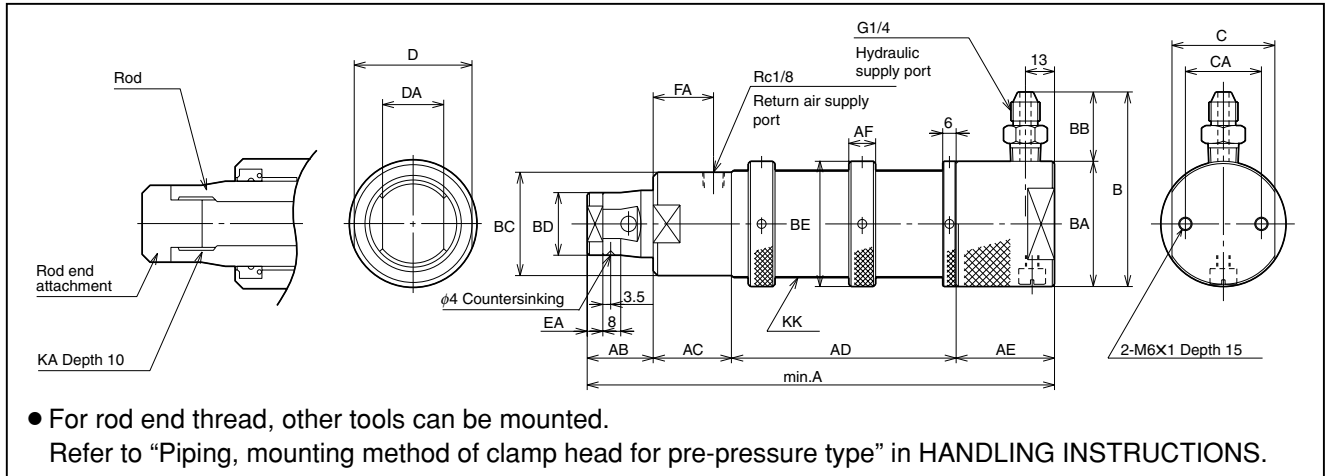


SEAL LIST

| Model code | Name | ⑩ | ⑪ | ⑫ | ⑬ | ⑭ |
|------------|------|-------------|----------|----------------------------|----------------------------|----------------------|
| | | Tube gasket | Rod seal | Piston seal (Air pressure) | Piston seal (Oil pressure) | Air vent plug O-ring |
| LHF-28-60 | | S-30 | DRP-16 | DOL-20 | ODU-28 | P-7 |
| LHF-40-80 | | S-42 | DRP-30 | DOL-30 | ODU-40 | P-7 |
| LHF-50-100 | | S-53 | DRP-40 | DOL-40 | ODU-50 | P-7 |

DIMENSIONAL DRAWINGS

Unit: mm

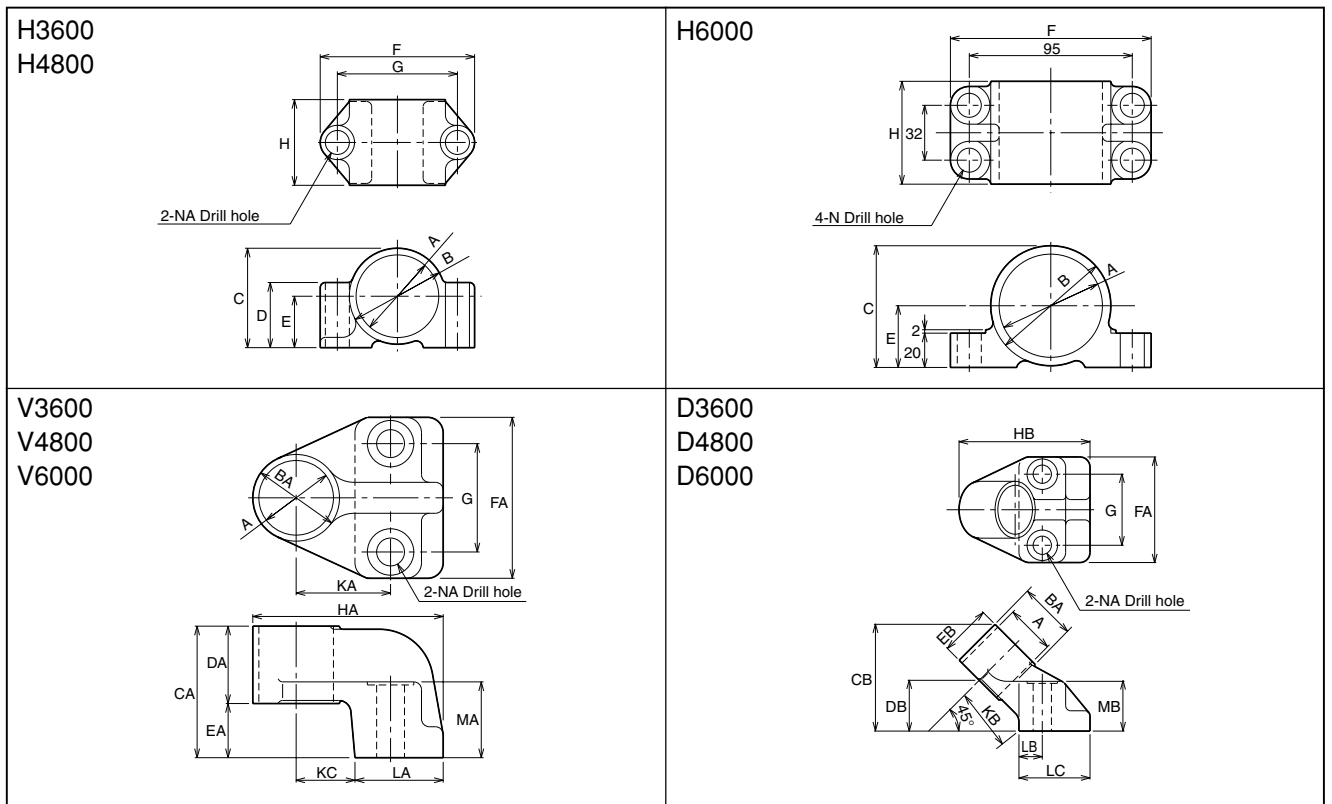


DIMENSIONAL TABLE

| Symbol Model code | A | AB | AC | AD | AE | AF | B | BA | BB | BC | BD | BE | C | CA | D | DA | EA | FA | KA | KK |
|----------------------|---------|------|----|------------------------------------|----|----|-----|----|----|------|------|----|----|----|----|----|----|----|---------|---------|
| LHF-28-60 | 178±0.5 | 27.5 | 28 | 78.5 ^{+1.5} ₀ | 44 | 12 | 72 | 42 | 30 | 34.2 | 15f8 | 42 | 38 | 26 | 32 | 12 | 5 | 20 | M10X1 | M36X1.5 |
| LHF-40-80 | 209±0.5 | 29.5 | 35 | 100.5 ^{+1.5} ₀ | 44 | 12 | 86 | 56 | 30 | 46.2 | 28f8 | 56 | 46 | 34 | 43 | 27 | 7 | 27 | M18X1.5 | M48X1.5 |
| LHF-50-100 | 231±0.5 | 29.5 | 35 | 120.5 ⁺² ₀ | 46 | 14 | 100 | 70 | 30 | 57 | 38f8 | 70 | 62 | 48 | 53 | 35 | 7 | 27 | M22X1.5 | M60X2 |

MOUNTING BRACKET

Unit: mm



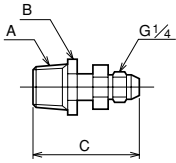
DIMENSIONAL TABLE

| Symbol Model code | A | B | BA | C | CA | CB | D | DA | DB | E | EA | EB | F | FA | G | H | HA | HB | MA | MB | N | NA | KA | KB | KC | LA | LB | LC |
|----------------------|------------------------------------|-----|-----|----|-----|-----|----|----|------|----|----|----|-----|-----|----|----|-----|-----|----|----|-----|-----|----|----|----|----|----|----|
| * 3600 | φ36.2 ^{+0.1} ₀ | φ42 | φ44 | 45 | 65 | 85 | 34 | 35 | 44.5 | 24 | 30 | 35 | 72 | 81 | 54 | 40 | 102 | 99 | 38 | 38 | φ11 | φ14 | 48 | 55 | 32 | 48 | 18 | 50 |
| * 4800 | φ48.2 ^{+0.1} ₀ | φ56 | φ56 | 58 | 85 | 105 | 38 | 50 | 50 | 30 | 35 | 50 | 90 | 104 | 70 | 50 | 123 | 129 | 49 | 49 | φ14 | φ18 | 61 | 63 | 38 | 57 | 23 | 70 |
| * 6000 | φ60.2 ^{+0.1} ₀ | φ70 | φ70 | 71 | 105 | 146 | — | 70 | 71.5 | 36 | 35 | 70 | 117 | 135 | 90 | 60 | 169 | 173 | 59 | 52 | φ14 | φ22 | 82 | 88 | 52 | 82 | 27 | 95 |

For mounting bracket, a hexagonal head cap bolt shall be used.

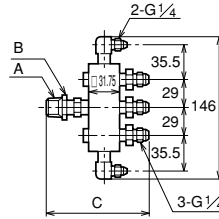
DIMENSIONAL DRAWINGS

Unit: mm



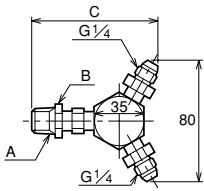
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|----|---|
| Model code | | | | |
| 1-1-40 | Rc1/2 | 23 | 47 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 1-1-80 | Rc3/4 | 29 | 49 | NBH-80 · PBH(E)-80 |
| 1-1-100 | Rc1 | 35 | 51 | NBH-100 |



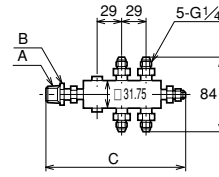
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|-----|---|
| Model code | | | | |
| 5-1-40 | Rc1/2 | 23 | 101 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 5-1-80 | Rc3/4 | 29 | 103 | NBH-80 · PBH(E)-80 |
| 5-1-100 | Rc1 | 35 | 105 | NBH-100 |



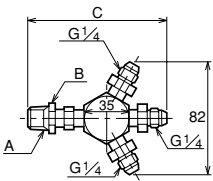
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|----|---|
| Model code | | | | |
| 2-1-40 | Rc1/2 | 23 | 87 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 2-1-80 | Rc3/4 | 29 | 89 | NBH-80 · PBH(E)-80 |
| 2-1-100 | Rc1 | 35 | 91 | NBH-100 |



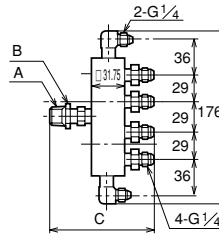
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|-----|---|
| Model code | | | | |
| 5-2-40 | Rc1/2 | 23 | 159 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 5-2-80 | Rc3/4 | 29 | 161 | NBH-80 · PBH(E)-80 |
| 5-2-100 | Rc1 | 35 | 163 | NBH-100 |



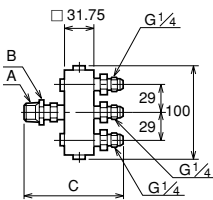
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|-----|---|
| Model code | | | | |
| 3-1-40 | Rc1/2 | 23 | 104 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 3-1-80 | Rc3/4 | 29 | 106 | NBH-80 · PBH(E)-80 |
| 3-1-100 | Rc1 | 35 | 108 | NBH-100 |



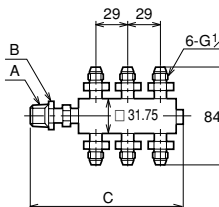
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|-----|---|
| Model code | | | | |
| 6-1-40 | Rc1/2 | 23 | 101 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 6-1-80 | Rc3/4 | 29 | 103 | NBH-80 · PBH(E)-80 |
| 6-1-100 | Rc1 | 35 | 105 | NBH-100 |



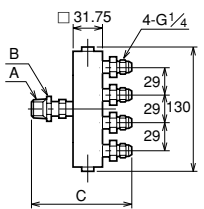
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|-----|---|
| Model code | | | | |
| 3-2-40 | Rc1/2 | 23 | 101 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 3-2-80 | Rc3/4 | 29 | 103 | NBH-80 · PBH(E)-80 |
| 3-2-100 | Rc1 | 35 | 105 | NBH-100 |



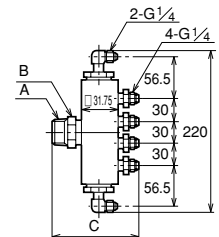
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|-----|---|
| Model code | | | | |
| 6-2-40 | Rc1/2 | 23 | 138 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 6-2-80 | Rc3/4 | 29 | 140 | NBH-80 · PBH(E)-80 |
| 6-2-100 | Rc1 | 35 | 142 | NBH-100 |



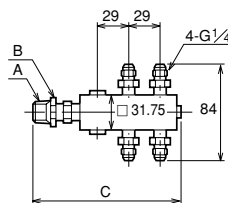
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|-----|---|
| Model code | | | | |
| 4-1-40 | Rc1/2 | 23 | 101 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 4-1-80 | Rc3/4 | 29 | 103 | NBH-80 · PBH(E)-80 |
| 4-1-100 | Rc1 | 35 | 105 | NBH-100 |



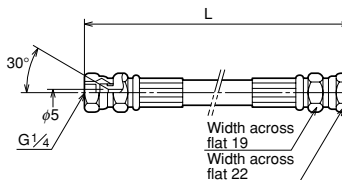
DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|-----|----------------------------|
| Model code | | | | |
| 6-1A-80 | Rc3/4 | 32 | 125 | NBH-80 PBH-80 PBE-80 |
| 6-1A-100 | Rc1 | 35 | 116 | NBH-100 |



DIMENSIONAL TABLE

| Symbol | A | B | C | Applied booster |
|------------|-------|----|-----|---|
| Model code | | | | |
| 4-2-40 | Rc1/2 | 23 | 138 | NBH3-40 · PBH(E)3-40 NBH3-60 · PBH(E)3-60 NBH3-60-130 |
| 4-2-80 | Rc3/4 | 29 | 140 | NBH-80 · PBH(E)-80 |
| 4-2-100 | Rc1 | 35 | 142 | NBH-100 |

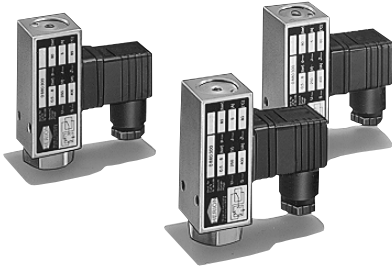


DIMENSIONAL TABLE

| Symbol | L(m) |
|------------|------|
| Model code | |
| OH-05 | 0.5 |
| OH-10 | 1 |
| OH-15 | 1.5 |
| OH-20 | 2 |

PRESSURE SWITCH

For details, refer to the catalog of Herion pressure switch 18D series.



SPECIFICATIONS (FOR HIGH PRESSURE)

| Model code | 0882100 | 0882200 | 0882300 | 0882400 |
|--------------------------------------|--|--------------|-------------|--------------|
| Item | | | | |
| Port size | G ¹ / ₄ | | | |
| Working fluid | Hydraulic oil, non-corrosive fluid | | | |
| Pressure setting range | 0.5 ~ 7MPa | 1 ~ 16MPa | 2.5 ~ 25MPa | 4 ~ 40MPa |
| Proof test pressure | 40MPa | | | 60MPa |
| Opening, closing pressure difference | 0.8 ~ 2MPa | 1.2 ~ 3.5MPa | 1.5 ~ 4MPa | 1.8 ~ 4.5MPa |
| Temperature range | -10°C ~ +70°C (Use in unfrozen condition.) | | | |
| Protective structure | Dust-proof, drop-proof structure (IP65) | | | |
| Accessories | Socket with neon lamp · Differential bore nipple | | | |
| Weight | 0.2kg | | | |

DIMENSIONAL DRAWINGS

Unit: mm

DIMENSIONAL TABLE

| Symbol | A | B | C |
|------------|----|---|----|
| Model code | | | |
| 0882100 | 76 | 6 | 21 |
| 0882200 | 76 | 6 | 21 |
| 0882300 | 77 | 7 | 22 |
| 0882400 | 77 | 7 | 22 |

PRESSURE GAUGE



• With no glycerine



• With glycerine

SPECIFICATIONS

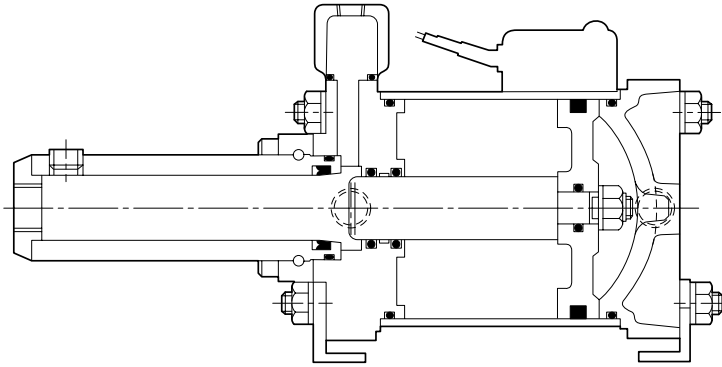
| Model code | Port size | Remarks |
|------------|-------------------------------|---------------------------|
| PG150Q-2 | R ¹ / ₄ | 15MPa |
| PG250Q-2 | R ¹ / ₄ | 25MPa |
| PG150Q-2G | R ¹ / ₄ | 15MPa (With glycerine) |
| PG250Q-2G | R ¹ / ₄ | 25MPa (With glycerine) |

DIMENSIONAL DRAWINGS

Unit: mm

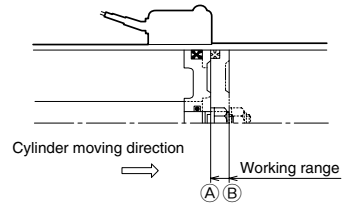
• Figure in parenthesis is the dimension of gauge with glycerine, contained.

WORKING EXPLANATION OF SWITCH SET

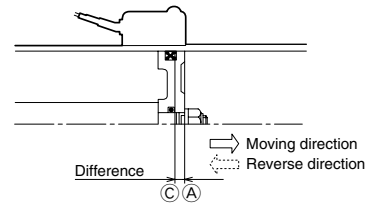


WORKING EXPLANATION

Reed switch, permanent magnet, protective circuit, operation check lamp are assembled in case; iron proximity switch of resin-mold structure is mounted at the periphery of aluminum tube; reed switch actuates with iron piston placed at lower position; and then the stroke position of cylinder is detected from outside without contact.



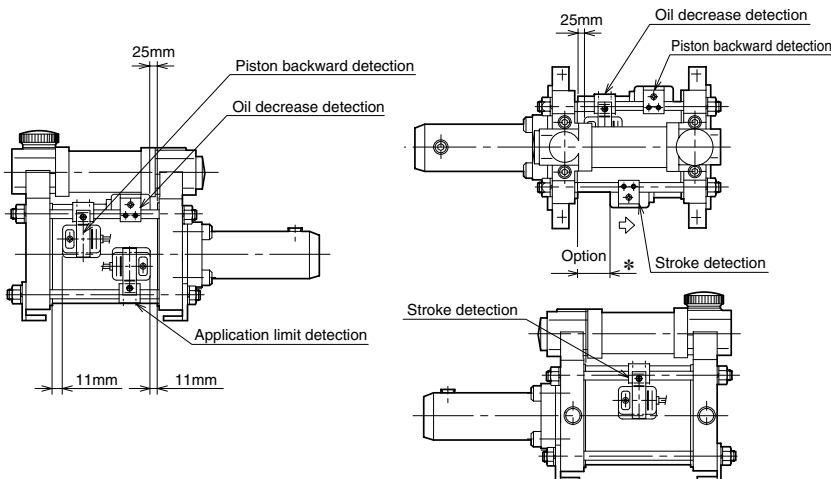
When the piston moves in the → direction and arrives at position ①, the reed switch actuates. The switch remains on from ① to ②. This is called the working range.



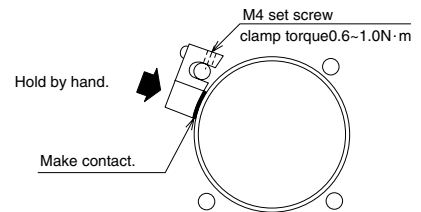
When the piston reaches position ① and then returns in the reverse direction ←, the switch remains on until the piston reaches position ③. The interval between ① and ③ is called the difference.

HOW TO USE SWITCH; SETTING OF DETECTING POSITION

- Stroke detection . . . Confirm the normal working at the pressurized side.
(If clamp head fails to stroke due to some trouble, switch is unable to detect. — Abnormal detection)
- Piston backward detection Confirm the normal working at the return side.
- Oil decrease detection If the oil leak is caused at clamp head and hydraulic hose when pressure is maintained for long time, piston moves forward. As it is detected when the output reaches about 90% of the max. output, make sure to inspect the oil supply and abnormal place.
- Application limit detection Output zero signal or suspension of peripheral instruments
(As the output becomes zero if piston of booster strokes to the end, it is detected just before the end.)



HOW TO MOUNT SWITCH



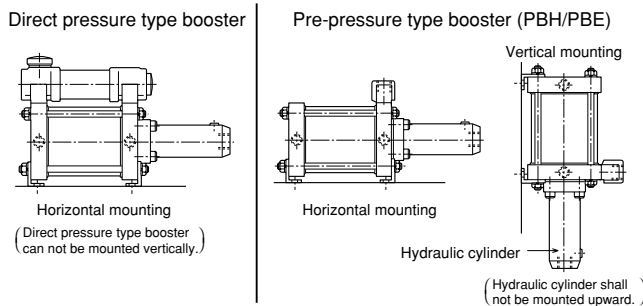
1. Slide switches on tie rods by loosening two M4 set screws with an allen wrench (2mm).
2. At the desired position, hold a switch by hand slightly and fix it by fastening set screws when the switch detection surface contacts the cylinder body.
Note) Please fasten the set-screw by correct tightening torque. If the tightening torque is incorrect, it may cause position displacement of the switch.
3. Indicating lamp turns off (AC) or turns on (DC) when switch actuates.

HANDLING INSTRUCTIONS

■ PRECAUTIONS FOR USE

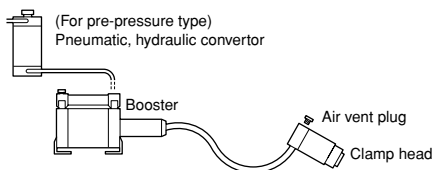
GENERAL CAUTIONS

- Booster shall be mounted at a little higher position than clamp head. If booster is mounted at too much higher position, oil pressure becomes large due to head and oil can not be returned with a return spring force of clamp head.
- Prior to use, it shall be surely ventilated for hydraulic piping.
- Clamp head shall be surely used at less than the effective stroke.
- Hydraulic hose shall not be bended extremely for use. The bending radius shall be over 300mm.
- Do not sprinkle cutting oil and lubricating oil on hydraulic hose as much as possible.
- Cosmo Mighty 10 (Cosmo Oil), Duffny Spintex Oil 10 (Idemitsu Kosan), Spinesso 10 (Esso Standard) shall be used as working oil.
- For setting a clamp head, load shall be applied vertically to the piston surface of clamp head, and it shall touch the whole of piston surface. Eccentric load may cause trouble.
- Booster shall be mounted according to the following drawings.



AIR VENTILATING METHOD

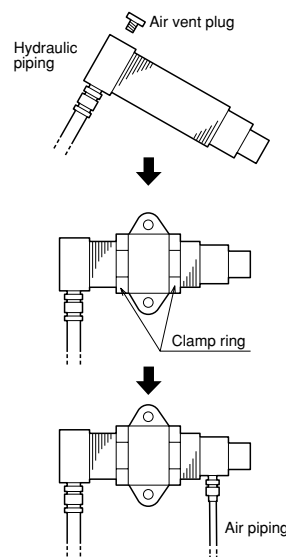
If air enters in working oil, air cushion will be caused when it is pressurized, and the clamping force will not be turned out as desired.



- ① For easy flow of working oil, a clamp head is located at the lower position than booster.
- ② The position of piston in booster is set at the most backward location.
- ③ Air vent plug of connected clamp head shall be loosened as much as possible for easy ventilation of air.
- ④ Working oil shall be put from oil port, and the lubrication shall be continued until the flow of oil from air vent plug mounting hole.

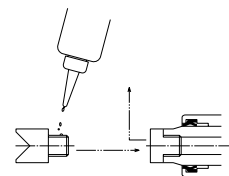
- ⑤ If bubble fails to come out of air vent plug mounting hole, an air vent plug shall be completely tightened.
- ⑥ After the completion of air ventilation as mentioned above, the working oil shall be located at midway of red round mark of oil gauge for direct pressure type booster and at over the lower limit of oil gauge of pneumatic, hydraulic convertor when clamp head starts the pre-pressure stroke for pre-pressure type booster to adjust the working oil capacity.
- ⑦ A cover shall be surely mounted at oil port.
- ⑧ If there is no output with the use of booster, the air mixing check (air ventilatio) shall be surely conducted.

PIPING, MOUNTING METHOD OF CLAMP HEAD FOR PRE-PRESSURE TYPE



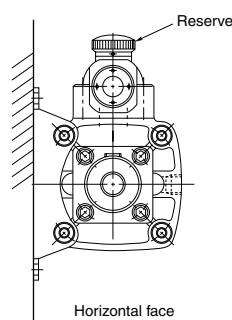
- Air is ventilated while clamp head is connected to booster.
- Clamp head with air ventilated is inserted in a mounting bracket, and the position of tools and work is set for fixing with a clamp ring.
- Air piping for return of clamp head is conducted.

• PREVENTION OF ROD END ATTACHMENT LOOSENING



It is able to remove a rod end attachment and to mount other tools. In this case, a loosening-proof medicine on sale at market shall be used.

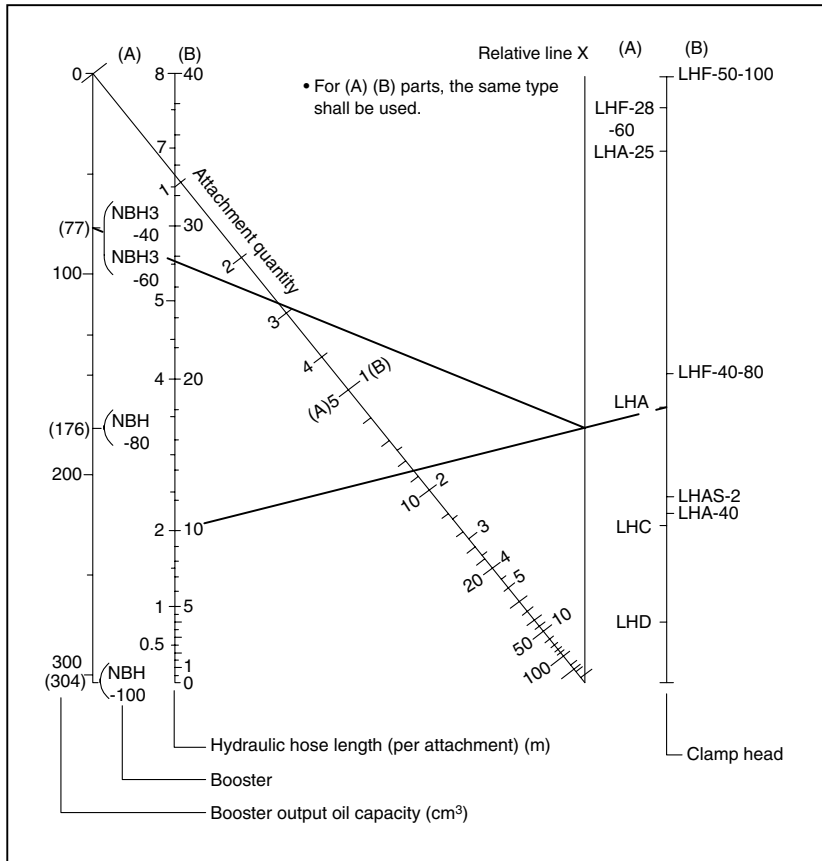
SPECIAL MOUNTING METHOD OF BOOSTER



For mounting at wall as in the left drawing, the fittings of NBH3-40 • NBH3-60 • NBH3-60-130 • NBH-80 shall be set as shown in drawing. (Such mounting method is not available for NBH-100.) Reserver shall be always mounted at the highest position. (Mounting contrary to the left drawing is forbidden.)

SELECTION MATERIALS

HOW TO SELECT CLAMP HEAD WITH USE OF DIRECT PRESSURE TYPE BOOSTER



(Example)

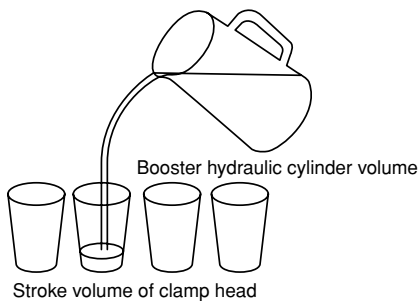
How many LHA clamp heads can be used in case of hydraulic hose 2m with NBH3-60?

(Answer)

As LHA is displayed at A side, a point of hydraulic hose length 2m in A side display and a point of LHA are connected. A crosspoint of this line and relative line X is connected with booster output oil capacity (NBH3-60: 77cm³). The quantity of attachments becomes about 2.8 pieces according to the value of A side display. But in this case, smaller quantity is surely adopted and it is set at 2 pieces.

HOW TO SELECT CLAMP HEAD

The quantity of clamp head to be used for one booster is set by the hydraulic cylinder volume of booster and the application volume of clamp head.



• Case of 1 type of clamp head

Quantity of usable clamp heads =

$$\frac{\text{Booster hydraulic cylinder volume}}{\text{Stroke volume per clamp head} + \text{Hydraulic hose expansion loss}} \times 0.85$$

Note) Hydraulic hose expansion loss is 5cm³ per 1m.
For pipe connection, the expansion loss is not calculated.

• Case of over 1 type of clamp head

$$0.85 > \frac{\text{Total volume of all clamp head strokes} + \text{Total expansion loss}}{\text{Booster hydraulic cylinder volume}}$$

Note) It is usable if the calculation of above formula is smaller than 0.85.

(Example)

How many LHA clamp heads are usable at the effective stroke 12mm with the application of NBH3-60? But hydraulic hose is 1m long.

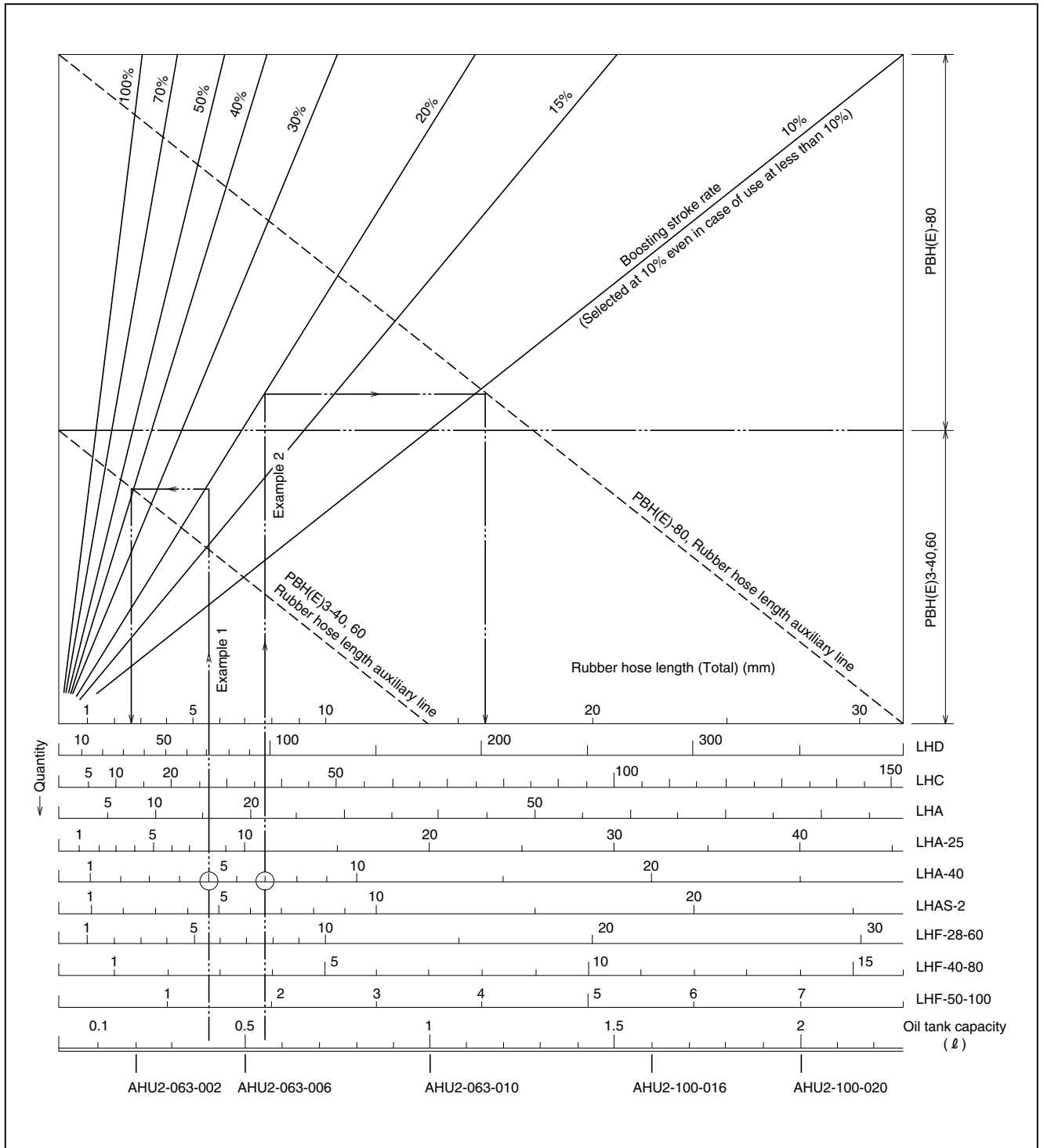
(Answer)

Stroke volume per LHA clamp head = Effective piston area × Applied stroke = 14 × 1.2 = 16.8cm³

Quantity of usable clamp heads = $\frac{77}{16.8 + 5} \times 0.85 = 3$

Less than 3 pieces usable

HOW TO SELECT CLAMP HEAD, PNEUMATIC, HYDRAULIC CONVERTOR WITH USE OF PRE-PRESSURE TYPE BOOSTER



(Example 1)

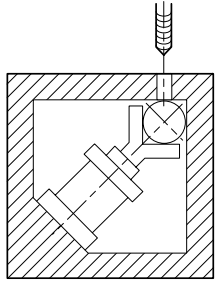
When 5 pieces of LHA-40 (maximum stroke 40mm) are used at the boosting stroke 8mm, the boosting stroke rate is $\frac{8}{40} \times 100 = 20\%$. The use of PBH(E)3-40 or PBH(E)3-60 and rubber hose piping of less than 2.6m are available. AHU2-063-006 is used for oil tank.

(Example 2)

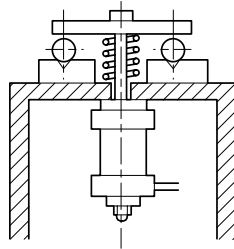
It is similar to Example 1. When 7 pieces are applied, the use of PBH(E)-80 and rubber hose piping of less than 16m are available. AHU2-063-010 with 0.56 ℓ is used for oil tank.

APPLICATION EXAMPLES OF DIRECT PRESSURE TYPE BOOSTER

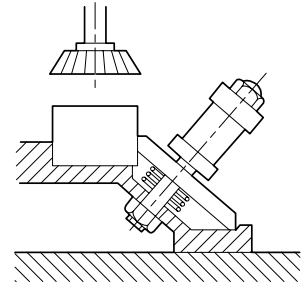
DRILL WORK



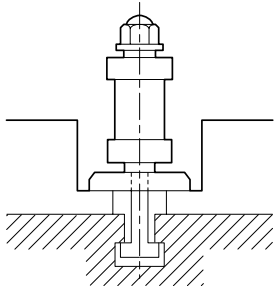
CLAMP WORK



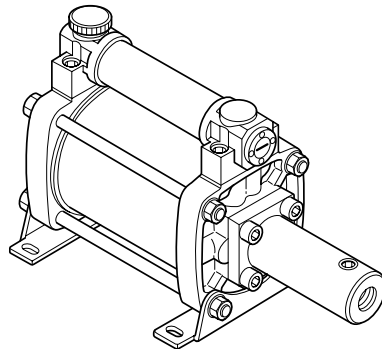
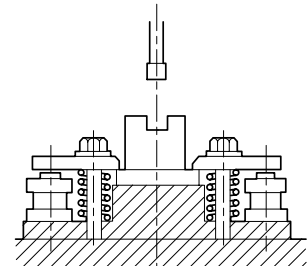
MILLING WORK



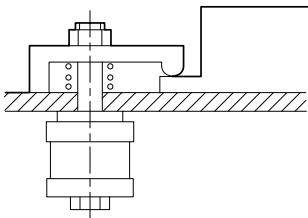
CLAMP WORK



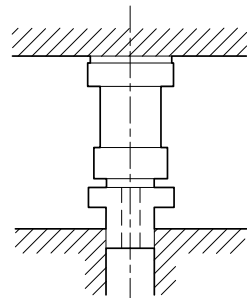
MILLING WORK



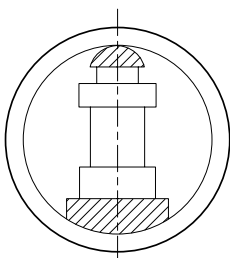
CLAMP WORK



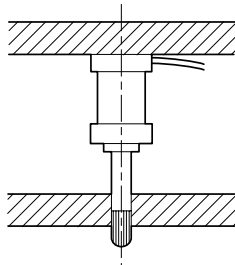
PRESSURIZING WORK



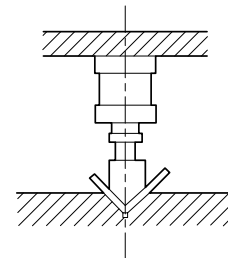
RECTIFICATION OF PIPE



PIN REMOVING WORK

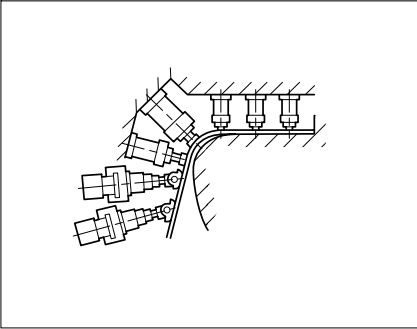


BENDING WORK

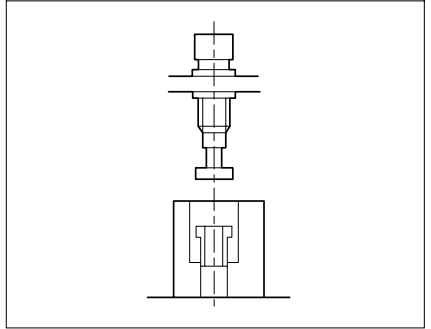


APPLICATION EXAMPLES OF PRE-PRESSURE TYPE BOOSTER

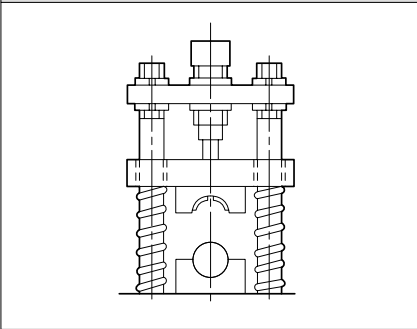
BENDING WORK



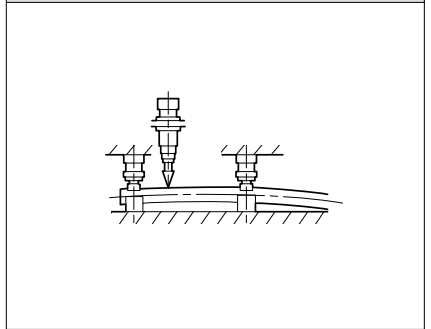
PRESSURIZING WORK IN DEEP HOLE PART



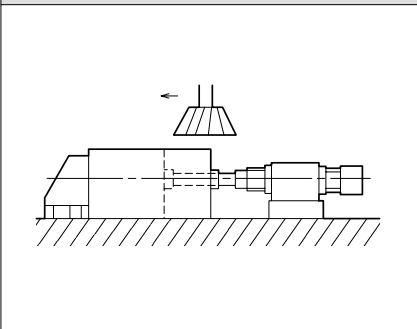
CAULKING WORK



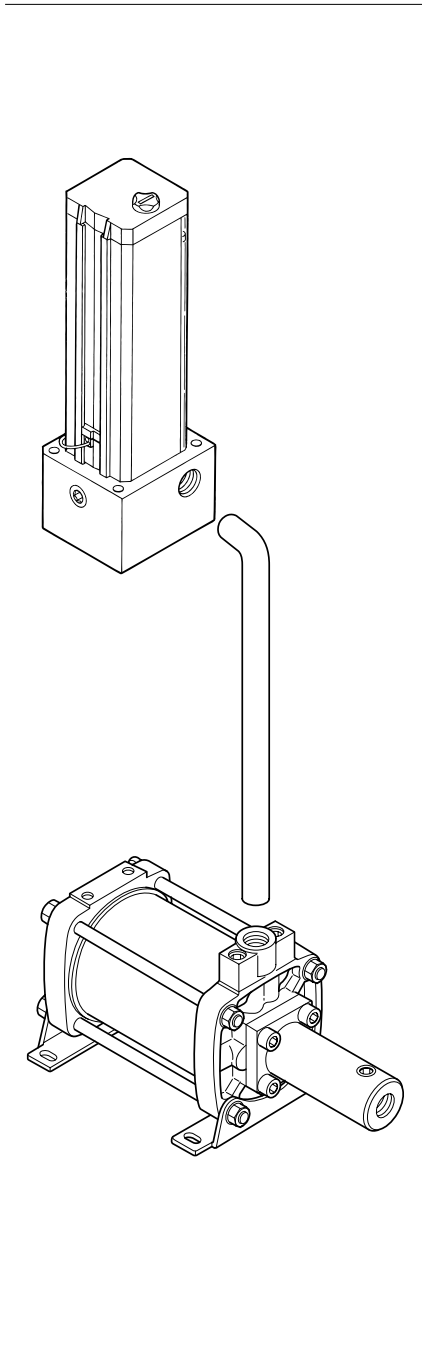
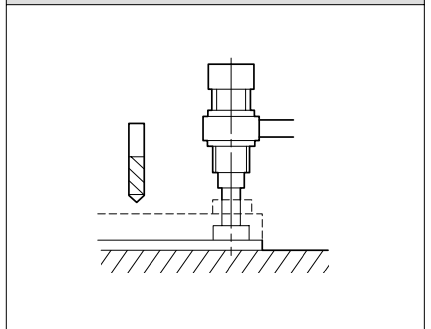
RECTIFICATION OF ROUND BAR



FIXING OF DIFFERENT-SIZE PROCESSED PRODUCT



FIXING OF DIFFERENT-SIZE PROCESSED PRODUCT



In accordance with the theory of booster, low air pressure is converted to high oil pressure, and the force is taken outside by hydraulic piston to use as power. With booster and clamp head in one unit, it is small and lightweight for easy application.

- With the cylindrical shape, both length and exterior dimension are small and it is also very compact.
- As cylinder volume is extremely small, the air consumption can be minimized.
- The mounting position can be adjusted with clamp ring, and the clamping will be performed quickly and completely with short stroke.
- It is the same as the dimensional drawing of old types but the output differs for some models.



SPECIFICATIONS

| Model code | Item | Nominal stroke (mm) | Boosting ratio | Theoretical clamping force at max. air pressure (kN) | Air pressure range | Weight (kg) |
|-------------|------|---------------------|----------------|--|--------------------|-------------|
| LE2-3603-03 | | 3 | 7.84 | 3.73 | 0.15~0.9MPa | 0.7 |
| LE2-3606-03 | | 6 | | | | 0.9 |
| LE2-3609-03 | | 9 | | | | 1.0 |
| LE2-4803-08 | | 3 | 8.16 | 8.34 | 0.15~0.9MPa | 1.3 |
| LE2-4806-08 | | 6 | | | | 1.5 |
| LE2-4809-08 | | 9 | | | | 1.7 |
| LE2-4812-08 | | 12 | | | | 2.0 |
| LE2-4803-12 | | 3 | 16 | 12.1 | 0.15~0.7MPa | 1.4 |
| LE2-6006-18 | | 6 | 11 | 18.0 | 0.15~0.9MPa | 2.6 |
| LE2-6009-18 | | 9 | | | | 3.4 |
| LE2-6012-18 | | 12 | | | | 3.8 |
| LE2-6003-21 | | 3 | 17.36 | 20.8 | 0.15~0.7MPa | 2.5 |
| LE2-6006-21 | | 6 | | | | 3.7 |

Value 1mm less than the nominal stroke shall be used as the effective stroke.

Common specifications:

- Working fluid... Air
- Lubrication..... Non-lubrication available
- Working oil..... Mobile Oil-made: Extra Hekla Super cylinder oil
- Temp. range.... +5°C ~ + 60°C

MODEL CODE

For order, specify the following code.

LE2 - 48 03 - 08
Series ① ② ③

| ① | Outer diameter screw | | ③ | Nominal clamping force | |
|----|----------------------|-----------|--------|------------------------|--------|
| | 36 | M36 X 1.5 | | 03 | 2.94kN |
| 48 | M48 X 1.5 | 08 | 7.85kN | | |
| 60 | M60 X 2 | 12 | 11.8kN | | |
| ② | Nominal stroke | | 18 | 17.7kN | |
| | 03 | 3mm | 21 | 20.6kN | |
| | 06 | 6mm | | | |
| | 09 | 9mm | | | |
| | 12 | 12mm | | | |

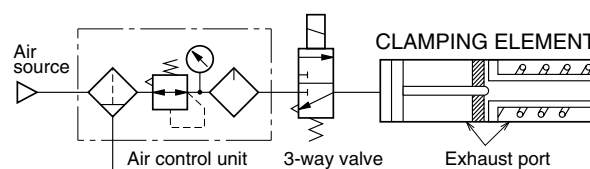
THEORETICAL CLAMPING FORCE

Unit : kN

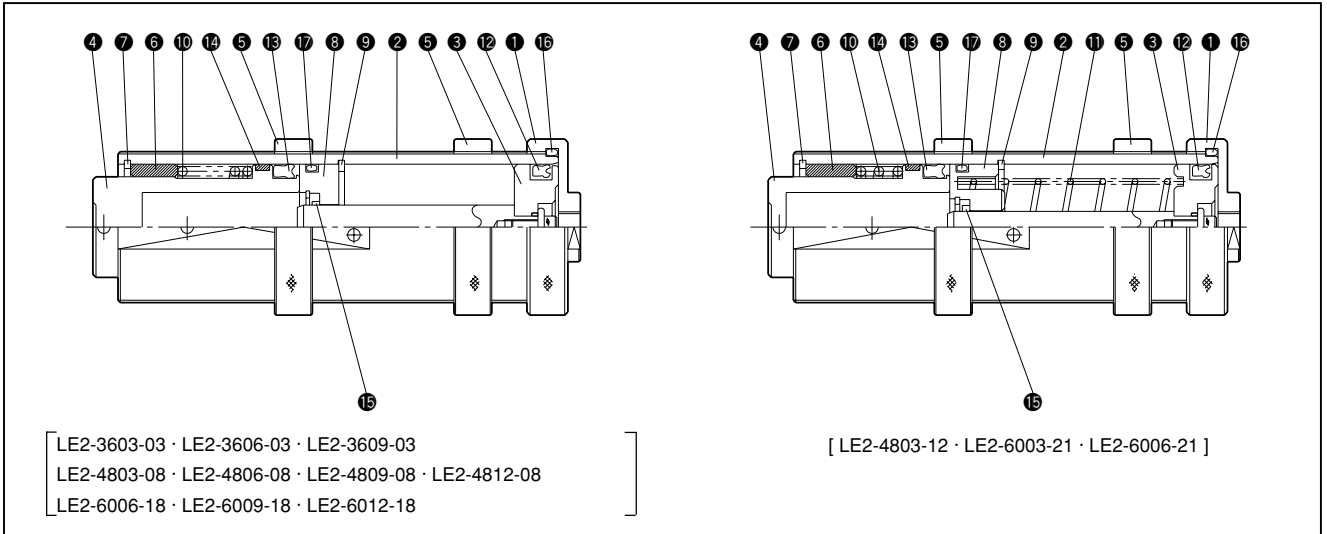
| Model code | Item | Air pressure (MPa) | | | | | | | | |
|-------------|------|--------------------|-------|------|------|------|------|------|------|------|
| | | 0.15 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| LE2-3603-03 | | | | | | | | | | |
| LE2-3606-03 | | 0.392 | 0.637 | 1.08 | 1.52 | 1.96 | 2.40 | 2.84 | 3.29 | 3.73 |
| LE2-3609-03 | | | | | | | | | | |
| LE2-4803-08 | | | | | | | | | | |
| LE2-4806-08 | | 0.981 | 1.47 | 2.45 | 3.43 | 4.41 | 5.39 | 6.37 | 7.35 | 8.34 |
| LE2-4809-08 | | | | | | | | | | |
| LE2-4812-08 | | | | | | | | | | |
| LE2-4803-12 | | 1.67 | 2.50 | 4.41 | 6.37 | 8.24 | 10.2 | 12.1 | — | — |
| LE2-6006-18 | | | | | | | | | | |
| LE2-6009-18 | | 2.60 | 3.63 | 5.69 | 7.75 | 9.81 | 11.9 | 13.9 | 16.0 | 18.0 |
| LE2-6012-18 | | | | | | | | | | |
| LE2-6003-21 | | 3.33 | 4.9 | 7.85 | 11.3 | 14.5 | 17.7 | 20.8 | — | — |
| LE2-6006-21 | | | | | | | | | | |

STRUCTURE

The inside structure of clamping element is very simple. Power is generated for hydraulic piston after a boosting piston of pneumatic cylinder in rear part of the body is inserted in hydraulic chamber and a large oil pressure is generated with the area ratio of pneumatic and hydraulic pistons. The hydraulic piston is returned with spring when pneumatic circuit is cut off. The surface of hydraulic piston is grinded with hardening and then is inserted in non-lubricating guide bush for smooth working



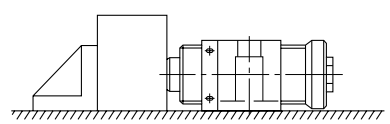
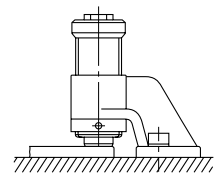
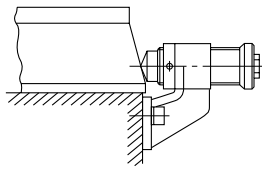
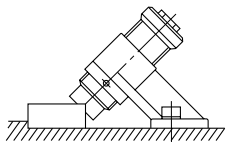
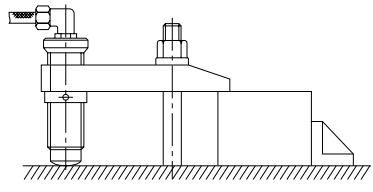
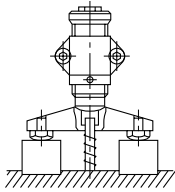
SECTIONAL DRAWINGS



PARTS LIST

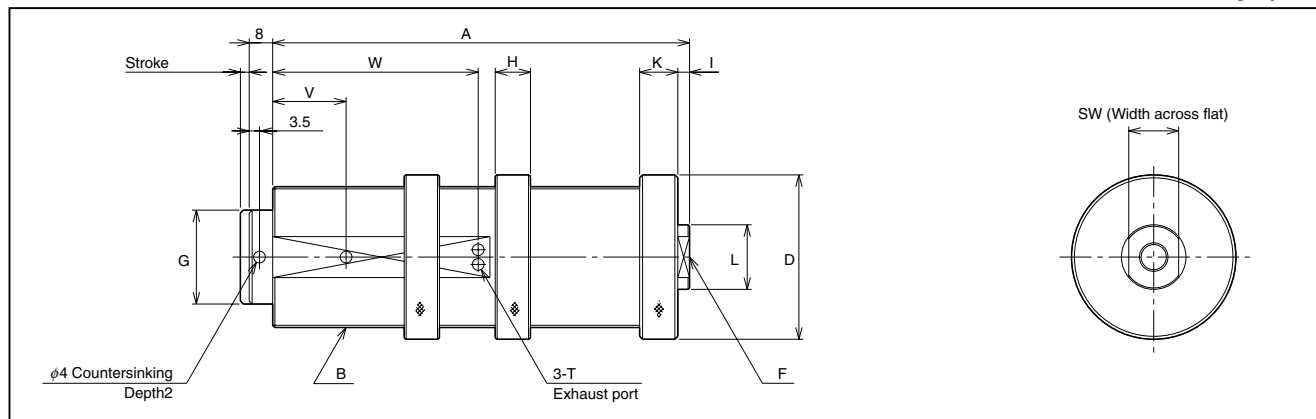
| No. | Name | Material | Q'ty |
|-----|---------------------------------|--|------|
| ① | Upper cover | Carbon steel | 1 |
| ② | Tube | Carbon steel | 1 |
| ③ | Pneumatic piston ASSY | Hardening, grinding (Hard chrome plated) | 1 |
| ④ | Output shaft (Hydraulic piston) | Carbon steel (Hard chrome plated) | 1 |
| ⑤ | Clamp ring | Carbon steel | 2 |
| ⑥ | Bush | Oilless alloy | 1 |
| ⑦ | Bush tap | Carbon tool steel | 1 |
| ⑧ | Intermediate ring | Cutting brass | 1 |
| ⑨ | Intermediate ring junk | Carbon tool steel | 1 |
| ⑩ | Return spring | Piano wire | 1 |
| ⑪ | Pneumatic piston return spring | Piano wire | 1 |
| ⑫ | Pneumatic piston seal | Nitrile rubber | 1 |
| ⑬ | Hydraulic piston seal | Nitrile rubber | 1 |
| ⑭ | Hydraulic piston wear ring | Resin | 1 |
| ⑮ | Boosting piston seal | Nitrile rubber | 1 |
| ⑯ | Tube gasket | Nitrile rubber | 1 |
| ⑰ | Intermediate ring gasket | Nitrile rubber | 1 |

APPLICATION EXAMPLES

| | | |
|---|--|---|
|  <p>Clamping element is horizontally mounted and is used to clamp the processed product for piercing, grinding, tapping and milling works.</p> |  <p>Clamping element is vertically mounted and is used to clamp the processed product of plate shape.</p> |  <p>Clamping element is used for clamping the parts of irregular shape with large size such as casting, raw materials.</p> |
|  <p>Clamping element is mounted at 45° to provide a clamping force of x-y component with the combination of V-shaped clamp tool.</p> |  <p>Clamping with the use of clamp lever. Lever ratio 1:2</p> |  <p>Two pieces of processed product are simultaneously clamped.</p> |

DIMENSIONAL DRAWINGS

Unit: mm



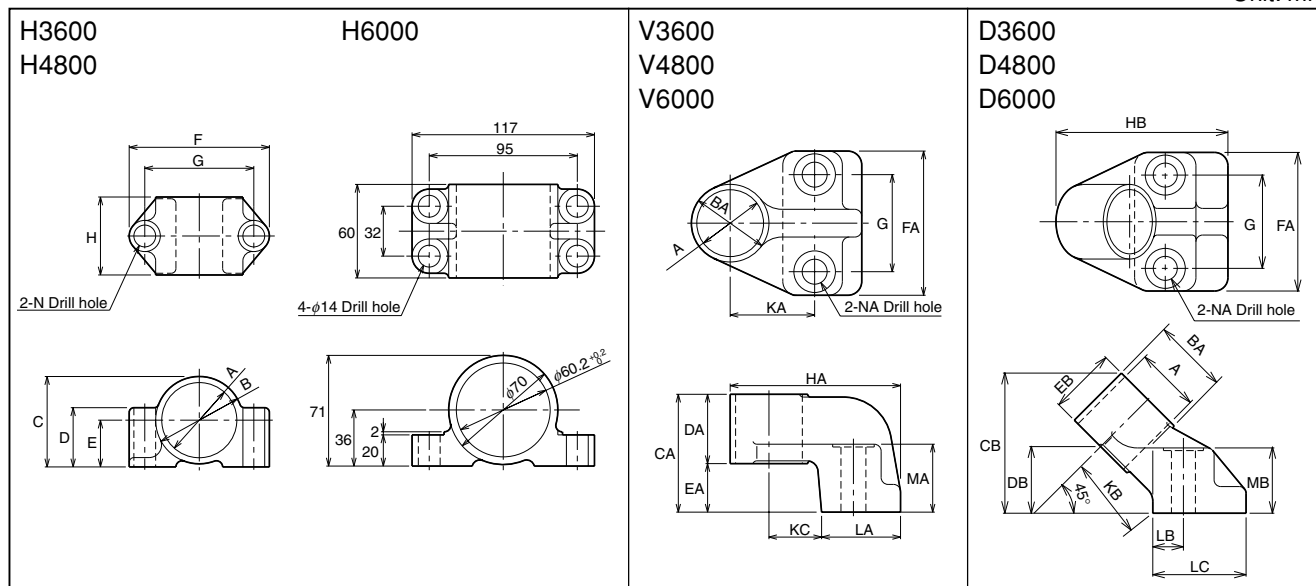
DIMENSIONAL TABLE

| Symbol Model code | Nominal stroke (mm) | A | B | D | F | G | H | I | K | L | SW | T | V | W |
|----------------------|---------------------|-----|---------|-----|------|-------|----|---|----|-----|----|----|----|-----|
| LE2-3603-03 | 3 | 100 | M36X1.5 | φ42 | G1/8 | φ22f8 | 12 | 4 | 13 | φ22 | 17 | φ3 | 25 | 56 |
| LE2-3606-03 | 6 | 142 | | | | | | | | | | | 25 | 72 |
| LE2-3609-03 | 9 | 192 | | | | | | | | | | | 46 | 96 |
| LE2-4803-08 | 3 | 112 | M48X1.5 | φ56 | G1/8 | φ32f8 | 12 | 4 | 13 | φ22 | 17 | φ4 | 26 | 66 |
| LE2-4806-08 | 6 | 147 | | | | | | | | | | | 20 | 75 |
| LE2-4809-08 | 9 | 188 | | | | | | | | | | | 34 | 90 |
| LE2-4812-08 | 12 | 236 | | | | | | | | | | | 40 | 111 |
| LE2-4803-12 | 3 | 142 | M48X1.5 | φ56 | G1/8 | φ32f8 | 12 | 4 | 13 | φ22 | 17 | φ4 | 25 | 70 |
| LE2-6006-18 | 6 | 175 | M60X2 | φ70 | G1/4 | φ40f8 | 14 | 5 | 18 | φ25 | 22 | φ4 | 30 | 85 |
| LE2-6009-18 | 9 | 245 | | | | | | | | | | | 60 | 122 |
| LE2-6012-18 | 12 | 291 | | | | | | | | | | | 60 | 134 |
| LE2-6003-21 | 3 | 168 | M60X2 | φ70 | G1/4 | φ40f8 | 14 | 5 | 18 | φ25 | 22 | φ4 | 40 | 83 |
| LE2-6006-21 | 6 | 283 | | | | | | | | | | | 70 | 133 |

The value 1mm less than the nominal stroke shall be used as the effective stroke.

MOUNTING BRACKET

Unit: mm



DIMENSIONAL TABLE

| Symbol Model code | A | B | BA | C | CA | CB | D | DA | DB | E | EA | EB | F | FA | G | H | HA | HB | MA | MB | N | NA | KA | KB | KC | LA | LB | LC |
|----------------------|------------------------------------|-----|-----|----|-----|-----|----|----|------|----|----|----|-----|-----|----|----|-----|-----|----|----|-----|-----|----|----|----|----|----|----|
| * 3600 | φ36.2 ^{+0.1} ₀ | φ42 | φ44 | 45 | 65 | 85 | 34 | 35 | 44.5 | 24 | 30 | 35 | 72 | 81 | 54 | 40 | 102 | 99 | 38 | 38 | φ11 | φ14 | 48 | 55 | 32 | 48 | 18 | 50 |
| * 4800 | φ48.2 ^{+0.1} ₀ | φ56 | φ56 | 58 | 85 | 105 | 38 | 50 | 50 | 30 | 35 | 50 | 90 | 104 | 70 | 50 | 123 | 129 | 49 | 49 | φ14 | φ18 | 61 | 63 | 38 | 57 | 23 | 70 |
| * 6000 | φ60.2 ^{+0.1} ₀ | φ70 | φ70 | 71 | 105 | 146 | - | 70 | 71.5 | 36 | 35 | 70 | 117 | 135 | 90 | 60 | 169 | 173 | 59 | 52 | φ14 | φ22 | 82 | 88 | 52 | 82 | 27 | 95 |

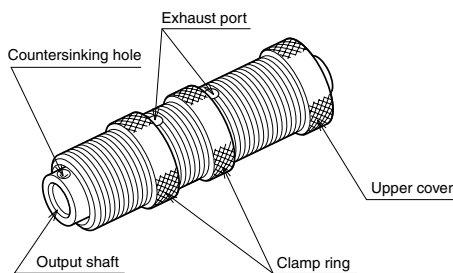
• For mounting a bracket, a hexagonal head cap bolt shall be used.

HANDLING INSTRUCTIONS

■ PRECAUTIONS FOR USE

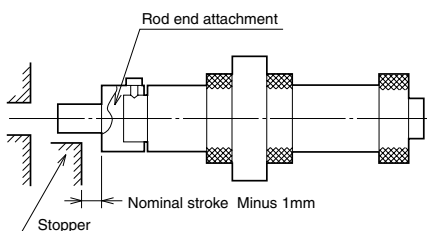
GENERAL CAUTIONS

- For pneumatic piping, it shall be properly cleaned inside with over 0.3MPa of compressed air blown in pipe.
- Air filter shall be surely mounted for piping in order that chip, rust, dirt, moisture will not enter in cylinder.
- JIS K2213-2 additive turbine oil ISO VG32 shall be used as lubricating oil for application of air lubricator.
- Drains of air filter shall be exhausted before it exceeds the upper level indicating position. Oil of air lubricator shall be regularly inspected for clean oil.
- When clamping element is mounted, precaution shall be taken so that exhaust port will not be obturated. Cautions shall also be taken that dust and foreign matters will not enter in exhaust port. If it is horizontally used, clamp ring shall be clamped and mounted after a body is rotated so that exhaust port faces the ground. (Fig. 1)



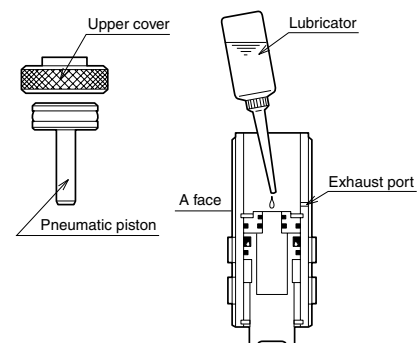
(Fig. 1)

- Countersinking hole shall be used for mounting a rod end attachment.
- Stroke shall be used surely at 1mm before the nominal stroke. If it is used for punching, an outer stopper shall be applied in order that output shaft will hit at 1mm before the nominal stroke. (Fig. 2)



(Fig. 2)

- Cautions shall be taken that output shaft shall not be splashed with cutting oil and other fluids. (When it is splashed with cutting oil, etc., contact to us.)
- For the return of output shaft, the force other than that for the return direction of output shaft shall not be applied. (In case that the external force will be applied on the return of output shaft, a speed control valve shall be mounted at port to set the return time of output shaft at 1~2 sec.)
- By inspecting regularly an applied stroke, it shall be confirmed that whether a set stroke is maintained or not.
- Lubrication method of working oil (Fig. 3) (If stroke is shortened, it shall be lubricated according to the following items.)
 - (a) When there is lack of working oil, a pneumatic piston shall be removed after a body is set up with output shaft set vertically downward, and upper cover is removed.
 - (b) Pneumatic piston is loosened by blowing a small quantity of low pressure air from exhaust port.
 - (c) By lubricating quietly the working oil with a lubricator, it shall be filled with oil until A face with no bubble caused.
 - (d) A small quantity of working oil shall be applied to the working face of pneumatic piston.
 - (e) Pneumatic piston ASSY shall be quietly assembled after no bubble is caused at A face.



(Fig. 3)

- For working oil, Mobile Oil-made Extra Hekla Super cylinder oil shall be used.

Compact, high-output, high-speed actuator with boosting mechanism provided in pneumatic cylinder.

- Space-saving air press. As compared with the conventional press, the volume is one-10th.
- Light press with strong aluminum alloy adopted for body. The carriage and installation are free. It shall be used vertically, horizontally or upside down.
- Besides the cutting, piercing, bending, caulking to be performed by ordinary press, it can be applied as high-output actuator for driving a variety of instruments.
- With the characteristics of air pressure, it is proud of high-speed working. The improvement of productivity and cycle time is also attained. Durability is excellent.

SPECIFICATIONS

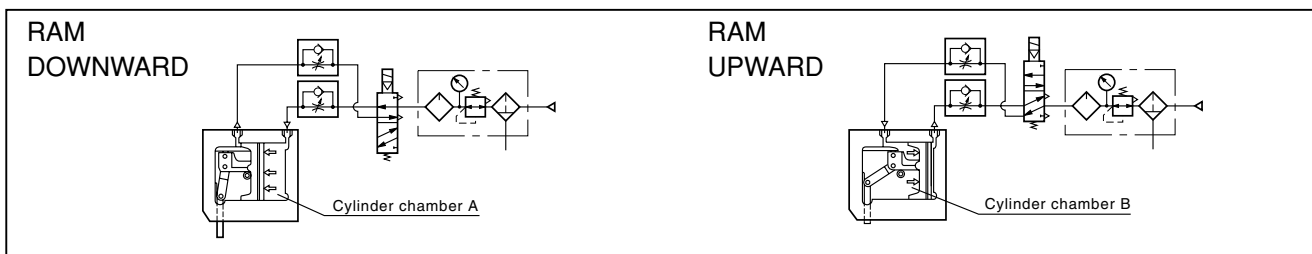
| Item | Model code | | | |
|--------------------------------|--|------------|------------|------|
| | TPH-010040 | TPH-015040 | TPH-020040 | |
| Pressure range | 0.15 ~ 0.7MPa | | | |
| Temperature range | +5 ~ +60°C | | | |
| Lubrication | JIS K2213-1 (Natural turnine oil ISO VG32) or equivalent | | | |
| Working fluid | Air | | | |
| Nominal output | kN | 9.81 | 14.7 | 19.6 |
| Stroke | mm | 40.1 | | |
| Max. use frequency (C · P · M) | 60 | | | |
| *Air consumption N ℓ /cycle | 5.4 | 8.2 | 10.8 | |

*At the operating pressure of 0.5MPa

MODEL CODE For order, specify the following code.

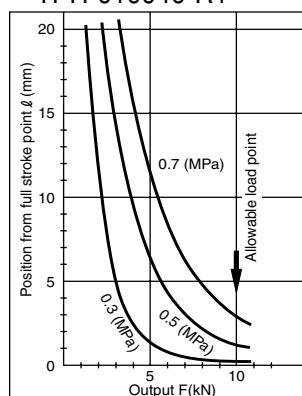
| | | | | | | | | |
|--------|----------------|---|---------|--------------|---|-----------|----------------|---|
| Series | TPH | - | 010 | 040 | - | R1 | - | L |
| | | | ① | Stroke | | Ram shape | | ② |
| ① | Nominal output | | 010 | 9.81kN | | 015 | 14.7kN | |
| | | | 020 | 19.61kN | | | | |
| | Ram guide | | No code | No ram guide | | L | With ram guide | |

WORKING THEORY

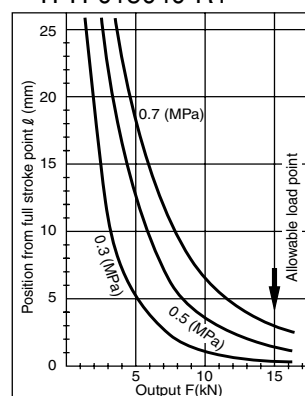


OUTPUT DIAGRAMS

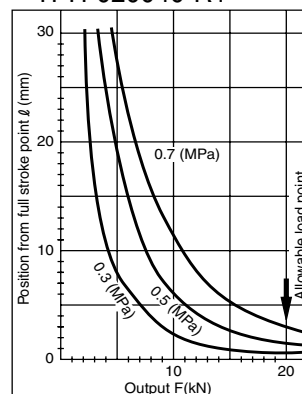
• TPH-010040-R1



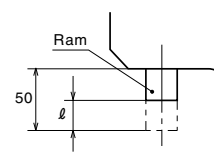
• TPH-015040-R1



• TPH-020040-R1

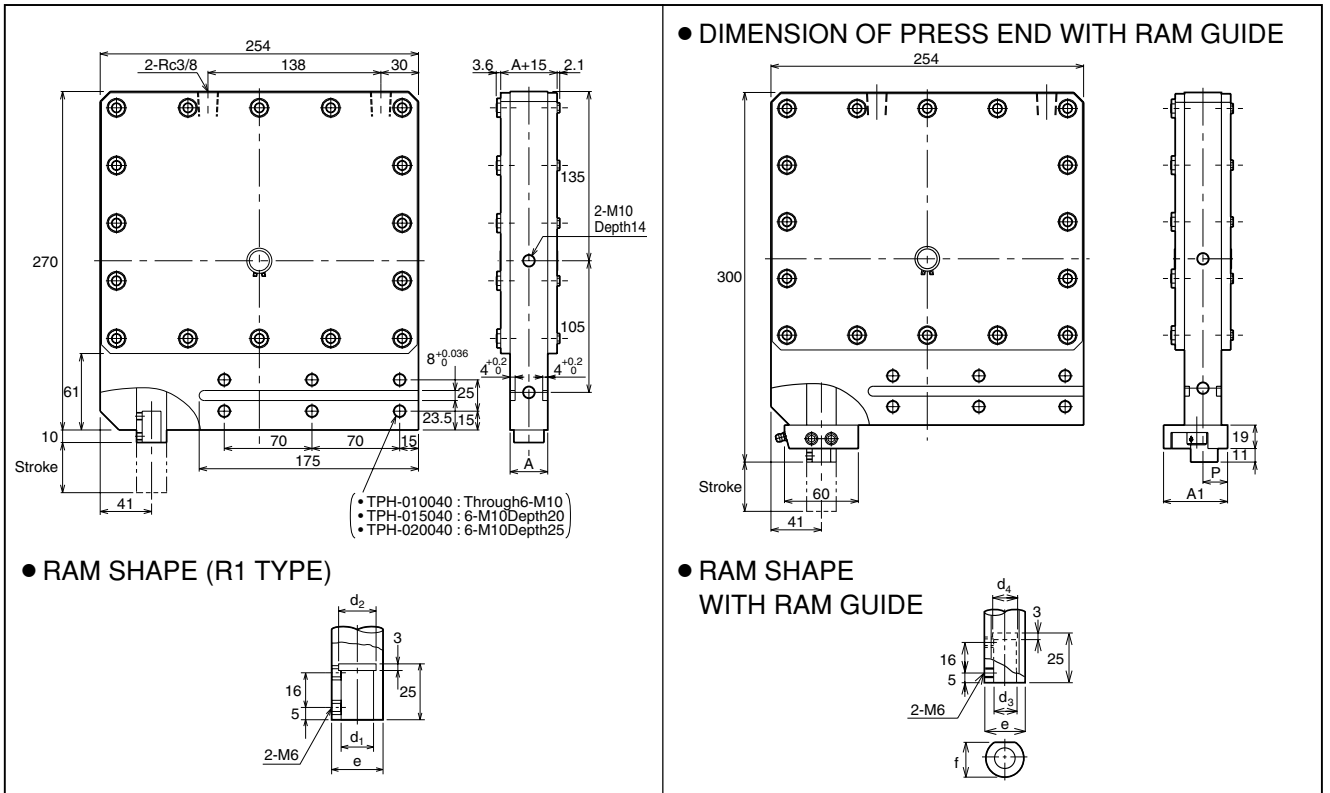


- "Position from full stroke point" in the output diagram indicates the position of ram that moved upward by ℓ from the max. stroke point.



DIMENSIONAL DRAWINGS

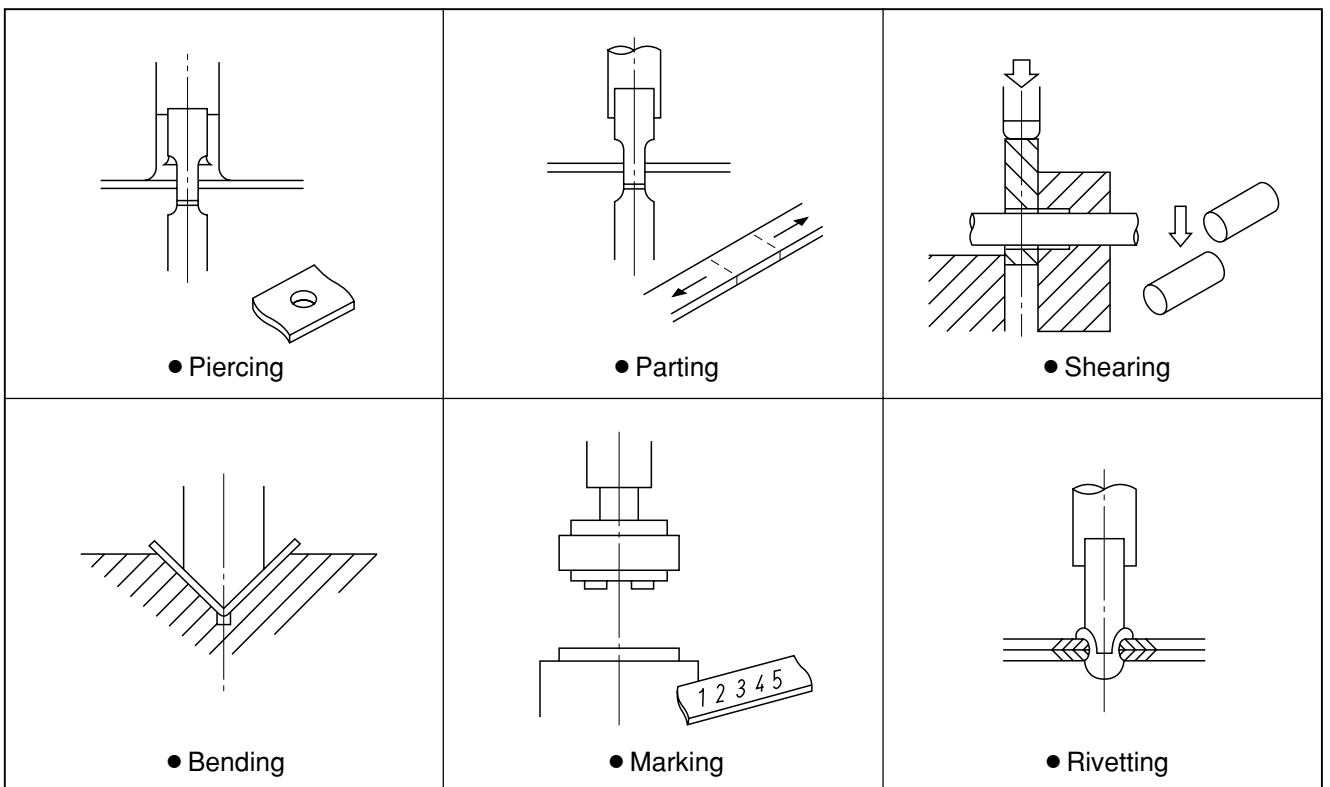
Unit: mm



DIMENSIONAL TABLE

| Symbol | A | A1 | d1 | d2 | d3 | d4 | e | f | p | Weight (kg) |
|---------------|----|----|-------|-------------|-------|-------|-----|----|----|-------------|
| TPH-010040-R1 | 30 | 52 | φ15H6 | φ15.5 | φ13H6 | φ13.5 | φ24 | 22 | 20 | 11 |
| TPH-015040-R1 | 45 | 52 | φ15H6 | φ15.5 | φ13H6 | φ13.5 | φ24 | 22 | 20 | 13 |
| TPH-020040-R1 | 60 | 64 | φ20H6 | φ21 or less | φ15H6 | φ15.5 | φ30 | 27 | 30 | 14 |

APPLICATION EXAMPLES



SELECTION MATERIALS

SELECTION OF TYPE FOR THIN TYPE PIERCING WORK

For selecting a toggle press, the following are necessary.

1. Force necessary for work. (Working force)
2. Two items of working stroke shall be defined to check up with the output characteristics of toggle press.

As working stroke is composed of work plate thickness and crotch as shown in chart, formula ① is given.

$$l = t + l' \dots \textcircled{1}$$

l : Working stroke

t : Work plate thickness

l' : Crotch (Crotch of punch against die)

For force necessary for thin plate piercing work (working force), formula ②, ③ are given according to the product of shearing stress and area.

$$F = l t \tau \dots \textcircled{2}$$

F : Shearing load (N)

l : Length of shearing latus (mm)

t : Plate thickness (mm)

τ : Shearing stress (N/mm²)

For round hole:

$$F = \pi D t \tau \dots \textcircled{3}$$

D : Round hole diameter

The characteristics of toggle press output and displacement ($F-l$) shown in chart indicates the output of 90% ($P = 0.5\text{MPa}$) and 75% ($P = 0.7\text{MPa}$) against the actual output to mitigate the shocking force in the thin plate piercing work. For the same reason, the load range is restricted to the section at 4mm from full stroke point.

EXAMPLE OF WORKING CONDITIONS

- Round hole piercing work $D = 15$ $t = 0.8$
- $\tau = 294\text{N/mm}^2$

Selection procedures (refer to Fig. 1)

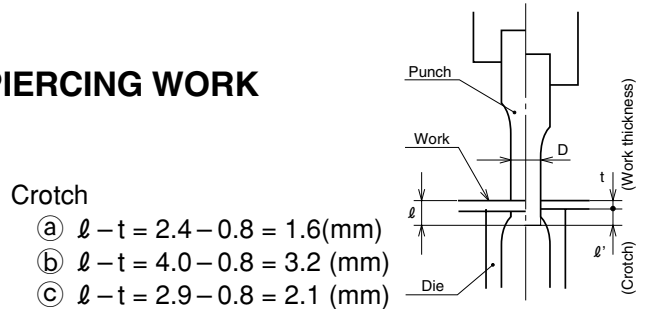
1. Against shearing force 294N/mm²
2. Calculate point A corresponding to plate thickness $t = 0.8$ and hole bore $D = 15$.
3. Line is drawn at right above point A and is extended to toggle press characteristics chart.
4. Read the respective conditions l from the cross point of 3 lines and characteristics curve.

- ① B ... TPH-015040 $P = 0.5\text{MPa}$ $B = 2.4\text{mm}$
- ② C ... TPH-020040 $P = 0.5\text{MPa}$ $C = 4.0\text{mm}$
- ③ E ... TPH-015040 $P = 0.7\text{MPa}$ $E = 2.9\text{mm}$

Calculate the maximum crotch according to type and operating pressure as the l dimension corresponding to B, C, E is equivalent to l of formula ①.

SHEARING STRESS τ OF MATERIALS N/mm²

| Materials | Shearing stress | | Materials | Shearing stress | | Materials | Shearing stress | |
|-----------------|-----------------|---------|---------------------------|-----------------|---------|---------------------|-----------------|------|
| | Soft | Hard | | Soft | Hard | | Soft | Hard |
| Lead | 19.6~29.4 | - | Zinc | 118 | 196 | Steel 0.1%C | 245 | 314 |
| Tin | 29.4~39.2 | - | Copper | 177~216 | 245~294 | ∕ 0.2%C | 314 | 392 |
| Aluminum | 68.6~88.3 | 127~157 | Brass | 216~294 | 343~392 | ∕ 0.3%C | 353 | 471 |
| Aluminum alloy | 68.6~108 | 127~177 | Rolled bronze | 314~392 | 392~588 | ∕ 0.4%C | 441 | 549 |
| Duralumin | 216 | 373 | Mild steel plate | 314 | 392 | ∕ 0.6%C | 549 | 706 |
| Phosphor bronze | 490 | - | Iron plate for deep crest | 294~343 | - | ∕ 0.8%C | 706 | 883 |
| Nickel silver | 275~353 | 441~549 | Steel plate | 441~490 | 539~588 | ∕ 1.0%C | 785 | 1030 |
| Nickel plate | 245 | - | Stainless steel plate | 510 | 549 | Silicon steel plate | 441 | 549 |
| | | | | | | Permaroy | 510 | - |

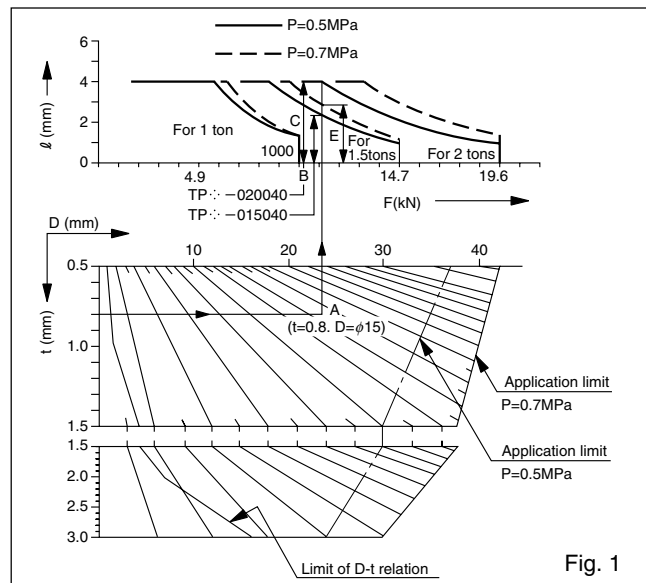


Crotch

- ① $l - t = 2.4 - 0.8 = 1.6(\text{mm})$
- ② $l - t = 4.0 - 0.8 = 3.2(\text{mm})$
- ③ $l - t = 2.9 - 0.8 = 2.1(\text{mm})$

Decide on the type with crotch taken in consideration. "Application limit" in chart $D-t$ (Fig. 1) indicates the limit of process available plate thickness-hole bore with toggle press output taken in consideration at the minimum crotch of 1mm.

WORK SHEARING STRESS 294N/mm²



"LIMIT OF D - t RELATION"

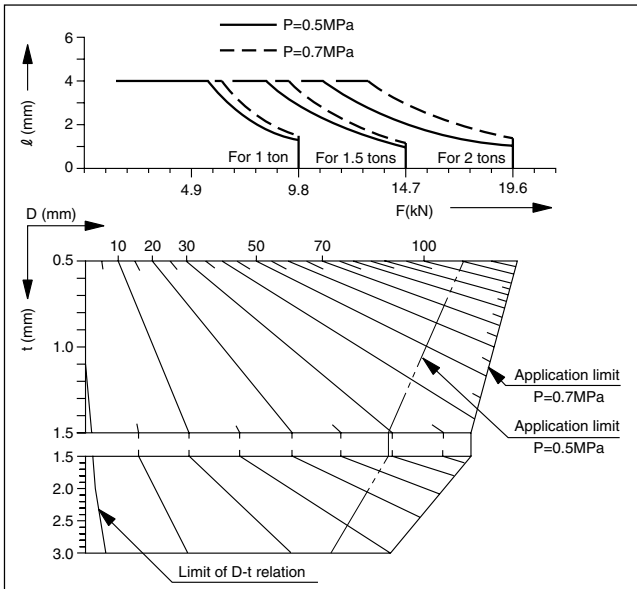
The limit calculated from the minimum hole bore against plate thickness is indicated as reference since the process available hole bore (minimum bore) against optional plate thickness is limited for general piercing work.

PIERCING WORK OTHER THAN ROUND HOLE

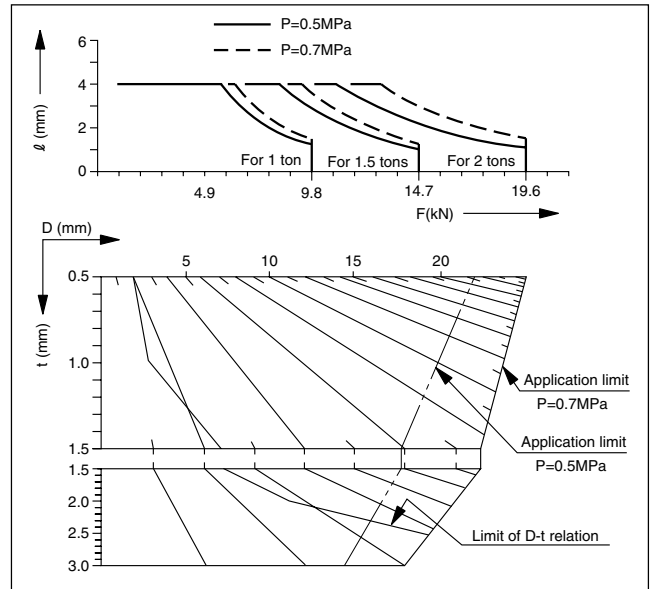
In the case of (long hole, square) other than round hole, the working force calculated from formula ② is computed in output-displacement ($F-l$) characteristic lateral shaft (F) in Fig. 1, and crotch is confirmed according to the same method as that for round hole to decide on the type.

WORK SHEARING STRESS

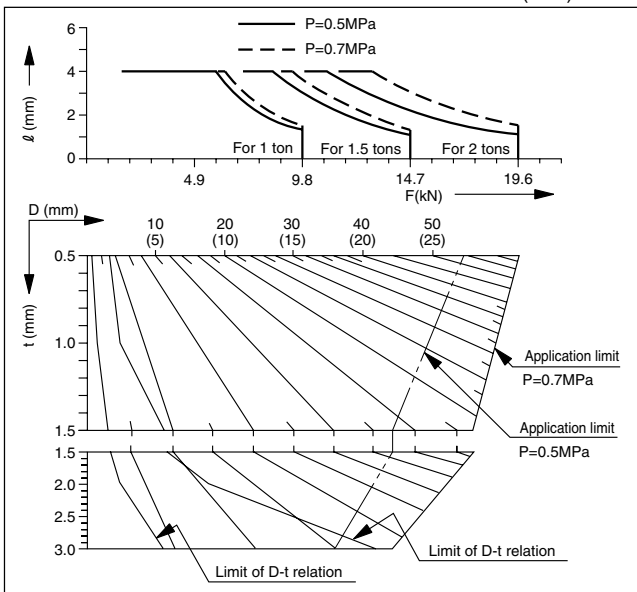
98.1N/mm²



490N/mm²



196(392)N/mm²



• Figures in parenthesis show shearing stress at 392N/mm²

HANDLING INSTRUCTIONS

- Piping, connecting joint, etc. shall be applied after dust and rust are completely removed by flushing.
- For lubricating oil, JIS K2213 ISO VG32 or equivalent shall be used. (Do not use spindle oil, machine oil.)
- Precautions shall be taken that durability may be shortened if it is used with load of over nominal output.
- Do not apply lateral and eccentric loads to ram.

- It shall be used at the following load rate against working air pressure in case that there is no load in ram stroke for punching and cutting work.
0.5MPa90% 0.6MPa80% 0.7MPa75%
- Load shall be applied at less than 4mm from full stroke point.
- For the application method that causes the ram rotating play, contact to our company.

For further information please contact:

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Specifications are subject to change without notice.

Cat. No. A00421-HIGH POWER SYSTEM-1-1(R)