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HINAKA

Pneumatic Drives

ISO Standard

Standard Series

High Speed Series

Multistage Pneumatic Series

Pneumatic cylinder selection

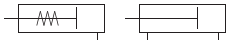
Pressure Source (MPa)

Cylinder type is selected according to size of air pressure source at work site.

Actuator
Single Action or Double Action

Single Acting：
Piston rod launched by air pressure in one direction with spring return.

Double Acting：
Piston rod launched and returned by air pressure.



Function
Buffers Installed or
Buffers Not Installed or
Sensor

Buffers Installed：
Piston slows as it approaches front and rear caps.

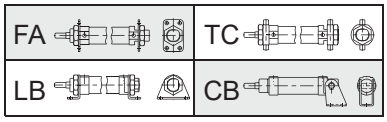
Buffers Not Installed：
Piston hits front and rear caps producing noise and rapid wear and tear.

Sensor：
There is a computer controlled sensor device.

Environment
Climate, Dust, Corrosion, Vibration, Etc

Choose accessories appropriate to local conditions.

Space Capacity (Mounting)
FA or CB or TC or LB



Choose mounting based on cylinder model and size of both work area and machine.

Force Required

Calculate required force according to pressure source (MPa) and cylinder model.
(Figure 1 Table "Pneumatic Cylinder Theoretical Output")

Air Consumption/ Flow

Air consumption and flow are calculated according to the type and size of cylinder.
(Figure Diagram 2, "Air Consumption" and "Air Flow")

Operating Pressure (MPa) :

Unit : N

Cylinder Diameter (mm)	Rod Diameter (mm)	Rod Diameter Diameter (mm)									
		3		4		5		6		7	
		Output Force	Return Force	Output Force	Return Force	Output Force	Return Force	Output Force	Return Force	Output Force	Return Force
12	6	33.9	25.4	45.2	33.9	56.5	42.4	67.8	50.9	79.1	59.3
16	6	60.3	51.8	80.4	69.1	100.5	86.4	120.6	103.6	140.7	120.9
	8	60.3	45.2	80.4	60.3	100.5	75.4	120.6	90.4	140.7	105.5
20	8	94.2	79.1	125.6	105.5	157.0	131.9	188.4	158.3	219.8	184.6
	10	94.2	70.7	125.6	94.2	157.0	117.8	188.4	141.3	219.8	164.9
25	10	147.2	123.6	196.3	164.9	245.3	206.1	294.4	247.3	343.4	288.5
	12	147.2	113.3	196.3	151.0	245.3	188.8	294.4	226.6	343.4	264.3
32	12	241.2	207.2	321.5	276.3	401.9	345.4	482.3	414.5	562.7	483.6
	16	241.2	180.9	321.5	241.2	401.9	301.4	482.3	361.7	562.7	422.0
40	16	376.8	316.5	502.4	422.0	628.0	527.5	753.6	633.0	879.2	738.5
50	20	588.8	494.6	785.0	659.4	981.3	824.3	1177.5	989.1	1373.8	1154.0
63	20	934.7	840.5	1246.3	1120.7	1557.8	1400.8	1869.4	1681.0	2181.0	1961.2
80	25	1507.2	1360.0	2009.6	1813.4	2512.0	2266.7	3014.4	2720.0	3516.8	3173.4
100	25	2355.0	2207.8	3140.0	2943.8	3925.0	3679.7	4710.0	4415.6	5495.0	5151.6
125	35	3679.7	3391.2	4906.3	4521.6	6132.8	5652.0	7359.4	6782.4	8585.9	7912.8
150	40	5298.8	4922.0	7065.0	6562.6	8831.3	8203.3	10597.5	9843.9	12363.8	11484.6
160	35	6028.8	5740.3	8038.4	7653.8	10048.0	9567.2	12057.6	11480.6	14067.2	13394.1
200	40	9420.0	9043.2	12560.0	12057.6	15700.0	15072.0	18840.0	18086.4	21980.0	21100.8

SIUnit Conversion :

- Pressure 1MPa=10.2kgf/cm^2
- Acceleration 1m/s^2=0.1G
- Vacuum Pressure -1kgf=-7.5mmHg
- Torque 1N.m=0.1kgf/m
- Force, Load 1N=0.1kgf

Theoretical Force Formula :

■ Theoretical Force

F1=A1×P **F2**=A2×P

$$A1=\frac{\pi D^2}{4}$$

$$A2=\frac{\pi}{4}(D^2\times d^2)$$

■ Actual Output

$$F1=\frac{\pi D^2}{4}\times P-R$$

■ Actual Return Force

$$F2=\frac{\pi}{4}(D^2\times d^2)\times P-R$$

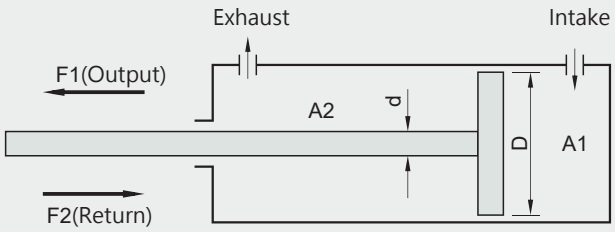
Air Consumption :

$$Q=(A1+A2)\times L\times\frac{P+0.1013}{0.1013}\times 10^{-6}\times N\times K$$

Air Flow :

$$Q1=60\times A1\times V\times\frac{P+0.1013}{0.1013}\times 10^{-6}$$

$$Q2=60\times A2\times V\times\frac{P+0.1013}{0.1013}\times 10^{-6}$$



F : Theoretical Force (N)
A1 : Upstream Pressure Side Cross-Section (mm2)
A2 : Downstream Pressure Side (mm2)
D : Cylinder Bore Diameter(mm)
d : Piston Rod Diameter(mm)
P : Working Pressure(MPa)
R : Friction Resistance depends on quality; from 10-40% of F
(For HINAKA Pneumatic Cylinders, R is from 12-18% of F)

Q : Air Consumption in Atmosphere (l/min)
L : Stroke(mm)
P : Gauge Pressure (MPa)
N : Cycles per Minute
K : Safety Factor(=2)
Q1 : Upstream Required Air Flow(l/min)
Q2 : Downstream Required Air Flow(l/min)
V : Maximum Operating Speed(mm/S)

Output Efficiency :

- Output efficiency of pneumatic cylinder is closely linked to air port specifications, size of control valve, condition of sliding surface in cylinder, and speed of movement. Factors above are difficult to measure; include margins of allowable tolerance while designing.
- Theoretical Output about 80% at slow speeds.
- Theoretical Output less than 50% at high speeds.
- Theoretical Output around 65% under normal conditions.

Air Consumption Calculation :

Air Consumption Q refers to the amount of air in natural conditions.
Before installation allowable tolerance margins must be integrated for:
air loss at control valve, pressure loss at ports, or other changing variables during use.
Generally when selecting an air compressor, use two times the air consumption of the air cylinder itself for calculation.