

4G^A_B1 to 3/MN4G^A_B Series

Technical data ③ Pneumatic system selection guide

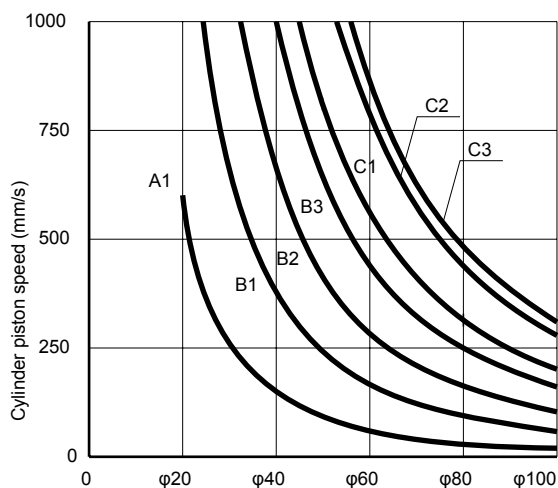
- (1) The cylinder average speed is obtained from the combination of 4G series and piping system. It is expressed as the cylinder's piston speed calculated by dividing the stroke length by the time that the piston rod takes from start to end of movement with the cylinder rod installed facing upward. When the load factor is 50%, the average speed should be approximately the cylinder's piston speed multiplied by 0.5.
- (2) The cylinder average speed described in "Pneumatic system device selection guide" is that when one cylinder is operated alone.
- (3) The effective cross-sectional area of the solenoid valve used for the calculation below is the 2-position value.
- (4) This selection guide is for reference. With the CKD sizing program, confirm conditions to be actually used.
- (5) Effective cross-sectional area S and sonic conductance C are converted as $S \approx 5.0 \times C$.

Standard system table 4G (metal base) * Refer to page 746 for MN4G (block manifold).

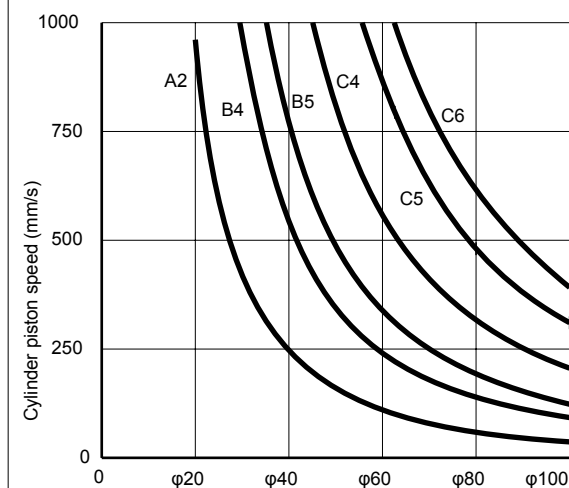
[Single unit]

Series	Body piping					
	Model No.	System No.	Speed controller	Silencer	Piping	Composite effective cross-sectional area (mm ²) pipe length 1 m
4G1	4GA110R-C4	A1	SC3W-M5-4	SLM-M5	φ4 × φ2.5	1.0
	4GA110R-C6	B1	SC1-6	SLM-M5	φ6 × φ4	2.5
4G2	4GA210R-C6	B2	SC1-6	SLW-6S	φ6 × φ4	4.3
	4GA210R-C8	B3	SC1-8	SLW-6S	φ8 × φ5.7	6.5
4G3	4GA310R-C8	C1	SC1-8	SLW-8S	φ8 × φ5.7	8.3
	4GA310R-C10	C2	SC1-10	SLW-8S	φ10 × φ7.2	11.6
	4GA310R-C10	C3	SC1-15	SLW-8S	φ10 × φ7.2	12.7
Series	Base piping					
	Model No.	System No.	Speed controller	Silencer	Piping	Composite effective cross-sectional area (mm ²) pipe length 1 m
4G1	4GB110R-06	A2	SC3W-6-4	SLW-6S	φ4 × φ2.5	1.6
	4GB110R-06	B4	SC1-6	SLW-6S	φ6 × φ4	3.6
4G2	4GB210R-08	B5	SC1-8	SLW-8S	φ6 × φ4	5.0
	4GB210R-08	C4	SC1-10	SLW-8S	φ8 × φ5.7	8.3
4G3	4GB310R-10	C5	SC1-10	SLW-10L	φ10 × φ7.2	12.6
	4GB310R-10	C6	SC1-15	SLW-10L	φ12 × φ8.9	15.9

* The system No. is indicated in the following graph.



Applicable cylinder bore size	SCM		
	SSD		
	SCPD2	CMK2	SCA2



Applicable cylinder bore size	SCM		
	SSD		
	SCPD2	CMK2	SCA2

4G^A_B1 to 3/MN4G^A_B Series

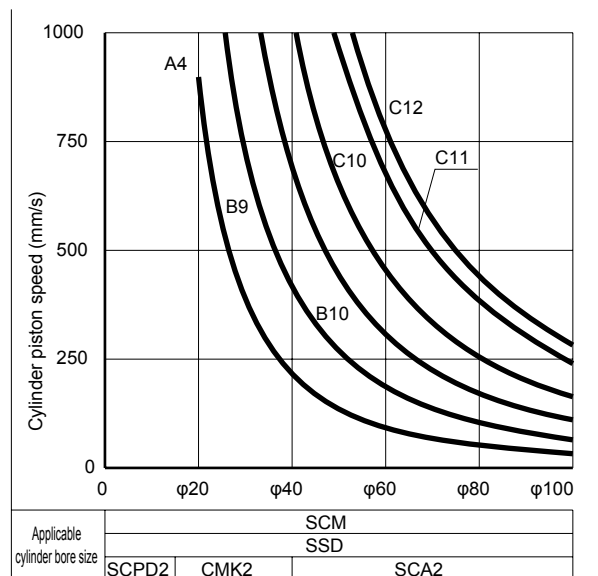
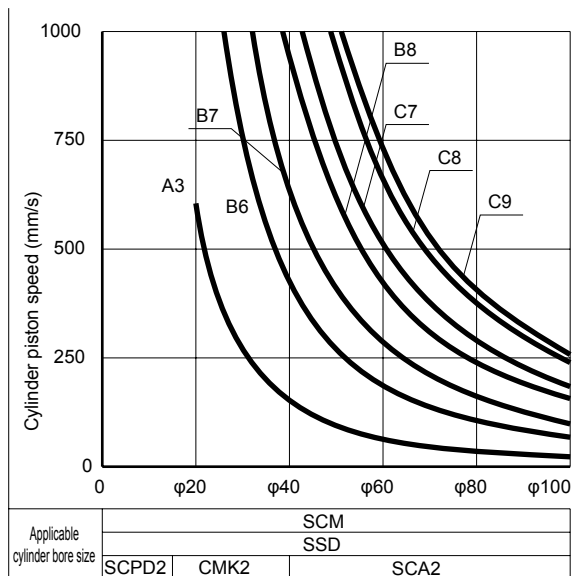
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[Manifold] (With internal exhaust check valve)

Series	Body piping					
	Model No.	System No.	Speed controller	Silencer	Piping	Composite effective cross-sectional area (mm ²) pipe length 1 m
4G1	M4GA110R-C4	A3	SC3W-M5-4	SLW-6S	φ4×φ2.5	1.0
	M4GA110R-C6	B6	SC1-6	SLW-6S	φ6×φ4	2.8
4G2	M4GA210R-C6	B7	SC1-6	SLW-8S	φ6×φ4	4.2
	M4GA210R-C8	B8	SC1-8	SLW-8S	φ8×φ5.7	6.2
4G3	M4GA310R-C8	C7	SC1-8	SLW-10L	φ8×φ5.7	7.5
	M4GA310R-C10	C8	SC1-10	SLW-10L	φ10×φ7.2	9.8
	M4GA310R-C10	C9	SC1-15	SLW-10L	φ10×φ7.2	10.5

Series	Base piping					
	Model No.	System No.	Speed controller	Silencer	Piping	Composite effective cross-sectional area (mm ²) pipe length 1 m
4G1	M4GB110R-C4	A4	SC3W-6-4	SLW-6S	φ4×φ2.5	1.5
	M4GB110R-C6	B9	SC1-6	SLW-6S	φ6×φ4	2.8
4G2	M4GB210R-C6	B10	SC1-8	SLW-8S	φ6×φ4	4.6
	M4GB210R-C8	C10	SC1-10	SLW-8S	φ8×φ5.7	6.7
4G3	M4GB310R-C10	C11	SC1-10	SLW-10L	φ10×φ7.2	10.0
	M4GB310R-C10	C12	SC1-15	SLW-10L	φ12×φ8.9	11.5

* The system No. is indicated in the following graph.



4GA/B
M4GA/B
MN4GA/B
4GA/B (mastr)
4GD/E
M4GD/E
MN4GD/E
4GA4/B4
MN3E
MN4E
W4GA/B2
W4GB4
4TB
4L2-4/ LMF0
MN3S0
MN4S0
4SA/B0
4KA/B
4KA/B (mastr)
4F
4F (mastr)
PV5G GMF
PV5 GMF
PV5S-0
3QR
3QB
MV3QR
3MA/B0
3PA/B
P/M/B
NP/NAP/ NVP
4F*0EX
4F*0E
HMV
HSV
2QV
3QV
SKH
PCD
Silencer
TotAirSys (Total Air)
TotAirSys (Gamma)
Ending

4G^A_B1 to 3/MN4G^A_B Series

Technical data ③ Pneumatic system selection guide

Standard system table **MN4G (block manifold)** (with internal exhaust check valve)

1. Common exhaust

Series	Solenoid valve port size	System No.	Speed controller	Cylinder piping Pipe length 1 m	Common exhaust piping	Composite effective cross-sectional area (mm ²)
MN4G1	C4	A1	SC3W-M5-4	φ4×φ2.5	φ6×φ4×3m	1.0
	C4	A2	SC3W-6-4	φ4×φ2.5	φ6×φ4×3m	1.4
	C6	B1	SC1-6	φ6×φ4	φ8×φ5.7×3m	2.7
MN4G2	C6	B2	SC1-6	φ6×φ4	φ8×φ5.7×3m	3.8
	C8	B3	SC1-8	φ8×φ5.7	φ10×φ7.2×3m	5.9

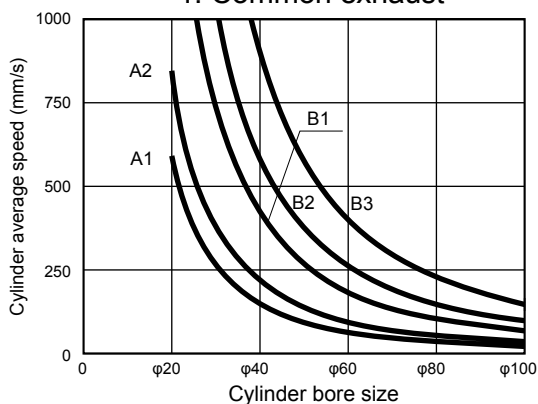
2. Atmospheric release exhaust (integrated exhaust muffler)

Series	Solenoid valve port size	System No.	Speed controller	Cylinder piping pipe length 1 m	End block	Composite effective cross-sectional area (mm ²)
MN4G1	C4	A3	SC3W-M5-4	φ4×φ2.5	N4G1-EX	1.0
	C4	A4	SC3W-6-4	φ4×φ2.5		1.5
	C6	B4	SC1-6	φ6×φ4		2.9
MN4G2	C6	B5	SC1-6	φ6×φ4	N4G2-EX	4.2
	C8	B6	SC1-8	φ8×φ5.7		5.9

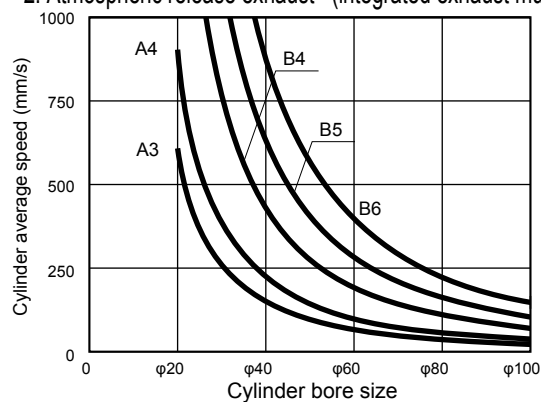
3. Exhaust with silencer

Series	Model No.	System No.	Speed controller	Cylinder piping pipe length 1 m	Silencer	Composite effective cross-sectional area (mm ²)
MN4G1	C4	A5	SC3W-M5-4	φ4×φ2.5	SLW-H6	1.0
	C4	A6	SC3W-6-4	φ4×φ2.5	SLW-H6	1.5
	C6	B7	SC1-6	φ6×φ4	SLW-H8	2.7
MN4G2	C6	B8	SC1-6	φ6×φ4	SLW-H8	3.8
	C8	B9	SC1-8	φ8×φ5.7	SLW-H10	6.0

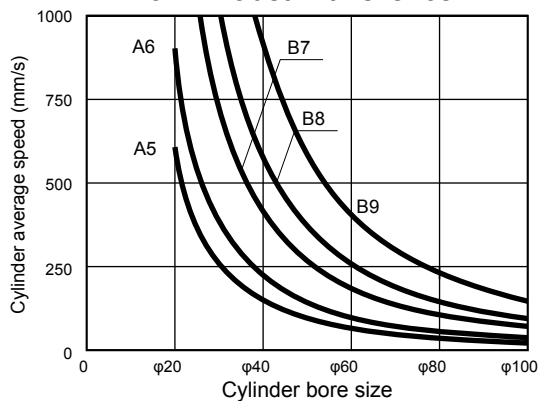
1. Common exhaust



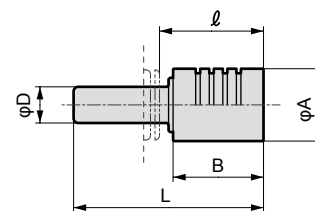
2. Atmospheric release exhaust (integrated exhaust muffler)



3. Exhaust with silencer



● Silencer



Model No.	D	L	A	B	ℓ
SLW-H6	φ6	41	16	20	23.5
SLW-H8	φ8	42	16	20	23
SLW-H10	φ10	53	20	27	31.5

Device selection guide is used to select the optimum model at a glance.

● Fluid control components selection

Whether the cylinder bore size and cylinder being used are driven with relative high or low speed is determined as a condition. Using the table shown below as a reference, select the theoretical reference speed of the cylinder.

Degree of cylinder speed	Theoretical reference speed (mm/s)
Low speed	250
Medium speed	500
High speed	750
Ultra high speed	1,000

Using the table in the device selection guide 1 (pages 748 and 749), select the equivalent bore size of cylinder tube and the proper standard system No. corresponding to theoretical reference speed.

● Theoretical reference speed: indicates degree of cylinder speed, expressed as the following formula. (This value matches speed with no load. When load is applied, speed drops considerably.)

$$v_0 = 1920 \times \frac{S}{A} = 2445 \times \frac{S}{D^2} \quad \text{..... (1)}$$

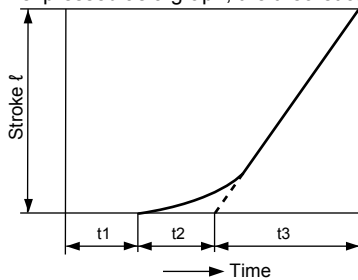
v_0 : Theoretical reference speed (mm/s)

A : Cylinder sectional area (cm²)

S : Composite effective cross-sectional area of circuit (exhaust air side) (mm²)

D : Cylinder bore size (cm)

When expressed as a graph, the theoretical reference speed is the speed within the range where the cylinder moves at a uniform speed



$$v_0 = \frac{l}{t_3} \text{ (mm/s)}$$

- t1: Time until movement starts
- t2: Time of primary delay
- t3: Operating time with constant velocity
- l : Stroke length

● Note: t1 and t2 differ depending on load. Can be effectively ignored with no load.

● Required flow rate: indicates instantaneous flow rate for operating a cylinder with velocity v_0 , expressed with the following formula. Values in the table are when $P = 0.5 \text{ MPa}$. The required flow rate is a value necessary to select clean air system components.

$$Q = \frac{A v_0 (P + 0.101) \times 60}{0.101 \times 10^4} \quad \text{..... (2)}$$

Q: Required flow rate (l/min) (ANR)

P: Supply pressure (MPa)

● Required effective sectional area: indicates composite effective cross sectional area for the exhaust circuit required for moving the cylinder at speed v_0 . (Composite effective sectional area of solenoid valve, speed controller, silencer or piping)

Effective cross-sectional area S and sonic conductance C are converted as $S \approx 5.0 \times C$.

● Proper standard system: indicates the most appropriate combination of solenoid valve, speed controller, silencer and bore size for operating a cylinder with velocity v_0 . The combination in the table is for a pipe length of 1 m.

Depending on the actual unit, they are shown as follows.

Choked flow when $\frac{P_2+0.1}{P_1+0.1} \leq b$

$$Q = 600 \times C(P_1+0.1) \sqrt{\frac{293}{273+t}} \quad \text{.....(1)}$$

Subsonic flow when $\frac{P_2+0.1}{P_1+0.1} > b$

$$Q = 600 \times C(P_1+0.1) \sqrt{1 - \left(\frac{\frac{P_2+0.1}{P_1+0.1} - b}{1 - b} \right)^2} \sqrt{\frac{293}{273+t}} \quad \text{.....(2)}$$

Q : Air flow rate [dm³/min(ANR)], SI unit dm³ (cubic decimeter) can also be expressed with l (liter). 1 dm³ = 1 l

C : Sonic conductance [dm³/(s/bar)]

b : Critical pressure ratio [-]

P₁: Upstream pressure [MPa]

P₂: Downstream pressure [MPa]

t : Temperature [°C]

When calculating with effective cross-sectional area S, substitute value C obtained with $C = S/5$ in the above formula.

For subsonic flow, substitute $b = 0.5$ in formula (2).

- 4GA/B
- M4GA/B
- MN4GA/B
- 4GA/B (mastr)
- 4GD/E
- M4GD/E
- MN4GD/E
- 4GA4/B4
- MN3E
- MN4E
- W4GA/B2
- W4GB4
- 4TB
- 4L2-4/LMF0
- MN3S0
- MN4S0
- 4SA/B0
- 4KA/B
- 4KA/B (mastr)
- 4F
- 4F (mastr)
- PV5G
- GMF
- PV5
- GMF
- PV5S-0
- 3QR
- 3QB
- MV3QR
- 3MA/B0
- 3PA/B
- P/M/B
- NP/NAP/NVP
- 4F*0EX
- 4F*0E
- HMV
- HSV
- 2QV
- 3QV
- SKH
- PCD
- Silencer
- TotAirSys (Total Air)
- TotAirSys (Gamma)
- Ending

4G^A_B1 to 3/MN4G^A_B Series

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4G Series [Device selection guide 1]

Cylinder bore size (mm)	Theoretical reference speed (mm/s)	Required flow rate (ℓ/min) (ANR)	Required effective sectional area (mm ²)	Proper standard system No.				
				Single unit		Manifold		
				Body piping	Base piping	Body piping	Base piping	
4GA/B	φ6	(500)	-	(0.1)	A 1	A 2	A 3	A 4
M4GA/B	φ10	(500)	-	(0.2)	A 1	A 2	A 3	A 4
	φ16	(500)	-	(0.5)	A 1	A 2	A 3	A 4
MN4GA/B	φ20	250	29	0.5	A 1	A 2	A 3	A 4
	4GA/B (mastr)	400	46	1.6	B 1	A 2	B 6	A 4
		250	44	0.8	B 1	A 2	A 3	A 4
4GD/E	φ25	400	70	1.9	B 1	B 4	B 6	B 9
		250	64	1.1	B 1	A 2	B 6	A 4
M4GD/E	φ30	400	100	2.8	B 1	B 4	B 6	B 9
		250	73	1.3	B 1	A 2	B 6	A 4
MN4GD/E	φ32	400	120	3.1	B 1	B 4	B 6	B 9
		250	110	2.0	B 1	B 4	B 6	B 9
4GA4/B4	φ40	400	180	4.9	B 2	B 4	B 7	B 9
		250	110	1.7	B 1	B 4	B 6	B 9
MN3E MN4E	φ40	500	230	3.3	B 2	B 4	B 7	B10
		750	340	5.0	B 3	B 5	B 8	C10
W4GA/B2	φ50	1000	450	6.6	C 1	C 4	C 7	C10
		250	180	2.6	B 2	B 4	B 7	B10
W4GB4	φ50	500	350	5.2	B 3	C 4	B 8	C10
		750	530	7.7	C 1	C 5	C 7	C11
		1000	710	10.4	C 2	C 5	C 8	C12
4TB	φ63	250	280	4.1	B 3	B 5	B 8	B10
		500	560	8.2	C 2	C 4	C 8	C11
		750	840	12.3	C 3	C 5	C 9	C12
4L2-4/ LMF0	φ75	1000	1,100	16.4	-	C 6	-	-
		250	400	5.8	C 1	C 4	C 7	C10
		500	800	11.6	C 3	C 5	C 9	C11
MN3S0 MN4S0	φ75	750	1,200	17.4	-	-	-	-
		1000	1,600	23.2	-	-	-	-
		250	450	6.6	C 1	C 4	C 7	C10
4SA/B0	φ80	500	910	13.2	C 3	C 6	-	C12
		750	1,400	19.8	-	-	-	-
		1000	1,800	25.4	-	-	-	-
4KA/B	φ100	250	710	10.3	C 2	C 5	C 8	C11
		500	1,400	20.6	-	-	-	-
		750	2,100	30.9	-	-	-	-
4F	φ100	1,000	2,800	41.2	-	-	-	-
		-	-	-	-	-	-	-

* Refer to pages 744 and 745 for system No.

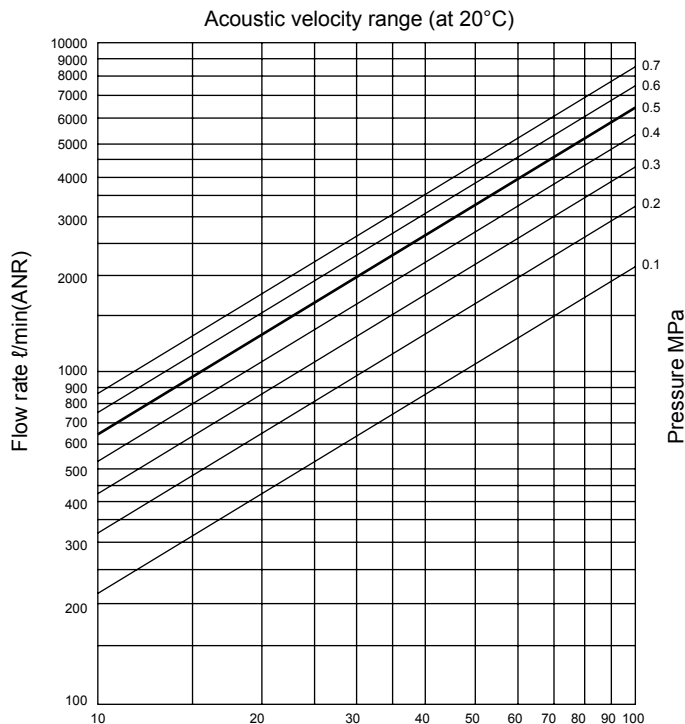
[Clean air system components]

Clean air system components

Part name	Model No.	Port size	Max. flow (ℓ/min atm press conv)
F.R.L. kit	C1000-6-W	Rc1/8	450
	C1000-8-W	Rc1/4	630
	C3000-8-W	Rc1/4	1280
	C3000-10-W	Rc3/8	1750
	C4000-8-W	Rc1/4	1430
	C4000-10-W	Rc3/8	2400
F.R. unit	C4000-15-W	Rc1/2	3000
	W1000-6-W	Rc1/8	830
	W1000-8-W	Rc1/4	1150
	W3000-8-W	Rc1/4	2150
	W3000-10-W	Rc3/8	2430
	W4000-8-W	Rc1/4	2500
Air filter (F)	W4000-10-W	Rc3/8	4350
	W4000-15-W	Rc1/2	4750
	F1000-6-W	Rc1/8	460
	F1000-8-W	Rc1/4	610
	F3000-8-W	Rc1/4	1230
	F3000-10-W	Rc3/8	1500
Regulator (R)	F4000-8-W	Rc1/4	1320
	F4000-10-W	Rc3/8	2140
	F4000-15-W	Rc1/2	3000
	R1000-6-W	Rc1/8	770
	R1000-8-W	Rc1/4	1350
	R3000-8-W	Rc1/4	2000
Lubricator (L)	R3000-10-W	Rc3/8	2600
	R4000-8-W	Rc1/4	2500
	R4000-10-W	Rc3/8	4400
	R4000-15-W	Rc1/2	5000
	L1000-6-W	Rc1/8	550
	L1000-8-W	Rc1/4	700
	L3000-8-W	Rc1/4	1100
	L3000-10-W	Rc3/8	2250
	L4000-8-W	Rc1/4	1000
	L4000-10-W	Rc3/8	1700
	L4000-15-W	Rc1/2	2700

Note) Max. flow rate: For F.R.L., F.R. and R, flow rate at 0.7 MPa primary pressure, 0.5 MPa set pressure, 0.1 MPa pressure drop. For air filter, flow rate at 0.7 MPa primary pressure, 0.02 MPa pressure drop. For lubricator, flow rate at 0.5 MPa primary pressure, flow rate at 0.03 MPa pressure.

[Effective cross-sectional area]



Effective cross-sectional area mm²
 (When the value of the effective cross-sectional area is x 10¹ or x 10⁰ multiply the value of flow rate by the same value.)

4G_B1 to 3/MN4G_B Series

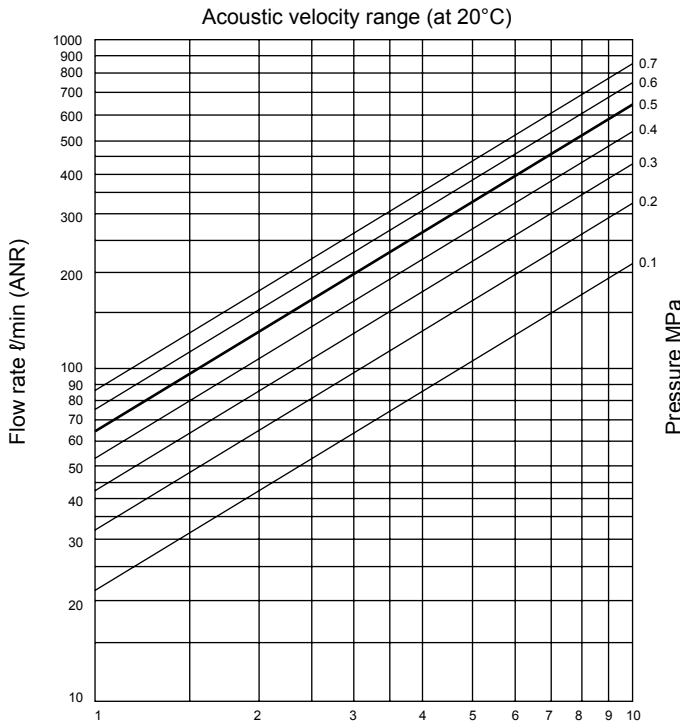
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MN4G Series [Device selection guide 1]

Cylinder bore size (mm)	Theoretical reference speed (mm/s)	Required flow rate (ℓ/min) (ANR)	Required effective sectional area (mm ²)	Proper standard system No.		
				1. Common exhaust	2. Atmospheric release exhaust	3. Exhaust with silencer
φ6	(500)	-	(0.1)	A 1	A 3	A 5
φ10	(500)	-	(0.2)	A 1	A 3	A 5
φ16	(500)	-	(0.5)	A 1	A 3	A 5
φ20	250	29	0.5	A 1	A 3	A 5
	400	46	1.6	B 1	B 4	B 7
φ25	250	44	0.8	A 2	A 4	A 6
	400	70	1.9	B 1	B 4	B 7
φ30	250	64	1.1	A 2	A 4	A 6
	400	100	2.8	B 1	B 4	B 7
φ32	250	73	1.3	A 2	A 4	A 6
	400	120	3.1	B 2	B 4	B 8
φ40	250	110	2.0	B 1	B 4	B 7
	400	180	4.9	B 3	B 6	B 9
φ40	250	110	1.7	B 1	B 4	B 7
	500	230	3.3	B 2	B 5	B 8
	750	340	5.0	B 3	B 6	B 9
	1000	450	6.6	-	-	-
φ50	250	180	2.6	B 1	B 1	B 7
	500	350	5.2	B 3	B 6	B 9
	750	530	7.7	-	-	-
	1000	710	10.4	-	-	-
φ63	250	280	4.1	B 2	B 5	B 8
	500	560	8.2	-	-	-
	750	840	12.3	-	-	-
	1000	1,100	16.4	-	-	-
φ80	250	450	6.6	-	B 6	-
	500	910	13.2	-	-	-
	750	1,400	19.8	-	-	-
	1000	1,800	25.4	-	-	-

* Refer to page 746 for system No.

[Effective cross-sectional area]



Effective cross-sectional area mm²
 (When the value of effective cross-sectional area is $\times 10^1$ or $\times 10^0$, multiply the value of flow rate by the same value.)

[Clean air system components]

Clean air system components

Part name	Model No.	Port size	Max. flow (ℓ/min atm press conv)
F.R.L. kit	C1000-6-W	Rc1/8	450
	C1000-8-W	Rc1/4	630
	C3000-8-W	Rc1/4	1280
	C3000-10-W	Rc3/8	1750
	C4000-8-W	Rc1/4	1430
	C4000-10-W	Rc3/8	2400
F.R. unit	C4000-15-W	Rc1/2	3000
	W1000-6-W	Rc1/8	830
	W1000-8-W	Rc1/4	1150
	W3000-8-W	Rc1/4	2150
	W3000-10-W	Rc3/8	2430
	W4000-8-W	Rc1/4	2500
Air filter (F)	W4000-10-W	Rc3/8	4350
	W4000-15-W	Rc1/2	4750
	F1000-6-W	Rc1/8	460
	F1000-8-W	Rc1/4	610
	F3000-8-W	Rc1/4	1230
	F3000-10-W	Rc3/8	1500
Regulator (R)	F4000-8-W	Rc1/4	1320
	F4000-10-W	Rc3/8	2140
	F4000-15-W	Rc1/2	3000
	R1000-6-W	Rc1/8	770
	R1000-8-W	Rc1/4	1350
	R3000-8-W	Rc1/4	2000
Lubricator (L)	R3000-10-W	Rc3/8	2600
	R4000-8-W	Rc1/4	2500
	R4000-10-W	Rc3/8	4400
	R4000-15-W	Rc1/2	5000
	L1000-6-W	Rc1/8	550
	L1000-8-W	Rc1/4	700
Ending	L3000-8-W	Rc1/4	1100
	L3000-10-W	Rc3/8	2250
	L4000-8-W	Rc1/4	1000
	L4000-10-W	Rc3/8	1700
	L4000-15-W	Rc1/2	2700

Note) Max. flow rate: For F.R.L., F.R. and R, flow rate at 0.7 MPa primary pressure, 0.5 MPa set pressure, 0.1 MPa pressure drop.
 For air filter, flow rate at 0.7 MPa primary pressure, 0.02 MPa pressure drop. For lubricator, flow rate at 0.5 MPa primary pressure, flow rate at 0.03 MPa pressure.