

● Air Tools for Maintenance

Spanners and Wrenches
for Maintenance

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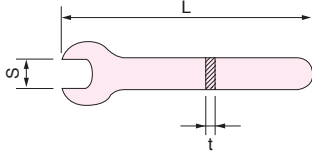
Air Tools and Air Compressor /
Air Pressure

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Spanners and Wrenches for Maintenance

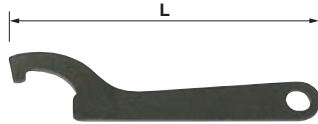
OPEN-END WRENCHES



AC No.	Size			Models
	S	L	t	
	mm	mm	mm	
F-100	5.5	81	2.5	FBM-1-1, 1F, 2, 2F
F-101	8.0	80	3.0	FG-13, 13X, TURBO-100
F-102	9.5	80	1.5	FCD-6A, 6B
F-103	10.0	80	3.0	FRD-5P-1, 5S-1, 1F, 6PX-2, 3, 5, *F-6SM-12, 21, 28, 28R, FRD-6S-2, 3, 5
F-103-1	10.0	105	4.0	FBM-16, 24
F-104	12.0	88	3.0	FG-12U, 12UX, 25D, 25DX, 50D, 50DX, FRD-8PX-1, 2, *F-5SM-2, 8.5, *8SMA-12, 28 FG-12U, 12UX, 2VX-1F, 3VX-1F, 6F, 25D, 25DX, 50DX, 26, 26X, 50X, 50D, FA-2C, 2CX, TURBO-100A, FRD-6PX-7, 6S-7, 7F, 8PX-3, *F-6SM-2.5, 2.5R, *5, 8, F-6SE, 6SF, *8SM-8.5RA, *8SMA-8.5, 6PFX
F-105	14.0	100	3.0	FRD-16Z, FCD-6X, F-10MT
F-106	17.0	130	3.0	FBM-300
F-117-1	17.0	150	6.0	
F-107	19.0	130	3.0	FCD-10X, FA-2C, 2CX, FT-8PX, FBM-80A
F-117	21.0	180	5.0	FG-3H, 3HL, 4HL, 50L, 50Y
F-109	24.0	200	4.0	FA-5E-3 Series, 7E-5, 6, 8 Series, FV-7, 9BH-1M, FX-027-1, FA-6C-6M, 8M, 9M, 9C-4, 4M
F-110	26.0	170	4.5	FA-150KG-5, 7, FA-5E-1, 2, 8, 13 Series, FA-7E-1, 2, 3 Series, 6C-1, 10, 12, 12M, 20, 9C-2, 2M, 7C-21
F-111	27.0	170	4.5	FG-5PX, FD-4, 4P
F-112	32.0	170	4.5	FG-3VX-2F, 3F, 4H, 4VA, 5HL, FA-4C, 4CH, 4CHK-1, FD-5, 5P
F-113	41.0	180	4.0	FV-9BH-4M, FRC-300-1

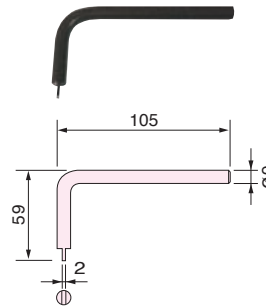
** = Thread Spindle type

HOOK SPANNERS



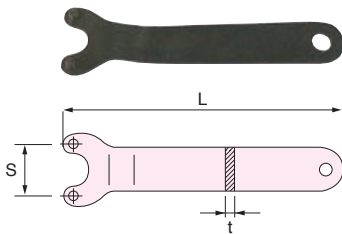
AC No.	Size		Models
	L	Thickness	
	mm	mm	
F-401	130	2	FD-4P, 4
F-402	160	2	FD-5P, 5
F-404	135	4.5	FA-3C, 3CX
F-405	170	4.5	FA-4CHK-3, 150K-2, 3

ANGLE WRENCH



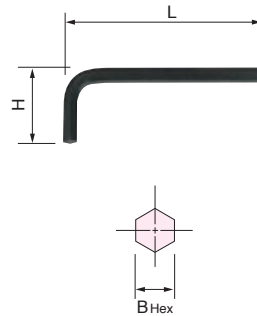
AC No.	Models
F-601	FD-5, 5P

OPEN-END PIN WRENCHES



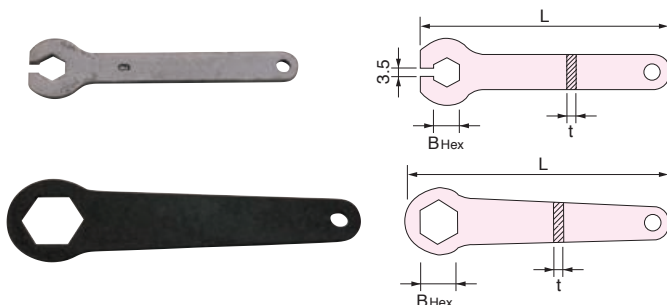
AC No.	Size			Models
	S	L	t	
	mm	mm	mm	
F-201	16	130	4.0	FG-5PX
F-202	30	160	4.5	FV-9BH-4M
F-203	32	180	4.5	FA-6C, 9C, 5E-13 Series, 7E-5, 6, 8 Series, FV-7-1M, 2M, 4M, 9BH-1M

HEXAGONAL PIN WRENCHES



AC No.	Size			
	B(Hex)	L	H	
	mm	in	mm	mm
F-701-2	1.25	-	45	10
F-701	1.5	-	52	12
F-701-1	1.5	-	52	52
F-712	2.0	-	58	12
F-702-1	2.0	-	60	60
F-702	2.5	-	60	15
F-703	3.0	-	65	20
F-704	4.0	-	72	25
F-705	5.0	-	80	28
F-706	6.0	-	90	32
F-707	-	1/4	90	32
F-708	8.0	-	100	36
F-710	-	3/8	112	40
F-709	10.0	-	112	40

HEXAGONAL WRENCHES



AC No.	Size			Models
	B(Hex)	L	t	
	mm	mm	mm	
F-301	8	80	3	TURBO-100, FG-06-1, 13, 13X
F-304	9	100	3	FG-06-1
F-306	14	101	4	TURBO-100A
F-302	17	135	2	FD-4P, 4
F-303	21	138	2	FD-5P, 5

The capacity of an air compressor should be higher than the number of air tools in operation. In other words, when the respective factors are represented by the following signs, the expression should be $Q > Nq + a$.

- Q** : Capacity of Air Compressor
- q** : Air Consumption of Each Tool
- a** : Air Leakage in Piping
- N** : Number of Air Tools

The power of an air compressor necessary to compress air of 1 m³/min at the air pressure of 0.63 MPa is theoretically calculated at 4.44 kW (6 PS). But, the required power of an air compressor comes to 7.4 kW (10 PS) to 11.1 kW (15 PS) depending on the types of compressors (reciprocating or screw compressors) when the actual efficiency of an air compressor is taken into account. For instance, what capacity of an air compressor is required if 1 piece of FA-7C-4 angle grinder is used? Air of 1.4 m³/min is necessary to use 1 piece of FA-7C-4 angle grinder and the required power of an air compressor is calculated at 10.36 kW (14 PS) to 15.54 kW (21 PS). If 20 pieces of FA-7C-4 angle grinders are used at the same time, air of 19.6 m³/min is necessary and the required power of an air compressor is calculated at 145.0 kW to 217.6 kW (196 PS to 294 PS). Even if the number of tools changes, the required power of an air compressor can be obtained by simple calculation. Yet, when a number of air tools are used at the same time, it does not seem that all the air tools are concurrently used at the maximum air consumption, so the following

expression is given under our past experience.

- Air Tools : **A, B, C...**
- Number of Air Tools : **Na, Nb, Nc...**
- Air Consumption of Each Tool : **Ca, Cb, Cc...**
- Coefficient according to Number of Air Tools : **F**
- Total Air Consumption : **Q**

$$Q = F (Na \times Ca + Nb \times Cb + Nc \times Cc + \dots)$$

The coefficient is given as per the under-mentioned table according to the number of air tools. The coefficient is in inverse proportion to the number of air tools.

Number of Air tools	1-5	6-10	11-20	21-30	31-50	51-100
F	1.0	0.8	0.7	0.6	0.5	0.4

Those coefficients are obtained because air tools are not always in successive operation. It is usual that operations of air tools are intermitted for changing jobs, lubrication, changing grinding wheel, drill bit, chisel, etc. There is a case that even small capacity of an air compressor can be available due to an interval of jobs when such air tools as impact wrenches, screw drivers, etc. are in operation. The running time of those air tools for one job is 2 to 5 seconds and they are not used in succession for one job.

Air Tools and Air Pressure

Air Tools and Air Pressure

Air pressure should be maintained at less than the recommended air pressure at the inlet of the air tool. Our air tools are usually designed to be used at the air pressure of 0.63 MPa and the fluctuation of air pressure affects the performance of the air tool. For instance, if the power of an air tool is 0.74 kW (1 PS) at the air pressure of 0.63 MPa, the power of the air tool generally comes to the following figures at each air pressure.

Air Pressure (MPa)	0.70	0.63	0.50	0.40	0.30
Power (kW)	0.93	0.74	0.56	0.40	0.26

It should be taken into account that air pressure drops at the inlet of the air tool due to the resistance and leakage caused when air passes in the pipe even if the air pressure is 0.63 MPa at the outlet of the air compressor. Needless to say, the loss of power may be caused unless the appointed air hose is used.

On the contrary, when air pressure fluctuates higher than the recommended air pressure at the inlet of the air tool, parts may consume comparatively faster, and what is worse, accidental operations may be induced, so air pressure should be maintained at less than the recommended air pressure at the inlet of the air tool in any case.

Air Tools and Air Pressure

Piping

Piping layout is very important to use the air tool efficiently. When a pipe is connected to an air compressor, the pipe should be installed at a reasonably high position from the air compressor to prevent drain from coming into the pipe from the air compressor. A slope more than 1/100 is necessary to drain water easily. The diameter of the main pipe should be determined according to an average air flow at load. The diameter of branch pipes should be 50% to 70% of the main pipe. Thin pipes may cause the drop of air pressure, so the pipes should be chosen lest air pressure should drop more than 0.0315 MPa. The drop of air pressure due to joints, elbows, etc. should be also taken into account.

Drop of Air Pressure (MPa) in 100 M

Straight Pipe at Air Pressure of 0.63 MPa (6.3 bar)

Pipe Inside Dia. (mm) \ Air Consumption (m ³ /min)	0.5	1.0	2.0	5.0	10.0	15.0
20	0.0095	0.0380	0.1428			
25	0.0038	0.0095	0.0476	0.2380		
32		0.0038	0.0190	0.0761	0.2857	
40			0.0038	0.0285	0.0857	0.1142
50				0.0076	0.0476	0.0571
60				0.0028	0.0095	0.0190
70					0.00476	0.0095
80						0.0028

Drop of Air Pressure (MPa) in 10 M

Air Hose at Air Pressure of 0.63 MPa (6.3 bar)

Hose Dia. (mm) \ Air Consumption (m ³ /min)	0.5	1.0	1.5	2.0	2.5	3.0	4.0
9.5mm (3/8")	0.0095	0.0485					
12.7mm (1/2")	0.0047	0.0317	0.0948	0.1826			
19.0mm (3/4")	0.0009	0.0041	0.0087	0.0190	0.0306	0.0463	
25.0mm (1")		0.0009	0.00213	0.0041	0.0074	0.0105	0.0126
38.0mm (1 1/2")					0.0005	0.0009	0.0013

Drop of Air Pressure in Coupling

(Valve, Elbow, etc.)

Pipe inside Dia. (mm)	Drop of air pressure in valve (m)	Drop of air pressure in elbow (m)
25	0.61	0.41
38	1.24	0.92
50	2.14	1.53
65	3.05	2.14
75	3.96	2.76
90	4.82	3.36
100	6.10	3.90
125	8.54	5.82
150	11.00	7.30

Recommended Piping Lay-Out for Air Line System

