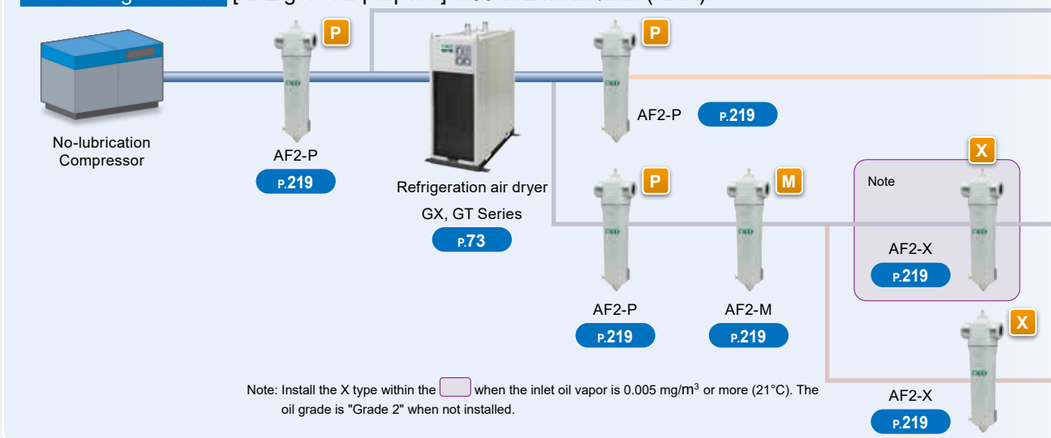
Recommended system configuration for Main Line Filter Components

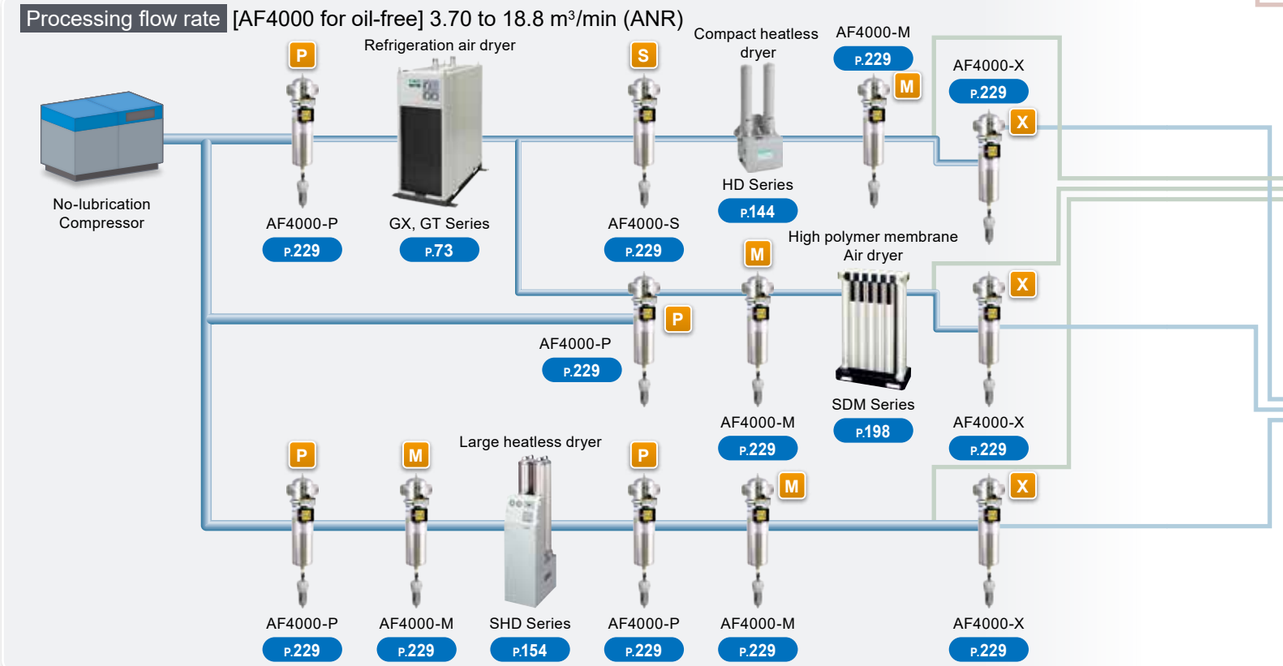
Medium Main Line Filters

Processing flow rate [AF2 general purpose] 4.95 to 24.1 m³/min (ANR)



Note: Install the X type within the ☐ when the inlet oil vapor is 0.005 mg/m³ or more (21°C). The oil grade is "Grade 2" when not installed.

Processing flow rate [AF4000 for oil-free] 3.70 to 18.8 m³/min (ANR)



AF2 Series Variations

Removes oil mist and solids
Protects Expensive Pneumatic Components.

- Removes particles 1 µm and larger
- Removes oil content up to 0.3 mg/m³ concentration on the secondary side (21°C)

P TYPE

High-performance removal of oil mist and solids.
For Pneumatic Circuits Which Prohibit Passage of Oil.

- Removes particles 0.01 µm and larger
- Removes oil content up to 0.01 mg/m³ concentration on the secondary side (21°C)

M TYPE

Removes oil mist and odors
Protects Expensive Pneumatic Components.

- Suction by activated carbon
- Removes oil vapor and odors up to 0.003 mg/m³ concentration on the secondary side (21°C)

X TYPE

AF4000 Series Variations

Removing Water Drops Solid Particle Removal
Ideal for use as a pre-filter for air dryers.

- Removes particles 5 µm and larger
- Water separation efficiency 99%

P TYPE

Solid Particle Removal
Protects Expensive Pneumatic Components.

- Removes particles 1 µm and larger

S TYPE

High-performance removal of oil mist and solids
For Pneumatic Circuits Which Prohibit Passage of Oil.

- Removes particles 0.01 µm and larger
- Oil content is removed up to 0.01 mg/m³ concentration on the secondary side (20°C)

M TYPE

Removes oil vapor and odors
For pneumatic circuits which prohibit passage of odors

- Activated carbon fiber adsorption
- Removes oil vapor and odors up to 0.003 mg/m³ concentration on the secondary side (20°C)

X TYPE

*1: If your conditions are different, refer to the specifications in the catalog in order to select a model.
*2: This example of system selection is based on an air-cooling refrigeration air dryer. When making a selection based on an air-cooling refrigeration air dryer, the model No. of the filter may vary since the standard processing air flow rate may differ. Contact CKD Sales for details.
*3: Air filter and oil mist filter are to be used where the inlet air temperature is 60°C or less, and X-type where the inlet air temperature is 30°C or less. If air temperature from the secondary side of the refrigeration air dryer is high, keep enough distance from the refrigeration air dryer to maintain a temperature no greater than the inlet air temperature.
*4: This system cannot be used for high pressure specifications (1 to 1.6 MPa). In that case, contact CKD Sales.
*5: Use anti-rust processed materials for piping (zinc plated pipe, lined pipe or stainless steel pipe).
*6: If there is a possibility of a large instantaneous air flow rate greater than the amount of air treated by the refrigeration air dryer, install a tank on the secondary side of the refrigeration air dryer. Installing a tank supplies stable moisture removed air.
*7: The air filter at the secondary side of the refrigeration air dryer can be used as a pre-filter before an oil mist filter.
*8: Depending on working conditions, condensation may form on the inside of the refrigeration air dryer and drip to the floor. To prevent water drops from flowing out, install a drain-pan, etc., before installing the dryer.
*9: Please feel free to consult with our sales staff when considering energy-saving systems.
*10: Install a filter immediately before the equipment to be used to remove contaminants existing in the piping.

Air Quality	Applications	Impurities in the Air			ISO 8573-1 compressed air purity grade
		Individual particles	Moisture	Oil content	
Dewatered air **Coarse dust removed air**	Air for cleaning (dry air not required)	1 µm	–	–	2: -: -
General dry air	General pneumatic components General pneumatic tools Labor-saving components Pneumatic jigs and tools Air chucks	1 µm	Pressure dew point 10°C	0.6 mg/m³	2.6.3
			Pressure dew point 7°C		2.5.3
Dry air (oil-free)	Instrumentation Measurement Sequence control Painting	0.01 µm	Pressure dew point 10°C	0.01 mg/m³ (0.003 mg/m³)	1.6.1
			Pressure dew point 7°C		1.5.1
Dry air (odorless)	Food and Pharmaceutical Processes (Stirring, dry blowing, packaging, brewing, pressure-feeding, filling) Cosmetic Manufacturing Processes *If the product directly contacts the workpiece, it is recommended to install a bacteria-removing filter.	0.01 µm	Pressure dew point 10°C	0.003 mg/m³	1.6.1
			Pressure dew point 7°C		1.5.1
Ultra dry air (oil-free)	Ozone generator Powder transfer Drying furnace gas Drying the insulation gas of a high-voltage generator Drying computer rooms Centralized control instrumentation Liquid crystal panel manufacturing Chemical plants Painted	0.01 µm	Pressure dew point -20°C	0.01 mg/m³	1.3.1
			Pressure dew point -40°C		1.2.1
			Pressure dew point -60°C		1.2.1
Ultra dry air (odorless)	Food and Pharmaceutical Processes (Stirring, dry blowing, packaging, brewing, pressure-feeding, filling) Cosmetic Manufacturing Processes *If the product directly contacts the workpiece, it is recommended to install a bacteria-removing filter.	0.01 µm	Pressure dew point -20°C	0.003 mg/m³	1.3.1
			Pressure dew point -40°C		1.2.1
			Pressure dew point -60°C		1.2.1

*1. The system No. is based on the class below. X not found in the table indicates odor removal; and "–" indicates no specification.

ISO 8573-1: 2010 Compressed air purity grade

Grade	Solid Particles				Humidity and Water Content		Oil
	Max. number of particles per m³ for particle diameter d (µm)			Mass Concentration Cp mg/m³	Pressure dew point °C	Water Concentration Cw g/m³	Total Oil Concentration mg/m³
	0.1 < d ≤ 0.5	0.5 < d ≤ 1.0	1.0 < d ≤ 5.0				
0	Conditions stricter than Grade 1, is to be specified by the user or supplier						
1	≤ 20,000	≤ 400	≤ 10	-	≤ -70	-	≤ 0.01
2	≤ 400,000	≤ 6,000	≤ 100	-	≤ -40	-	≤ 0.1
3	-	≤ 90,000	≤ 1,000	-	≤ -20	-	≤ 1
4	-	-	≤ 10,000	-	≤ +3	-	≤ 5
5	-	-	≤ 100,000	-	≤ +7	-	-
6	-	-	-	0 < Cp ≤ 5	≤ +10	-	-
7	-	-	-	5 < Cp ≤ 10	-	Cw ≤ 0.5	-
8	-	-	-	-	-	0.5 < Cw ≤ 5	-
9	-	-	-	-	-	5 < Cw ≤ 10	-
X	-	-	-	Cp > 10	-	Cw > 10	> 5

For example, "Grade 1: 2: 1" means:
●Solid particles 0.1 to 0.5 µm are 20,000 particles or less, 0.5 to 1.0 µm are 400 particles or less, and 1.0 to 5.0 µm are 10 particles or less
●Pressure dew point −40°C or less
●Oil concentration 0.01 mg/m³or less
and these indicate the class.

Main Line Components
Refrigeration Dryers
Desiccant Dryers
High Polymer Membrane Dryers
Main Line Filters
Drain discharger, etc.
Ending

Roles and functions of Main Line Components

	Appearance	Components removed	Removal performance	Page
Main Line Filters	 ・AF2 Series  ・AF4000 Series  ・AF3000 Series  ・AF5000 Series	Particle Solid foreign matter Contaminant Dust	Particle size: 10 / 1 / 0.1 / 0.01 / 0.001 µm P-type filter: 5 µm (AF4000), 3 µm (AF3000, AF5000), 1 µm (AF2) S-type filter: 1 µm (AF4000), 0.3 µm (AF3000, AF5000) M-type filter: 0.01 µm	207
		Oil content	Oil concentration: 10 / 1 / 0.1 / 0.01 / 0.001 mg/m³ P-type filter: 0.3 mg/m³ (AF2) S-type filter: 0.5 mg/m³ (AF5000) M-type filter: 0.01 mg/m³ X-type filter: 0.003 mg/m³	207
		Odor	X-type filter	207
Air dryer	 ・GX Series  ・SU Series  ・SDM Series  ・GT Series  ・HD Series  ・SHD Series	Moisture	atmospheric dew point: 0 / -10 / -20 / -30 / -40 / -50 / -60 / −70 °C Refrigeration Dryers GX Series GT Series: −17 Polymer separation membrane dryer SD SU SDM Series: -60 Desiccant Air Dryers HD Series SHD Series: −72	Refrigeration 73 High polymer membrane 169 Desiccant 137

Main Line Components

Series Variation

Refrigeration Air Dryers

Compressor kW (horsepower *1)	Standard processing air flow rate m³/min (ANR)	Refrigeration Dryers GX Series	Refrigeration Dryers GT Series	Refrigeration Dryers Water Cooling Series	Main Line Filters P-type Water and solid removing (Filtration rating)	Micro-mist separator S-type Oil removing (Degree of filtration)	Micro-mist separator M-type High-performance oil removing (Degree of filtration)	Micro-mist separator X-type For deodorizing (Degree of filtration)
		Pressure dew point 10°C						
Up to 0.75 (-1)	0.10/0.11	GX3203D GX5203D	-	-	F2000-10-W-F1 (5 μm)	M2000-10-W-F1S (0.3 μm)	M2000-10-W-F1 (0.01 μm)	M2000-10-W-X
1.5 (2)	0.20/0.22	GX3203D GX5203D	-	-	F2000-10-W-F1 (5 μm)	M2000-10-W-F1S (0.3 μm)	M2000-10-W-F1 (0.01 μm)	M2000-10-W-X
2.2 (3)	0.30/0.35	GX3203D GX5203D	-	-	F3000-10-W-F (5 μm)	M3000-10-W-F1S (0.3 μm)	M4000-10-W-F1 (0.01 μm)	M4000-10-W-X
3.7 (5)	0.40/0.52	GX3206D GX5204D	-	-	F3000-10-W-F (5 μm)	M4000-10-W-F1S (0.3 μm)	M6000-20-W-F1 (0.01 μm)	M6000-20-W-X
5.5 (7.5)	0.64/0.72	GX3206D GX5206D	-	-	F4000-15-W-F (5 μm)	M4000-15-W-F1S (0.3 μm)	M6000-20-W-F1 (0.01 μm)	M6000-20-W-X
7.5 (10)	1.22/1.32	GX3208D GX5208D	-	-	F6000-20-W-F (5 μm)	M6000-20-W-F1S (0.3 μm)	M8000-20-W-F1 (0.01 μm)	M8000-20-W-X
11 (15)	1.65/1.82	GX3211D GX5211D	-	-	F8000-25-W-F (5 μm)	M8000-25-W-F1S (0.3 μm)	M8000-25-W-F1 (0.01 μm)	M8000-25-W-X

Compressor kW (horsepower *1)	Standard processing air flow rate m³/min (ANR)	Refrigeration Dryers GX Series	Refrigeration Dryers GT Series	Refrigeration Dryers Water Cooling Series	Main Line Filters General Purpose P-type Water and Solid Removing (Filtration rating)	Micro-mist separator General Purpose S-type For oil removal (Filtration rating)	Main Line Filters Oil-free P-type Water and Solid Removing (Filtration rating)	Micro-mist separator Oil-free S-type For oil removal (Filtration rating)	Micro-mist separator General Purpose M-type High-performance oil removing (Filtration rating)	Micro-mist separator General Purpose X-type For deodorizing (Filtration rating)	Micro-mist separator Oil-free M-type High-performance oil removing (Filtration rating)	Micro-mist separator Oil-free X-type For deodorizing (Filtration rating)
		Pressure dew point 10°C										
15 (20)	2.40/2.80	GX3215D GX5215D	-	-	AF2-05P25A (1 μm)		AF4004P-25 (5 μm)	AF4004S-25 (1 μm)	AF2-05M25A (0.01 μm)	AF2-05X25A	AF4004M-25 (0.01 μm)	AF4004X-25
22 (30)	3.70/4.20	GX3222D GX5222D	-	-	AF2-08P40A (1 μm)		AF4007P-40 (5 μm)	AF4007S-40 (1 μm)	AF2-08M40A (0.01 μm)	AF2-08X40A	AF4007M-40 (0.01 μm)	AF4007X-40
37 (50)	5.70/6.10	GX3237D GX5237D	-	-	AF2-08P40A (1 μm)		AF4010P-40 (5μm)	AF4010-S-40 (1μm)	AF2-08M40A (0.01 μm)	AF2-08X40A	AF4010M-40 (0.01 μm)	AF4010X-40
55 (75)	8.40/9.80	GX3255D GX5255D	-	-	AF2-13P50A (1 μm)		AF4013P-50 (5 μm)	AF4013S-40 (1 μm)	AF2-13M50A (0.01 μm)	AF2-13X50A	AF4013M-50 (0.01 μm)	AF4013X-50
75 (100)	11.4/12.6	GX5275D	GT9075D	GT9075WD	AF2-20P50A (1μm) AF3016P-50 (3 μm)	AF3016S-50 (0.3 μm)	AF5016P-50 (3 μm)	AF4020S-50 (1 μm) AF5016S-50 (0.3 μm)	AF2-20M50A AF3016M-50 (0.01 μm)	AF2-20X50A AF3016X-50	AF4020M-50 AF5016M-50 (0.01 μm)	AF4020X-50 AF5016X-50
90 (120)	16.3/18.9	-	GT9090D	GT9090WD	AF2-20P50A (1μm) AF3032P-80 (3 μm)	AF302S-80 (0.3 μm)	AF5032P-80 (3 μm)	AF4020S-50 (1 μm) AF5032S-50 (0.3 μm)	AF2-20M50A (0.01 μm)	AF2-20X50A	AF4020M-50 AF5032M-80 (0.01 μm)	AF4020X-50 AF5032X-80
120 (160)	20.8/23.8	-	GT9120D	GT9120WD	AF2-24P65A (1μm) AF3032P-80 (3 μm)	AF3032S-80 (0.3 μm)	AF5032P-80 (3 μm)	AF5032S-50 (0.3 μm)	AF2-24M65A AF3032M-80 (0.01 μm)	AF2-24X65A AF3032X-80	AF5032M-80 (0.01 μm)	AF5032X-80
150 (200)	25.9/30.1	-	GT9150D	GT9150WD	AF3032P-80 (3 μm)	AF3032S-80 (0.3 μm)	AF5032P-80 (3 μm)	AF5032S-80 (0.3 μm)	AF3032M-80 (0.01 μm)	AF3032X-80	AF5032M-80 (0.01 μm)	AF5032X-80
190 (250)	32.1/38.1	-	GT9190D	GT9190WD	AF3048P-100 (3 μm)	AF3048S-100 (0.3 μm)	AF5048P-100 (3 μm)	AF5048S-100 (0.3 μm)	AF3048M-100 (0.01 μm)	AF3048X-100	AF5048M-100 (0.01 μm)	AF5048X-100
240 (320)	36.5/43.0	-	GT9240	GT9240W	AF3048P-100 (3 μm)	AF3048S-100 (0.3 μm)	AF5048P-100 (3 μm)	AF5048S-100 (0.3 μm)	AF3048M-100 (0.01 μm)	AF3048X-100	AF5048M-100 (0.01 μm)	AF5048X-100
300 (400)	44.2/52.0	-	GT9300	GT9300W	AF3064P-100 (3 μm)	AF3064S-100 (0.3 μm)	AF5064P-100 (3 μm)	AF5064S-100 (0.3 μm)	AF3064M-100 (0.01 μm)	AF3064X-100	AF5064M-100 (0.01 μm)	AF5064X-100
380 (505)	55.2/65.0	-	GT9380	GT9380W	AF3080P-100 (3 μm)	AF3080S-100 (0.3 μm)	AF5080P-100 (3 μm)	AF5080S-100 (0.3 μm)	AF3080M-100 (0.01 μm)	AF3080X-100	AF5080M-100 (0.01 μm)	AF5080X-100
450 (600)	70.3/82.8	-	GT9450	GT9450W	AF3096P-150 (3 μm)	AF3096S-150 (0.3 μm)	AF5096P-150 (3 μm)	AF5096S-150 (0.3 μm)	AF3096M-150 (0.01 μm)	AF3096X-150	AF5096M-150 (0.01 μm)	AF5096X-150
710 (950)	139.1	-	-	GT9710WV2	AF3160P-200 (3 μm)	AF3160S-200 (0.3 μm)	AF5160P-200 (3 μm)	AF5160S-200 (0.3 μm)	AF3160M-200 (0.01 μm)	AF3160X-200	AF5160M-200 (0.01 μm)	AF5160X-200
960 (1280)	184.2	-	-	GT9960WV2	AF3192P-200 (3 μm)	AF3192S-200 (0.3 μm)	AF5192P-200 (3 μm)	AF5192S-200 (0.3 μm)	AF3192M-200 (0.01 μm)	AF3192X-200	AF5192M-200 (0.01 μm)	AF5192X-200

*1: 1 PS (horsepower) is equivalent to 0.7355 kW, but conventionally expressed in 1 PS=0.75 kW.

*2: This list is for selection guide. For the final selection, refer to the relevant page and select a model upon confirming installation and operating conditions.

*3: Use AF2 and AF3000 Series in oil type compressor systems, and AF4000 and AF5000 Series in oil-prohibited compressor systems.

Desiccant Air Dryer (heatless dryer)

Compressor	Standard processing air flow rate	Desiccant Dryers					Main Line Filters		Micro-mist separator		
		Compact HD Series			Large SHD Series						
kw (horsepower) *1	m^3/min (ANR)	Atmospheric dew point -17.5°C	Atmospheric dew point -40°C	Atmospheric dew point -72°C	Pressure dew point -20°C (-40°C) /*5 -40°C (-57°C)	Pressure dew point -60°C (-74°C) *5	P-type Water and Solid Removing (Filtration rating)		S-type For oil removal (Filtration rating)	M-type High-performance oil removing (Filtration rating)	X-type For deodorizing (Filtration rating)
Up to 0.4 (0.53)	0.042/0.049	-	-	HD-0.5	-	-	F2000-10-W-F1 (5 μm)		M2000-10-W-F1S (0.3 μm)	M2000-10-W-F1 (0.01 μm)	M2000-10-W-X
0.75 (-1)	0.10/0.11	HD-0.5	HD-0.5	HD-1	-	-	F2000-10-W-F1 (5 μm)		M2000-10-W-F1S (0.3 μm)	M2000-10-W-F1 (0.01 μm)	M2000-10-W-X
1.5 (2)	0.20/0.22	HD-1	HD-1	HD-1.5	-	-	F2000-10-W-F1 (5 μm)		M2000-10-W-F1S (0.3 μm)	M2000-10-W-F1 (0.01 μm)	M2000-10-W-X
2.2 (3)	0.30/0.35	HD-1.5	HD-1.5, -2	HD-2	-	-	F3000-10-W-F (5 μm)		M3000-10-W-F1S (0.3 μm)	M4000-10-W-F1 (0.01 μm)	M4000-10-W-X
3.7 (5)	0.40/0.52	HD-2	HD-4	HD-4	-	-	F3000-10-W-F (5 μm)		M4000-10-W-F1S (0.3 μm)	M6000-20-W-F1 (0.01 μm)	M6000-20-W-X
5.5 (7.5)	0.64/0.72	HD-4	-	HD-6	-	-	F4000-15-W-F (5 μm)		M4000-15-W-F1S (0.3 μm)	M6000-20-W-F1 (0.01 μm)	M6000-20-W-X
7.5 (10)	1.22/1.32	HD-6	HD-6	HD-9	-	-	F6000-20-W-F (5 μm)		M6000-20-W-F1S (0.3 μm)	M8000-20-W-F1 (0.01 μm)	M8000-20-W-X
11 (15)	1.65/1.82	HD-9	HD-9	-	-	-	F8000-25-W-F (5 μm)		M8000-25-W-F1S (0.3 μm)	M8000-25-W-F1 (0.01 μm)	M8000-25-W-X

Compressor	Standard processing air flow rate	Desiccant Dryers					Main Line Filters	Micro-mist separator	Main Line Filters	Micro-mist separator	Micro-mist separator			
		Compact HD Series			Large SHD Series		General Purpose		Oil-free		General Purpose		Oil-free	
kw (horsepower) *1	m^3/min (ANR)	Atmospheric dew point -17.5°C	Atmospheric dew point -40°C	Atmospheric dew point -72°C	Pressure dew point -20°C (-40°C) /*5 -40°C (-57°C)	Pressure dew point -60°C (-74°C) *5	P-type/Water and Solid Removing (Filtration rating)	S-type For oil removal (Filtration rating)	P-type Water and Solid Removing (Filtration rating)	S-type For oil removal (Filtration rating)	M-type High-performance oil removing (Filtration rating)	X-type For deodorizing (Filtration rating)	M-type High-performance oil removing (Filtration rating)	X-type For deodorizing (Filtration rating)
15 (20)	2.40/2.80	HD-9	-	-	SHD3025-G/M	SHD3025-M	AF2-05P25A (1 μm)		AF4004P-25 (5 μm)	AF4004S-25 (1 μm)	AF2-05M25A (0.01 μm)	AF2-05X25A	AF4004M-25 (0.01 μm)	AF4004X-25
22 (30)	3.70/4.20	-	-	-	SHD3045-G/M	SHD3045-M	AF2-11P40A (1 μm)		AF4007P-40 (5 μm)	AF4007S-40 (1 μm)	AF2-08M40A (0.01 μm)	AF2-08X40A	AF4007M-40 (0.01 μm)	AF4007X-40
37 (50)	5.70/6.10	-	-	-	SHD3075-G/M	SHD3075-M	AF2-08P40A (1 μm)		AF4010P-40 (5μm)	AF4010-S-40 (1μm)	AF2-11M40A (0.01 μm)	AF2-11X40A	AF4010M-40 (0.01 μm)	AF4010X-40
55 (75)	8.40/9.80	-	-	-	SHD3100-G/M	SHD3100-M	AF2-13P50A (1 μm)		AF4010P-40 (5μm)	AF4010S-40 (1μm)	AF2-13M50A (0.01 μm)	AF2-13X50A	AF4010M-40 (0.01 μm)	AF4010X-50
75 (100)	11.4/12.6	-	-	-	SHD3125-G/M SHD3150-G/M	SHD3125-M SHD3150-M	AF2-13P50A AF2-20P50A (1 μm)	-	AF4013P-50 (5μm) AF4020S-50 (1 μm)	AF4013S-50 (1 μm) AF4020S-50 (1μm)	AF2-13M50A AF2-20M50A (0.01 μm)	AF2-13X50A AF2-20X50A	AF4013M-50 AF4020M-50 (0.01 μm)	AF4013X-50 AF4020X-50
90 (120)	16.3/18.9	-	-	-	SHD3200-G/M	SHD3200-M	AF2-24P65A (1 μm)	-	AF5032P-80 (3 μm)	AF5032S-50 (0.3 μm)	AF2-24M65A (0.01 μm)	AF2-24X65A	AF5032M-80 (0.01 μm)	AF5032X-80
120 (160)	20.8/23.8	-	-	-	SHD3240-G/M	SHD3240-M	AF2-24P65A (1 μm)	-	AF5032P-80 (3 μm)	AF5032S-50 (0.3 μm)	AF2-24M65A AF3032M-80 (0.01 μm)	AF2-24X65A AF3032X-80	AF5032M-80 (0.01 μm)	AF5032X-80

*1: 1 PS (horsepower) is equivalent to 0.7355 kW, but conventionally expressed in 1 PS=0.75 kW.
*2: This list is for selection guide. For the final selection, refer to the relevant page and select a model upon confirming installation and operating conditions.
*3: Use AF2 and AF3000 Series in oil type compressor systems, and AF4000 and AF5000 Series in oil-prohibited compressor systems.
*4: This table has been prepared based on the conditions of "inlet air pressure: 0.7 MPa, inlet air temperature: in accordance with the rating of each series". In cases when the conditions are different, a model will be corrected based on multiplier calculations.
*5: The value in ( ) is the atmospheric dew point converted value.

High Polymer Membrane Air Dryer (Super Dryer)

Compressor	Standard processing air flow rate m^3/min (ANR)	Standard dew point		Low dew point					Large flow rate manifold			Main Line Filters	Micro-mist separator		
kw (horsepower) *1		Low purge type Purge rate 10% atmospheric dew point -15°C	Large flow rate type Purge rate 20% atmospheric dew point -20°C	Standard dew point Unit type atmospheric dew point -20°C	Low dew point Unit type atmospheric dew point -40°C	Standard dew point Discrete type atmospheric dew point -20°C	Low dew point atmospheric dew point -40°C	Ultra-low dew point Discrete atmospheric dew point -60°C	Atmospheric dew point -20°C	Atmospheric dew point -40°C	Atmospheric dew point -60°C	P-type Water and Solid Removing (Filtration rating)	S-type For oil removal (Filtration rating)	M-type High-performance oil removing (Filtration rating)	X-type For deodorizing (Filtration rating)
Up to 0.2 (0.15)	0.021/0.025	-	-	-	-	-	-	SD3015-C	-	-	-	F2000-10-W-F1 (5 µm)	M2000-10-W-F1S (0.3 µm)	M2000-10-W-F1 (0.01 µm)	M2000-10-W-X
0.4 (0.53)	0.042/0.049	SD/SU301E	-	-	SU3015-B	-	SD3015-B	SD3025-C	-	-	-	F2000-10-W-F1 (5 µm)	M2000-10-W-F1S (0.3 µm)	M2000-10-W-F1 (0.01 µm)	M2000-10-W-X
0.75 (1)	0.10/0.11	SD/3U302E	SD/SU301D	SU3015-A	SU3025-B	SD3015-A	SD3035-B	SD3050-C	-	-	-	F2000-10-W-F1 (5 µm)	M2000-10-W-F1S (0.3 µm)	M2000-10-W-F1 (0.01 µm)	M2000-10-W-X
1.5 (2)	0.20/0.22	-	SD/SU302D	-	SU3050-B	-	SD3050-B	SD3075/ 4050-C	-	-	-	F2000-10-W-F1 (5 µm)	M2000-10-W-F1S (0.3 µm)	M2000-10-W-F1 (0.01 µm)	M2000-10-W-X
2.2 (3)	0.30/0.35	SD/SU401E	-	SU3025-A	-	SD3025-A	SD3075/ 4050-B	SD4075-C	-	-	-	F3000-10-W-F (5 µm)	M3000-10-W-F1S (0.3 µm)	M4000-10-W-F1 (0.01 µm)	M4000-10-W-X
3.7 (5)	0.40/0.52	SD/SU402E	SD/SU401D	SU3035-A	-	SD3035/ 4050-A	SD4075-B	SD4100-C	-	-	SDM4050-2-C	F3000-10-W-F (5 µm)	M4000-10-W-F1S (0.3 µm)	M6000-20-W-F1 (0.01 µm)	M6000-20-W-X
5.5 (7.5)	0.64/0.72	-	SD/SU402D	SU3050-A	-	SD3050-A	SD4100-B	-	-	SDM4050-2-B	SDM4075-2-C	F4000-15-W-F (5 µm)	M4000-15-W-F1S (0.3 µm)	M6000-20-W-F1 (0.01 µm)	M6000-20-W-X
7.5 (10)	1.22/1.32	-	-	SU3075-A	-	SD3075/ 4075-A	-	-	SDN4050-2-A	SDM4075-2-B	SDM4075-3-C	F6000-20-W-F (5 µm)	M6000-20-W-F1S (0.3 µm)	M8000-20-W-F1 (0.01 µm)	M8000-20-W-X
11 (15)	1.65/1.82	-	-	SU4100-A	-	SD4100-A	-	-	SDM4075-2-A	SDM4075-3-B	SDM4100-3-C	F8000-25-W-F (5 µm)	M8000-25-W-F1S (0.3 µm)	M8000-25-W-F1 (0.01 µm)	M8000-25-W-X

Compressor	Standard processing air flow rate m^3/min (ANR)	Standard dew point		Low dew point					Large flow rate manifold			Main Line Filters	Micro-mist separator	Main Line Filters	Micro-mist separator	Micro-mist separator			
												General Purpose		Oil-free		General Purpose		Oil-free	
kw (horsepower) *1		Low purge type Purge rate 10% atmospheric dew point -15°C	Large flow rate type Purge rate 20% atmospheric dew point -20°C	Standard dew point Unit type atmospheric dew point -20°C	Low dew point Unit type atmospheric dew point -40°C	Standard dew point Discrete type atmospheric dew point -20°C	Low dew point atmospheric dew point -40°C	Ultra-low dew point Discrete atmospheric dew point -60°C	Atmospheric dew point -20°C	Atmospheric dew point -40°C	Atmospheric dew point -60°C	P-type/Water and Solid Removing (Filtration rating)	S-type For oil removal (Filtration rating)	P-type/Water and Solid Removing (Filtration rating)	S-type/For oil removal (Filtration rating)	M-type/High-performance oil removing (Filtration rating)	X-type For deodorizing (Filtration rating)	M-type/High-performance oil removing (Filtration rating)	X-type For deodorizing (Filtration rating)
15 (20)	2.40/2.80	-	-	-	-	-	-	-	SDM4075-3-A	SDM4100-3-B	SDM4075-8-C	AF2-05P25A (1 µm)		AF4004P-25 (5 µm)	AF4004S-25 (1 µm)	AF2-05M25A (0.01 µm)	AF2-05X25A	AF4004M-25 (0.01µm)	AF4004X-25
22 (30)	3.70/4.20	-	-	-	-	-	-	-	SDM4050-6-A	SDM4075-6-B	SDM4075-10-C	AF2-08P40A (1 µm)		AF4007P-40 (5 µm)	AF4007S-40 (1 µm)	AF2-08M40A (0.01 µm)	AF2-08X40A	AF4007M-40 (0.01µm)	AF4007X-40
37 (50)	5.70/6.10	-	-	-	-	-	-	-	SDM4075-6-A	SDM4075-10-B	-	AF2-08P40A (1 µm)		AF4010P-40 (5 µm)	AF4010S-40 (1 µm)	AF2-08M40A (0.01 µm)	AF2-08X40A	AF4010M-40 (0.01µm)	AF4010X-40
55 (75)	8.40/9.80	-	-	-	-	-	-	-	SDM4100-6-A	-	-	AF2-13P50A (1 µm)		AF4013P-50 (5 µm)	AF4013S-40 (1 µm)	AF2-13M50A (0.01 µm)	AF2-13X50A	AF4013M-50 (0.01µm)	AF4013X-50
75 (100)	11.4/12.6	-	-	-	-	-	-	-	SDM4100-8-A	-	-	AF2-20P50A (1 µm)		AF4020P-50 (5 µm) AF5016P-50 (3 µm)	AF4020S-50 (1 µm) AF5016S-50 (0.3 µm)	AF2-20M50A AF3016M-50 (0.01 µm)	AF2-20X50A AF3016X-50	AF4020M-50 AF5016M-50 (0.01 µm)	AF4020X-50 AF5016X-50
												AF3016P-50 (3 µm)	AF3016S-50 (0.3 µm)						

*1: 1 PS (horsepower) is equivalent to 0.7355 kW, but conventionally expressed in 1 PS=0.75 kW.
*2: This list is for selection guide. For the final selection, refer to the relevant page and select a model upon confirming installation and operating conditions.
*3 : Use AF2 and AF3000 Series in oil type compressor systems, and AF4000 and AF5000 Series in oil-prohibited compressor systems.
*4 : This table has been prepared based on the conditions of "inlet air pressure: 0.7 MPa, inlet air temperature: in accordance with the rating of each series". In cases when the conditions are different, a model will be corrected based on multiplier calculations.

Indicatoring air flow rate

Indicator values of air flow rate differ depending on the state of the air. Pneumatic components must be selected upon checking the condition for displayed flow rate.
There are two main methods for displaying the air flow rate.

(1) Flow rate unit expressing volume in reference state L/min (normal) (N L/min)

(2) Flow rate unit expressing volume in standard condition L/min (ANR)

The reference state refers to the absolute pressure: 101.3 KPa
Temperature: 0°C
relative humidity: 0%
This state is usually used for the flow rate meter.
The standard condition refers to absolute pressure: 101.3 KPa
Temperature: 20°C
relative humidity: 65%
This is the standard condition (refer to Japan Fluid Power Association Standards JPAS008) in which people are active.
The approximation formula is usually used to convert both conditions.

1 L/min (normal) (1N L/min) ≈ 1.08 L/min (ANR)

Even if the air flow rate is the same, smaller values are displayed for NL/min. Under the Japan Fluid Power Association Standards, the air flow rate unit is ANR(Note)The display is integrated with the display, and all flow rates in the catalog are displayed in ANR. (Excluding flow rate sensor) Other than the above, some flow rates are displayed with the manufacturer's original reference values. In these cases, make sure to convert values to ANR when selecting the model.

Note: The origin of ANR comes from the French expression "Conditions de l'atmosphère normale de référence" (which is French for "Standard reference atmospheric conditions").

Cost of air and energy saving

1 Cost of air

The cost of compressed air is calculated as the total sum of all expenses required to compress 1 m³ of air to a specified pressure with atmospheric pressure conversion.
Cost of compressed air =

$$\frac{\text{Electricity cost (compressor/auxiliary components such as dryer, pump, etc.) + facility depreciation cost + running cost + maintenance cost [yen/year]}}{\text{Amount of compressed air discharged [m}^3\text{/year]}}$$

When simply calculated from equipment performance, it differs due to contracted basic power rates. However, it is generally 2.5 yen/m³ or less.
Practically, the used flow rate (air discharge rate) differs with the daily operation time zone, such as daytime, nighttime, weekday, or month. When the flow rate and pressure change, power consumption also changes. To calculate the actual cost of air, the average annual cost must be found by measuring the total amount of power and amount of used air flow rate through the year.
When assuming the general operation state, some calculation examples provide 3.0 yen/m³ for the cost of air.

The cost of air must be understood to promote energy conservation of the pneumatic system, and to illustrate the improvement effect. This is also important for increasing awareness in making improvements.

2 Points of energy saving

(1) Suppressing wasted air consumption
- Reduction of air leakage
- Review and reduction of air blow consumption
- Optimization of air components sizing, etc.

(2) Selecting devices and components with low power consumption

(3) Lowering pneumatic pressure
Driving the compressor shaft, which consumes the most energy, is reduced by lowering discharge pressure. (Example: If using a screw, savings of 8% or more are achieved by lowering discharge from 0.7 to 0.6 MPa). Thus, the working pressure at the end must be reduced and pneumatic components with small pressure loss must be selected.

3 Efforts by CKD

- High efficiency is pursued in every aspect of CKD products.
  By enhancing efficiency, high processing performance is realized with small power consumption.
- By reducing pressure loss of components, low pressure air sources can be used, reducing compressor shaft force (power consumption).

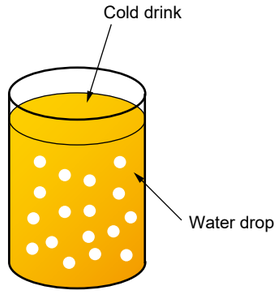
Dew point

The term dew point is used with dryers to express their performance. Along with the valve's effective cross-sectional area, Cv, and cylinder bore size, this is one of the most important specifications when selecting a model.

There are two dew points, which are atmospheric dew point and pressure dew point. Both are used often so the differences between them must be understood.

What is Dew Point?

In addition to nitrogen and oxygen, air contains water in the form of vapor. Air can contain a larger amount of water vapor when the temperature is higher. The point where the water vapor changes to water drops (dew) when lowering the temperature is called the dew point. When a cold drink is poured into a glass on a hot day, dew is formed soon on the outside of the glass. This happens because the air around the glass is cooled and the water vapor in the air becomes water drops.



☆Water vapor is invisible. Steam in a bath room is fine water drops.

The air we breathe is called atmospheric air. The temperature at which water drops form in atmospheric (dew point) is strictly called 'dew point temperature'.

Atmospheric dew point

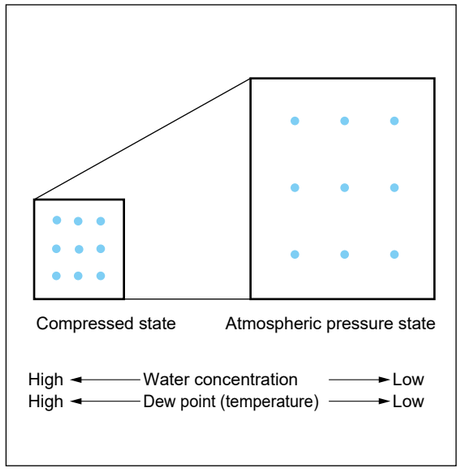
pressure dew point.

Pressure dew point

As shown in the lower right figure, the temperature at which the water vapor changes to water drops in compressed air is called

Pressure dew point

pressure dew point.



Atmospheric dew point and pressure dew point

When the air pressure and temperature are known, the pressure dew point is determined from the atmospheric dew point, and vice versa, using a saturated water vapor rate table or pressure dew point - atmospheric dew point conversion table (provided in catalog).

Dryer types and achieved dew point

A dryer is the device to remove water vapor from compressed air to create dry air. The achieved dew point differs by the type of dryer.

Dew point conversion table

[°C]

Pressure dew point	15	10	7	5	3	−8	-10	-20	-30	−31	-40	−43	-50	-60	−70
atmospheric dew point	−13	−17	−19	-20	−22	-30	−32	-40	−48	-50	−57	-60	−66	−74	−83

Note: The pressure dew point is for 0.7 MPa.

Saturated vapor rate table (Relative humidity 100%)

(Unit: g/m³)

Temperature at 10°C unit	Temperature at 1°C unit 0	1	2	3	4	5	6	7	8	9
90	418	433	449	465	481	498	515	532	551	569
80	291	302	313	325	337	350	363	376	390	404
70	197	205	213	222	231	240	250	259	270	280
60	130	135	141	147	154	160	167	174	182	189
50	82.8	86.7	90.8	95.0	95.5	104	109	114	119	124
40	51.1	53.7	56.4	59.3	62.2	65.3	68.5	71.9	75.4	79.0
30	30.3	32.0	33.7	35.6	37.6	39.6	41.7	43.9	46.2	48.6
20	17.2	18.3	19.4	20.6	21.8	23.0	24.4	25.8	27.2	28.7
10	9.39	10.0	10.7	11.3	12.1	12.8	13.6	14.5	15.4	16.3
0	4.85	5.19	5.56	5.94	6.36	6.79	7.26	7.75	8.27	8.81
−0	4.84	4.84	4.13	3.82	3.52	3.24	2.99	2.75	2.53	2.33
-10	2.14	1.96	1.80	1.65	1.51	1.39	1.27	1.16	1.06	0.967
-20	0.882	0.804	0.732	0.667	0.607	0.551	0.501	0.454	0.412	0.373
-30	0.338	0.305	0.276	0.249	0.225	0.203	0.183	0.164	0.148	0.133
-40	0.119	0.107	0.0955	0.0854	0.0763	0.0681	0.0608	0.0541	0.0482	0.0428
-50	0.0381	0.0338	0.0299	0.0265	0.0234	0.0207	0.0183	0.0161	0.0142	0.0125
-60	0.0109	0.00959	0.00840	0.00734	0.00642	0.00560	0.00488	0.00425	0.00369	0.00320
−70	0.00277	0.00240	0.00207	0.00179	0.00154	0.00133	0.00114	0.000977	0.000836	0.000715
−80	0.000610	0.000520	0.000442	0.000376	0.000318	0.000269	0.000228	0.000192	0.000162	0.000136
−90	0.000114	0.0000952	0.0000795	0.0000663	0.0000551	0.0000458	0.0000379	0.0000313	0.0000259	0.0000213

Reading saturated vapor rate table

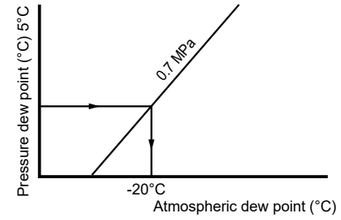
The temperature in 10°C units is shown in the vertical column, and the temperature in 1°C units is shown in the horizontal row.
(Example) Finding saturated vapor rate for 32°C.

Temperature at 10°C unit	Temperature at 1°C unit 0	1	2	3		
40						
30			33.7			
20						

33.7 g/m³ can be selected from the above table.

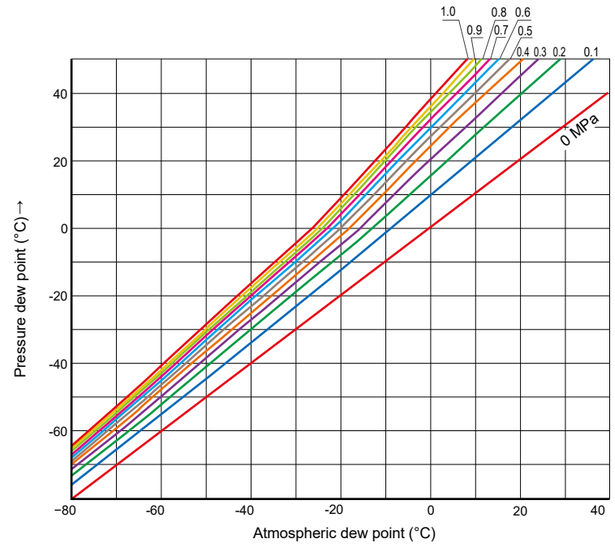
Reading pressure dew point - atmospheric dew point conversion table

This table is used to convert the pressure dew point at each pressure into the atmospheric dew point, or vice versa.
(Example) Obtaining the atmospheric dew point when the pressure is 0.7 MPa and the pressure dew point is 5°C.



When the pressure dew point of 5°C at 0.7 MPa pressure is converted to the atmospheric dew point, the result is -20°C.

Pressure dew point - atmospheric dew point conversion table



Main Line Components

Selection Guide of Air Dryers

The air dryers include refrigeration dryers, desiccant dryers, and polymer separation membrane dryers. The types are selectable according to the required dew point, usage conditions, and applications.

Type of air dryer	Refrigeration	Desiccant Heatless	Desiccant Manual	Polymer membrane
Atmospheric dew point performance (°C)	Down to −17	−20 to −72	−43, −72	−15 to −60
Drying Principle	Compressed air is cooled by a refrigerating machine to condense water vapor in the air and to remove it as drain water.	Water vapor in compressed air is suctioned and removed by desiccant. Basic structure is the same as the heat type. Heat is not used to regenerate the desiccant. Some dried air is depressurized and expanded, and passed through humid desiccant to regenerate it.	Water vapor in compressed air is suctioned and removed by desiccant. Desiccant is not regenerated.	High polymer membrane easily penetrated by water vapor is used to separate moisture in compressed air and discharge it out of the membrane. In the basic structure, thousands of membranes in the form of thin hollow fibers are bundled.
Features	• Most common • Both equipment and operating costs are reduced.	• Stable low dew point is obtained • Equipment cost is less expensive than the heat type • Large air consumed to regenerate desiccant	• Disposable (Desiccant replacement is required each time) • Power supply not required • Low pressure use is also available	• High reliability • Power supply not required • Explosion-proof • Purge air is required
Major Applications	• General plants General pneumatic circuits and pneumatic components	• Ultra-dry air required manufacturing line Semiconductor manufacturing facilities, liquid crystal panel manufacturing lines, foodstuffs, pharmaceutical plants, chemical plants, ozone generators, powder transfer	• Ultra-dry air required manufacturing line • Medical components protection • Analytic components protection	• Point-of-use drying in plants Instrument for analysis, inspection device, working machine
Appearance (examples)	 • GX / GT Series	 • HD Series  • SHD Series	 • 4002 Series  • 4001 Series	 • SD / SU Series  • SDM Series
Listed page	73	137	137	169