

# SMC Air Preparation System

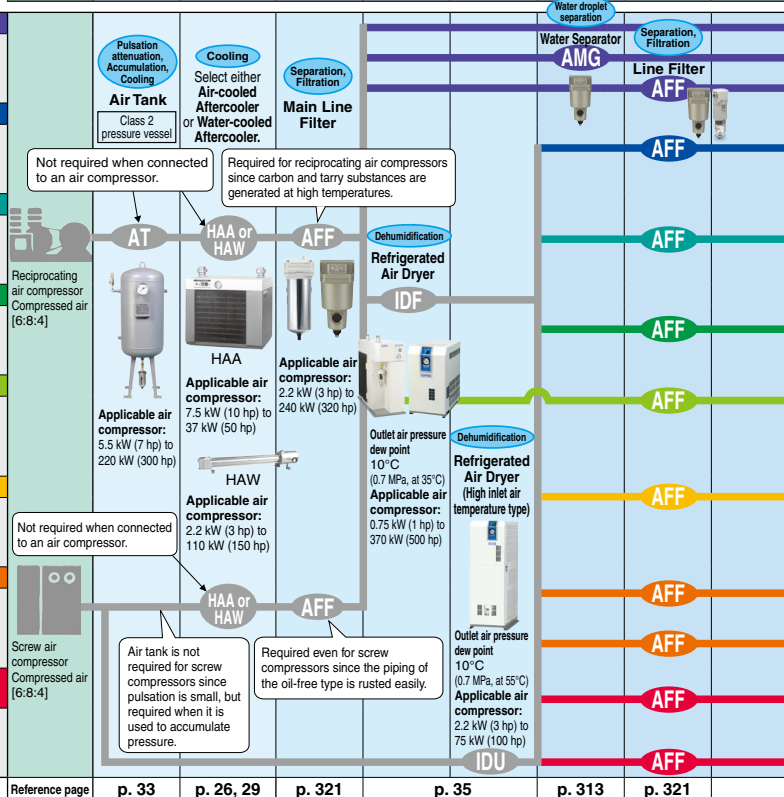
## Main Line

## Sub Line

Description	Air Tank	Air-cooled Aftercooler Water-cooled Aftercooler	Main Line Filter	Refrigerated Air Dryer		Water Separator	Line Filter
	AT	HAA HAW	AFF	IDF	IDU	AMG	AFF
Model	AT	HAA HAW	AFF	IDF	IDU	AMG	AFF
Flow capacity L/min(ANR)	Capacity 100 to 3,000 L	1,000 to 5,700 300 to 18,000	300 to 45,000	100 to 65,000	320 to 12,500	300 to 12,000	300 to 3,700
Max. inlet air temperature	100°C	70°C, 180°C (Varies by model)	60°C	50°C, 65°C (Varies by model)	80°C	60°C	
Filtration (Filtering efficiency)			1 μm, 3 μm (99%) (Varies by model)				1 μm (99%)
Purity class (Particle)			4				4
Water droplet removal ratio			99%			99%	
Atmospheric pressure dew point [At inlet air pressure of 0.7 MPa]				-17.6°C At inlet temperature 35°C	-17.6°C At inlet temperature 55°C		
Pressure dew point [At inlet air pressure of 0.7 MPa]				10°C At inlet temperature 35°C	10°C At inlet temperature 55°C		
Purity class (Liquid water)				4 to 6			
Outlet oil mist concentration (Max.) *1							
Purity class (Oil)							

- \*1 When the inlet oil mist concentration (compressor discharge concentration) is approx. 30 mg/m<sup>3</sup> (ANR) or less.
- \*2 This describes the compressed air purity class based on ISO 8573-1:2010 (JIS B 8392-1:2012) (refer to page 22), which is the maximum purity class for the system. It varies, however, depending on the inlet air conditions.
- \*3 Please contact SMC since this can be manufactured as a special order (depending on the operating conditions).

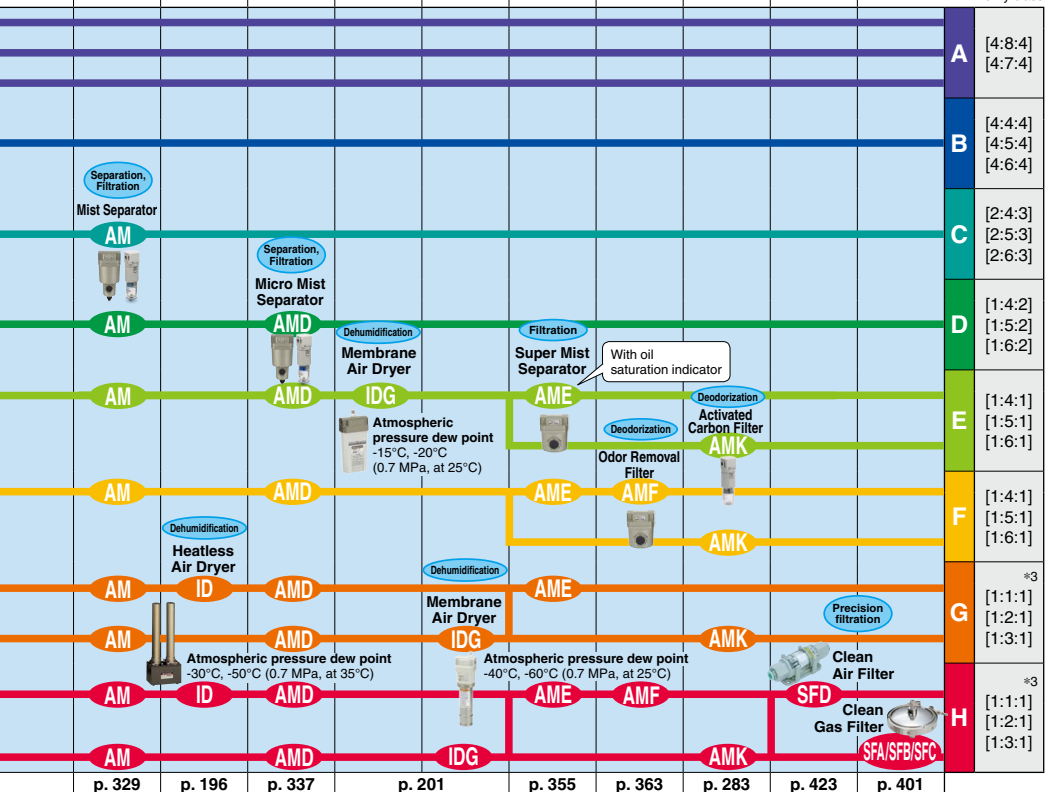
	Water drop removed air
<b>A</b>	<ul style="list-style-type: none"> <li>• Air blowing (Simple removal of particles)</li> <li>• General pneumatic tools</li> </ul>
<b>B</b>	<ul style="list-style-type: none"> <li>• Used for the same applications as A, when temperature drop in the middle of piping is large.</li> </ul>
<b>C</b>	<ul style="list-style-type: none"> <li>• Dry air</li> </ul>
<b>D</b>	<ul style="list-style-type: none"> <li>• General pneumatic equipment</li> <li>• General painting</li> </ul>
<b>D</b>	<ul style="list-style-type: none"> <li>• Dry clean air</li> <li>• High grade painting • Sequence control</li> <li>• Measurement device • Instrumentation</li> <li>• Drying and cleaning (Precision parts)</li> <li>• Machine tools (Pneumatic bearing)</li> </ul>
<b>E</b>	<ul style="list-style-type: none"> <li>• Dry clean air</li> <li>• Without refrigerated air dryer on the sub line</li> <li>• Built-in with equipment (With machine tools, 3-D measurement device, etc.)</li> </ul>
<b>F</b>	<ul style="list-style-type: none"> <li>• Deodorant air</li> <li>• Stirring, transporting, drying and packaging</li> <li>• Food industry (Except direct blowing to foods)</li> </ul>
<b>G</b>	<ul style="list-style-type: none"> <li>• Low dew point clean air</li> <li>• Drying electric and electronic parts</li> <li>• Drying a filling tank</li> <li>• Transporting powders</li> <li>• Ozone generator</li> <li>• Low temperature actuated equipment</li> </ul>
<b>H</b>	<ul style="list-style-type: none"> <li>• Low dew point clean air (For clean room)</li> <li>• Blowing semiconductor parts in the clean room</li> </ul>



## Local line

Local line										
Mist Separator	Heatless Air Dryer	Micro Mist Separator	Membrane Air Dryer		Super Mist Separator	Odor Removal Filter	Activated Carbon Filter	Clean Air Filter	Clean Gas Filter	
AM	ID	AMD	IDG		AME	AMF	AMK	SFD	SFA, SFB, SFC	
300 to 12,000	80 to 780	200 to 40,000	10 to 1,000 25 to 1,000	75 to 300 50 to 150	200 to 12,000	200 to 12,000	300 to 3,700	100 to 500	26 to 300	
60°C	50°C	60°C	50°C, 55°C (Varies by model)		60°C			45°C	80°C, 120°C (Varies by models)	
0.1 μm, 0.3 μm (99.9%) (Varies by model)		0.01 μm (99.9%)			0.01 μm (99.9%)			0.01 μm (99.9%)		
2		1			1			1		
	-30°C At inlet temperature 35°C -50°C, -70°C At inlet temperature 20°C		-15°C, -20°C At inlet temperature 25°C	-40°C, -60°C At inlet temperature 25°C						
	-5.5°C At inlet temperature 35°C -29.9°C, -53.9°C At inlet temperature 20°C		-13.3°C, 7°C At inlet temperature 25°C	-17.8°C, -42°C At inlet temperature 25°C						
	1 to 3		4 to 6	2 to 3						
1 mg/m <sup>3</sup> (ANR) [=0.8 ppm]		0.1 mg/m <sup>3</sup> (ANR) [=0.08 ppm]			0.01 mg/m <sup>3</sup> (ANR) [=0.008 ppm]	0.004 mg/m <sup>3</sup> (ANR) [=0.0032 ppm]	0.003 mg/m <sup>3</sup> (ANR) [=0.0025 ppm]			
3		2			1	1	1			

\*2  
ISO8573-1:2010  
Purity class



# International Standard ISO 8573-1:2010 (Compressed Air Purity Classes)

Compressed air is used in a variety of manufacturing processes. In this age, compressed air with a high degree of purity is becoming increasingly necessary.

For this reason, it is necessary to remove contaminants from systems which supply compressed air and to secure the quality. The standard which stipulates the class according to the quantities of contaminants in compressed air is ISO 8573-1.

### [Outline]

Stipulates the purity class of contaminants (particles, water, oil) mixed in with the compressed air

### [Scope]

Can be used in various places in compressed air systems

### [Terms and Definitions]

- Purity class: An index assigned for each classification obtained by dividing the concentration of each contaminant into ranges
- Particle: Small discrete mass of solid or liquid matter
- Humidity and liquid water: Water vapor (gas), Water droplets
- Oil: Liquid oil, Oil mist, Oil vapor

### [Purity Classes]

Class	Particles			Mass concentration Cp [mg/m <sup>3</sup> ]	Humidity and liquid water		Oil Concentration of total oil [mg/m <sup>3</sup> ]
	Maximum number of particles per cubic meter as a function of particle size d [µm]				Pressure dew point [°C]	Concentration of liquid water Cw [g/m <sup>3</sup> ]	
0	0.1 < d ≤ 0.5	0.5 < d ≤ 1.0	1.0 < d ≤ 5.0				
As specified by the equipment user or supplier and more stringent than class 1							
1	≤ 20000	≤ 400	≤ 10	—	≤ -70	—	≤ 0.01
2	≤ 400000	≤ 6000	≤ 100	—	≤ -40	—	≤ 0.1
3	—	≤ 90000	≤ 1000	—	≤ -20	—	≤ 1
4	—	—	≤ 10000	—	≤ +3	—	≤ 5
5	—	—	≤ 100000	—	≤ +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

### [How to Perform a Test to Check the Performance]

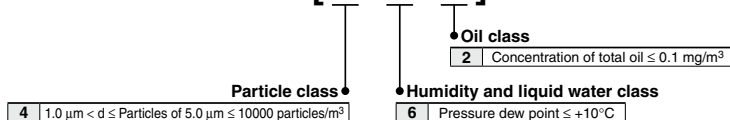
ISO 12500, which sets out the test method to be used in order to check the filter performance for each of the three kinds of contaminants, is indicated below.

- Particle: ISO 12500-3:2009
- Liquid water: ISO 12500-4:2009
- Oil: ISO 12500-1:2007

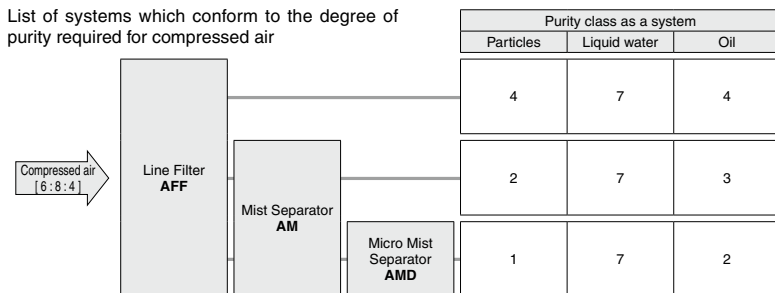
\* Measured using a dedicated evaluation system which has been certified according to ISO 12500-□ and also by a third party (Certified)

### [Purity Class Designation Example]

## ISO 8573-1:2010 [ 4 : 6 : 2 ]



List of systems which conform to the degree of purity required for compressed air



The class indicates the compressed air purity according to ISO 8573-1:2010 (JIS B 8392-1:2012) and indicates the maximum purity class which can be obtained using that system. Note, however, that this value will differ according to the inlet air conditions.

# Quick Reference Guide to Air Preparation Equipment

## Quick Reference Guide to Air Preparation Equipment

- \* Shows standard combinations. The suffix numbers of the model indicate port size. Refer to pages described to each equipment for detail.
- \* The symbol "—" in the table indicates that no such equipment exists.
- \* The figures for air flow capacity corresponding to air compressor output are provided for reference only.
- \* Combine equipment as necessary. (Refer to the **Web Catalog**.)

### ●For Screw Compressors

(When an aftercooler is installed, Refrigerated air dryer inlet temperature: 35°C or 40°C, Membrane air dryer inlet temperature: 25°C)

Air compressor			Main line		Sub line		Local line					
Output (kW)	Air flow capacity (m <sup>3</sup> /min) (l/s) <sup>(1)</sup>		Aftercooler (Note 2)		Refrigerated air dryer (Note 3)		Mist separator	Micro mist separator with pre-filter	Micro mist separator	Membrane air dryer (Note 5)	Super mist separator	Activated carbon filter/ Odor removal filter
	Suction condition (32°C, 75%)	ANR conversion (20°C, 75%)	Air-cooled	Water-cooled	50 Hz	60 Hz						
1.5	0.16	0.15	HAA7-06	HAW2-04	IDF2E		AM20-02 AM150C-02	AMH150C-02	AMD20-02 AMD150C-02	IDG20-02	AME150C-02	AMK20-02 AMF150C-02
2.2	0.245	0.23	HAA7-06	HAW2-04	IDF3E	IDF2E	AM20-02 AM150C-02	AMH250C-02	AMD20-02 AMD250C-02	IDG20-02	AME250C-02	AMK20-02 AMF250C-02
3.7	0.44	0.41	HAA7-06	HAW7-06	IDF4E		AM30-03 AM250C-03	AMH250C-03	AMD30-03 AMD250C-03	IDG50A-03	AME250C-03	AMK30-03 AMF250C-03
5.5	0.72	0.68	HAA7-06	HAW7-06	IDF6E		AM30-03 AM250C-03	AMH350C-03	AMD30-03 AMD350C-03	IDG60-03	AME350C-03	AMK30-03 AMF350C-03
7.5	1.2	1.1	HAA15-10	HAW22-14	IDF8E		AM40-04 AM350C-04	AMH350C-04	AMD40-04 AMD350C-04	IDG100-04	AME350C-04	AMK40-04 AMF350C-04
11	1.8	1.7	HAA15-10	HAW22-14	IDF15E1	IDF11E	AM50-06 AM450C-06	AMH450C-06	AMD50-06 AMD450C-06	—	AME450C-06	AMK50-06 AMF450C-06
15	2.6	2.4	HAA22-14	HAW22-14	IDF15E1		AM60-10 AM550C-10	AMH550C-10	AMD60-10 AMD550C-10	—	AME550C-10	AMK60-10 AMF550C-10
22	4	3.8	HAA37-14	HAW37-14	IDF60		AM70D-14 AM650-14	AMH650-14	AMD70D-14 AMD650-14	—	AME650-14	AMF650-14
37	6.6	6.2	—	HAW55-20	IDF80	IDF60 or IDF70	AM70D-14 AM650-14	AMH650-14	AMD70D-14 AMD650-14	—	AME650-14	AMF650-14
55	9.5	8.9	—	HAW75-20	IDF80 or IDF90	IDF80	AM90D-20 AM850-20	AMH850-20	AMD90D-20 AMD850-20	—	AME850-20	AMF850-20
75	13	12.2	—	HAW110-30	IDF100F	IDF80 or IDF90	AM90D-20 AM850-20	AMH850-20	AMD90D-20 AMD850-20	—	AME850-20	AMF850-20
110	19	17.9	—	HAW110-30	IDF125F	IDF100F	—	—	AMD900-30	—	—	—
150	28.5	26.8	—	—	IDF190D	IDF150F	—	—	AMD900-30	—	—	—
220	45	42.3	—	—	IDF240D		—	—	AMD1000-40	—	—	—

### ●For Screw Compressors

(When an aftercooler is not installed, Refrigerated air dryer inlet temperature: ambient temperature +15°C, Membrane air dryer inlet temperature: 25°C)

Air compressor			Sub line			Local line					
Output (kW)	Air flow capacity (m <sup>3</sup> /min) (l/s) <sup>(1)</sup>		Air-cooled aftercooler integrated type refrigerated air dryer (Note 4)			Mist separator	Micro mist separator with pre-filter	Micro mist separator	Membrane air dryer (Note 5)	Super mist separator	Activated carbon filter/ Odor removal filter
	Suction condition (32°C, 75%)	ANR conversion (20°C, 75%)	50 Hz		60 Hz						
1.5	0.16	0.15	IDU3E			AM20-02 AM150C-02	AMH150C-02	AMD20-02 AMD150C-02	IDG20-02	AME150C-02	AMK20-02 AMF150C-02
2.2	0.245	0.23	IDU3E			AM20-02 AM150C-02	AMH250C-02	AMD20-02 AMD250C-02	IDG20-02	AME250C-02	AMK20-02 AMF250C-02
3.7	0.44	0.41	IDU4E			AM30-03 AM250C-03	AMH250C-03	AMD30-03 AMD250C-03	IDG50A-03	AME250C-03	AMK30-03 AMF250C-03
5.5	0.72	0.68	IDU6E			AM30-03 AM250C-03	AMH350C-03	AMD30-03 AMD350C-03	IDG60-03	AME350C-03	AMK30-03 AMF350C-03
7.5	1.2	1.1	IDU8E			AM40-04 AM350C-04	AMH350C-04	AMD40-04 AMD350C-04	IDG100-04	AME350C-04	AMK40-04 AMF350C-04
11	1.8	1.7	IDU15E1		IDU11E	AM50-06 AM450C-06	AMH450C-06	AMD50-06 AMD450C-06	—	AME450C-06	AMK50-06 AMF450C-06
15	2.6	2.4	IDU15E1			AM60-10 AM550C-10	AMH550C-10	AMD60-10 AMD550C-10	—	AME550C-10	AMK60-10 AMF550C-10
22	4	3.8	IDU22E			AM70D-14 AM650-14	AMH650-14	AMD70D-14 AMD650-14	—	AME650-14	AMF650-14
37	6.6	6.2	IDU55E		IDU37E	AM70D-14 AM650-14	AMH650-14	AMD70D-14 AMD650-14	—	AME650-14	AMF650-14
55	9.5	8.9	IDU75E		IDU55E	AM90D-20 AM850-20	AMH850-20	AMD90D-20 AMD850-20	—	AME850-20	AMF850-20
75	13	12.2	—		IDU75E	AM90D-20 AM850-20	AMH850-20	AMD90D-20 AMD850-20	—	AME850-20	AMF850-20
110	19	17.9	—		—	—	—	AMD900-30	—	—	—
150	28.5	26.8	—		—	—	—	AMD900-30	—	—	—
220	45	42.3	—		—	—	—	AMD1000-40	—	—	—

# Quick Reference Guide to Air Preparation Equipment

## Quick Reference Guide to Air Preparation Equipment

### ●For Reciprocating Compressors

(Aftercooler inlet: 180°C or 70°C, Refrigerated air dryer inlet temperature: 35°C or 40°C, Membrane air dryer inlet temperature: 25°C)

Air compressor			Main line			Sub line			Local line					
Output (kW)	Air flow capacity (m <sup>3</sup> /min) (m <sup>3</sup> /h) <sup>1)</sup>		Air tank	Aftercooler (Note 2)		Main line filter	Refrigerated air dryer (Note 3)		Mist separator	Micro mist separator with pre-filter	Micro mist separator	Membrane air dryer (Note 5)	Super mist separator	Activated carbon filter/ Odor removal filter
	Suction condition (32°C, 75%)	ANR conversion (20°C, 75%)		Air-cooled	Water-cooled		50 Hz	60 Hz						
0.75	0.1	0.09	AT6C-04	HAA7-06	HAW2-04	AFF20-02 AFF2C-02	IDF1E		AM20-02 AM150C-02	AMH150C-02	AMD20-02 AMD150C-02	IDG10-02	AME150C-02	AMK20-02 AMF150C-02
1.5	0.2	0.19	AT6C-04	HAA7-06	HAW2-04	AFF20-02 AFF2C-02	IDF2E		AM20-02 AM150C-02	AMH150C-02	AMD20-02 AMD150C-02	IDG20-02	AME150C-02	AMK20-02 AMF150C-02
2.2	0.3	0.28	AT6C-04	HAA7-06	HAW2-04	AFF20-02 AFF2C-02	IDF3E		AM20-02 AM150C-02	AMH250C-02	AMD20-02 AMD250C-02	IDG30A-02	AME250C-02	AMK20-02 AMF250C-02
3.7	0.5	0.47	AT6C-04	HAA7-06	HAW7-06	AFF30-03 AFF4C-03	IDF4E		AM30-03 AM250C-03	AMH250C-03	AMD30-03 AMD250C-03	IDG50A-03	AME250C-03	AMK30-03 AMF250C-03
5.5	0.7	0.66	AT6C-04	HAA7-06	HAW7-06	AFF30-03 AFF4C-03	IDF6E		AM30-03 AM250C-03	AMH350C-03	AMD30-03 AMD350C-03	IDG60-03	AME350C-03	AMK30-03 AMF350C-03
7.5	1.0	0.9	AT11C-06	HAA7-06	HAW7-06	AFF40-04 AFF8C-04	IDF8E		AM40-04 AM350C-04	AMH350C-04	AMD40-04 AMD350C-04	IDG75-04	AME350C-04	AMK40-04 AMF350C-04
11	1.5	1.4	AT11C-06	HAA15-10	HAW22-14	AFF40-04 AFF8C-04	IDF11E		AM40-04 AM350C-04	AMH450C-04	AMD40-04 AMD450C-04	—	AME450C-04	AMK40-04 AMF450C-04
15	2.0	1.9	AT22C-14	HAA15-10	HAW22-14	AFF50-06 AFF11C-06	IDF15E1		AM50-06 AM450C-06	AMH450C-06	AMD50-06 AMD450C-06	—	AME450C-06	AMK50-06 AMF450C-06
22	3.0	2.8	AT22C-14	HAA22-14	HAW37-14	AFF60-10 AFF22C-10	IDF15E1		AM60-10 AM550C-10	AMH550C-10	AM60-10 AMD550C-10	—	AME550C-10	AMK60-10 AMF550C-10
27	3.5	3.3	AT37C-14	HAA22-14	HAW37-14	AFF60-10 AFF22C-10	IDF22E		AM60-10 AM550C-10	AMH550C-10	AM60-10 AMD550C-10	—	AME550C-10	AMK60-10 AMF550C-10
37	5.0	4.7	AT37C-14	HAA37-14	HAW55-20	AFF70D-14 AFF37B-14	IDF60 or IDF70		AM70D-14 AM650-14	AMH650-14	AMD70D-14 AMD650-14	—	AME650-14	AMF650-14
55	7.5	7.1	AT55C-20	—	HAW75-20	AFF90D-20 AFF75 <sub>A</sub> -20	IDF80		AM90D-20 AM850-20	AMH850-20	AMD90D-20 AMD850-20	—	AME850-20	AMF850-20
75	10.0	9.4	AT75C-20	—	HAW110-30	AFF90D-20 AFF75 <sub>B</sub> -20	IDF80 or IDF90	IDF80	AM90D-20 AM850-20	AMH850-20	AMD90D-20 AMD850-20	—	AME850-20	AMF850-20
110	15.0	14.1	AT125C-30	—	—	AFF125A-30	IDF100F		—	—	AMD900-30	—	—	—
150	20.0	18.8	AT150C-40	—	—	AFF125A-30	IDF125F	IDF100F	—	—	AMD900-30	—	—	—
220	30.0	28.2	AT220C-40	—	—	AFF220A-40	IDF190D	IDF150F	—	—	AMD1000-40	—	—	—

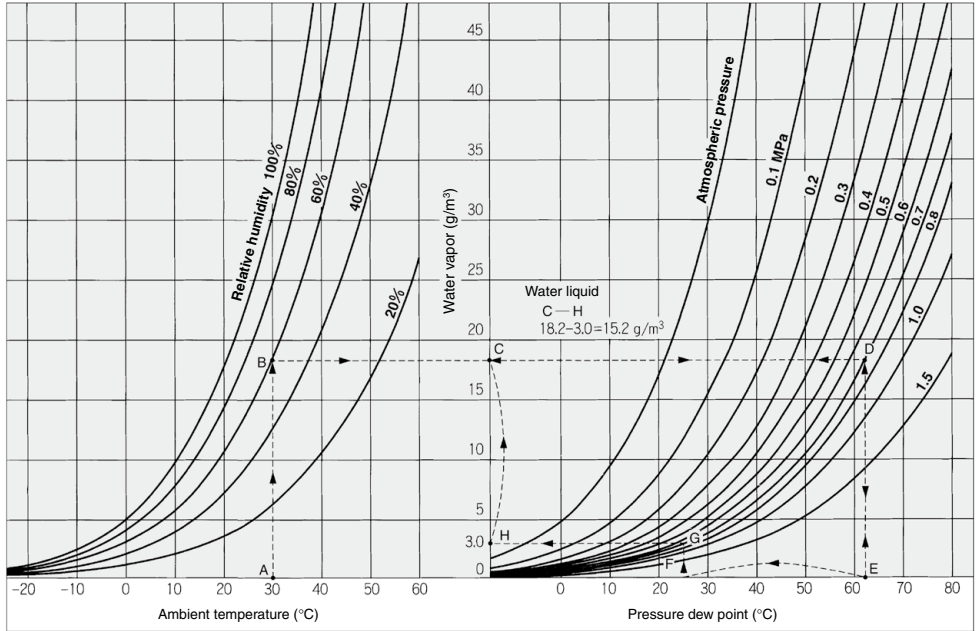
\*The contents of this table are for reference only. The flow rate that can be treated by the dryer or filter varies depending on the conditions. Please select the appropriate equipment in accordance with the actual conditions.

- Note 1) Air flow capacity conditions Suction condition..... 32°C, Atmospheric pressure, relative humidity 65%  
ANR conversion..... 20°C, Atmospheric pressure, relative humidity 65%
- Note 2) Air-cooled aftercooler Inlet air temperature..... 70°C  
Ambient temperature..... 32°C  
Water-cooled aftercooler Inlet air temperature..... 70°C (Screw compressors), 180°C (Reciprocating compressors, 70°C for HAW2,7)  
Cooling water inlet temperature..... 30°C
- Note 3) ID Series Inlet air temperature..... 35°C saturation (IDF1E to 15E1, IDF60/70), 40°C saturation (IDF80 to 90, IDF100F to 240D)  
Ambient temperature..... 32°C
- Note 4) IDU Series Inlet air temperature..... 55°C saturation (IDU3E to 75E)  
Ambient temperature..... 32°C
- Note 5) IDG Series Inlet air temperature..... 25°C  
Ambient temperature..... 25°C

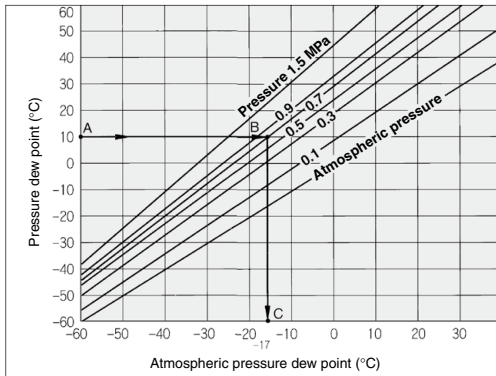
# Data: Calculation of Condensed Water Amount & Dew Point Conversion Chart

## Data: Calculation of Condensed Water Amount & Dew Point Conversion Chart

### Calculation of Condensed Water Amount



### Dew Point Conversion Chart B



<How to read the dew point conversion chart>

(Example)

In the case of seeking the atmospheric pressure dew point at the pressure dew point 10°C and the pressure of 0.7 MPa

- Trace the arrow mark →, starting with the point A at the pressure dew point 10°C to find the intersection B on the pressure characteristic line for 0.7 MPa.
- Trace the arrow mark →, starting with the point B to find the intersection C at the atmospheric pressure dew point.
- The intersection C is the conversion value -17°C under atmospheric pressure dew point.

<How to Calculate Amount of Condensed Water>

(Example)

In the case of calculating the amount of condensed water by applying the pressure up to 0.7 MPa with an air compressor installed under the ambient temperature 30°C and the relative humidity 60% and then having that compressed air cooled down to 25°C.

- Trace the arrow mark, starting with the point A of ambient temperature 30°C to obtain the intersection B on the curved line for the relative humidity of 60%.
- Trace the arrow mark, starting with the intersection B to obtain the intersection D on the curved line for the 0.7 MPa pressure characteristics.
- Trace the intersection D to obtain the intersection E.
- The intersection E is the dew point under pressure 0.7 MPa with the ambient temperature of 30°C and the relative humidity of 60%. Value for E is at 62°C.
- Trace the intersection E upward, and C leftward to obtain the intersection D.
- The intersection C is the amount of water included in the compressed air 1 m<sup>3</sup> at 0.7 MPa with the pressure dew point of 62°C. The amount of water is 18.2 g/m<sup>3</sup>.
- Trace the arrow mark, starting with F for cooling temperature 25°C (pressure dew point 25°C) to find the intersection G on the pressure characteristic line for 0.7 MPa.
- From the intersection G, trace the arrow mark to obtain the intersection H on the vertical axis.
- The intersection H is the amount of water included in the compressed air 1 m<sup>3</sup> at 0.7 MPa, pressure dew point of 25°C. The amount of water is 3.0 g/m<sup>3</sup>.
- Therefore, the amount of condensed water is as following. (Per 1 m<sup>3</sup>)  
The amount of water at the intersection C – The amount of water at the intersection H = The amount of condensed water 18.2 – 3.0 = 15.2 g/m<sup>3</sup>