Jemaco™

PCM Air Dryer

Nomenclature

PCM Series

PCM [ ] J — [ ]

Model	Flow capacity (Nm^3/min)
PCM2.7J	2.7
PCM3.5J	3.5
PCM6.8J	6.8
PCM14.1J	14.1
PCM18.9J	18.9
PCM28.1J	28.1
PCM42.7J	42.7
PCM49.9J	49.9
PCM66.5J	66.5
PCM99.8J	99.8
PCM133.0J	133.0
PCM199.5J	199.5
PCM266.0J	266.0
PCM332.5J	332.5
PCM399.0J	399.0

Options	
T	Stainless steel 304 air inlet/outlet piping & separator
X	Common inlet /outlet air header with isolation valve

* Options 'T' is available on models PCM 28.1J and larger
* Options 'X' is available on models PCM 99.8J and larger

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Jemaco™

Automatic and Energy Saving Solutions for Tropical Regions

PCM Air Dryer

jemacoair.com

Why Do Compressed Air Systems Need Drying?

IT&S provides compressed-air dryers and filters that remove oil, water, dirt, rust and pipe scale. Contaminants found in compressed air can adversely affect all components of an air distribution system, and can cause a malfunction of pneumatic control in the instrument air system.

Properly treated compressed air can improve work efficiency and reduces maintenance. Desiccant and refrigerated type compressed air dryers are used in the control air systems of power plants.

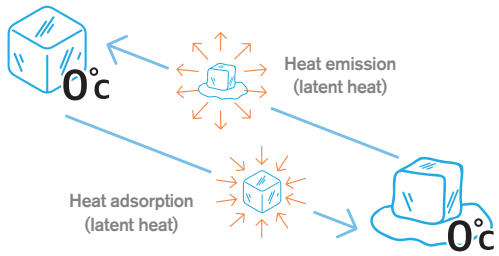
PCM Air Dryer

From 20HP to 3,000HP and larger PCM Series is the ultimate solution providing perfect dehydration and enormous energy savings!

This PCM technology harnesses the latent heat occurs when PCM converts solid to liquid or liquid to solid, which automatically triggers the refrigeration compressor to switch On/Off according to varying compressed air heat loads.

Latent Heat

Latent heat is energy released or absorbed by a body or a thermodynamic system, during a constant temperature process that is specified in some way. For instance, when ice melts into water, it absorbs heat from its surroundings. Vice versa, when water freezes into ice, the same volume of the heat is released. As such, when heat flows in and out at constant temperature, we call this heat as latent heat.
In general, latent heat value is much higher than sensible heat value. For example, sensible heat value for water is 4.18KJ/kgC, but latent heat for changing water to ice at constant temperature of 0˚C is 334kJ/kg which is 80 times of sensible heat value.



Why Phase Change Material?

PCM is a substance with high latent heat which melts or solidifies at a certain temperature, thus being able to absorb or release large amounts of energy.
Taking advantage of the magnitude of latent heat (at change of phase) which is a multitude of times higher than sensible heat (at change of temperature), PCM air dryer provides sufficient cold storage with only a small amount of phase change material. As a result, PCM air dryer is in simple engineering design, compared to existing "Thermal Mass" air dryers which are available in the market.
Hence with PCM's cutting edge technology, IT&S has introduced the most cost-effective and efficient high performance air dryer in the industry.

IT&S Korea

Unique Product Design

- Adapted Phase change material PCM (Patented)
- Stainless steel brazed plate heat exchanger with PCM filled in
- Automatically triggers refrigeration compressor to switch On/Off according to varying compressed air heat loads

Zero Loss Drain

- Electrostatic capacity sensor
- Zero loss of compressed air when condensate water is discharged
- Automatically switch to timer mode at malfunction
- EDV (Models PCM18.9J and smaller)

Great Energy Efficiency

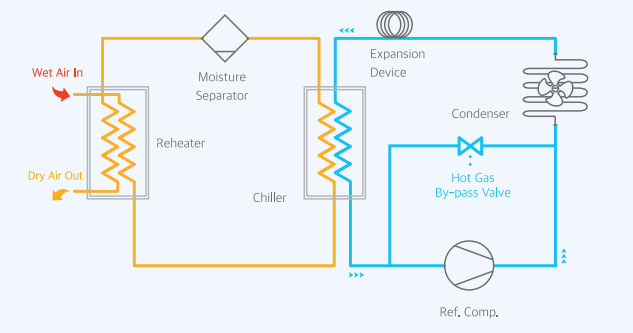
- Up to 99% energy saving with the lowest cost
- Shortest period of return of investment

Oil Removal to Provide Virtually Oil Free Air

(Models PCM28.1J and larger)

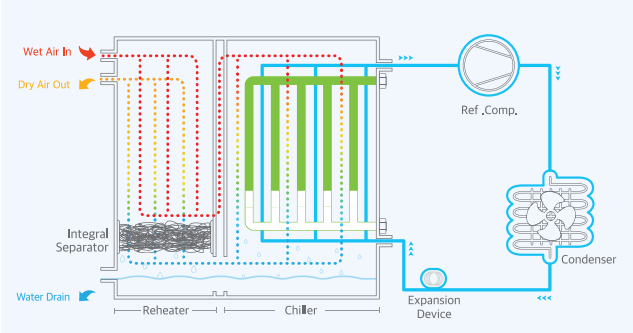
- Built-in Cold Coalescing oil removal filter
- 99.8% oil removal efficiency

Non-Cycling Air Dryer (Conventional)



- Hot gas by-pass valve
- Continuous running at fixed RPM
- Simple configuration
- Low price
- Low efficiency
- Unstable dew point

Cycling (PCM Air Dryer)



- Utilize latent heat of phase change material
- Load control by On/Off cycling
- Heat exchanger with no pump/valve/tank (Simplest design)
- Competitive price
- Highest energy efficiency with minimum heat loss
- Stable dew point

PCM Air Dryer

Features

* PCM2.7J~18.9J　　** PCM28.1J~66.5J　　** PCM99.8J~PCM399.0J (Modular design)

* Without cold-coalescing filter
** With built-in cold-coalescing filter

Modular Design : Common Inlet / outlet header and valves to be supplied by customer

Unique Product Design

Minimalist design but unparalleled energy savings

Advanced OPTi-Eco control panel

OPTi-Eco Level 2 Controller

- Power On/Off
- Alarm status
- Air dryer running light
- Air dryer running time
- Ref. comp. running light
- Ref. comp. running time
- 485 Modbus communication port
- Upgrade firmware program through USB port
- Energy saving %
- Energy saving graph
- Dew point indicator

High Durability

PCM contained in the stainless steel brazed plate heat exchanger

- Streamlined design with minimum components, dispense with glycol tank, pump, pipe, etc.
- High efficiency, performance, and stable dew point
- Anti-corrosive stainless steel material
- Helium leak tests (below 0.3g/year)

Heat Exchanger

PCM Storage, Re-heater, Chiller and Separator Combined into 4 in 1 Module (PCM2.7~18.9J)

- Low pressure drop reduces operating costs
- Compact design saves floor space
- Simple structure, ease of maintenance

High efficiency condensing unit

- Optimized efficiency and durability with brazed aluminum material
- Up-flow design of condenser exhaust vent, saves installation space

Eco-friendly refrigerant R-134a or R-407C

Patented NGF Filter

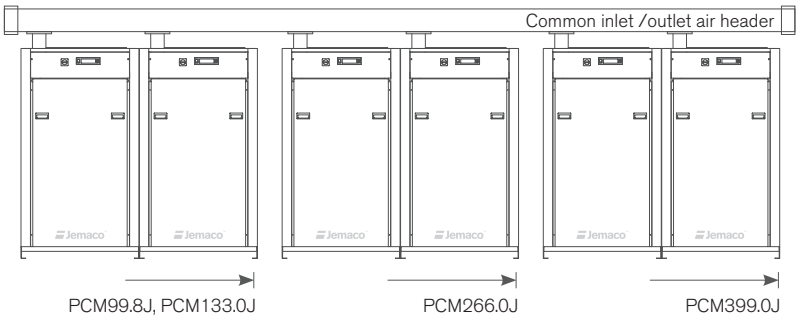
99.8% oil removal efficiency (Models PCM28.1J and larger)

- Integral two-stage separator/filter : Oil removal filter and moisture separator
- Built-in patented NGF filter (H Grade)
  : Adopting Cold Coalescing filtration technology
  : Removal of aerosol mist and liquid oil
  : High-performance deep bed pleated element design

Module Type

Modular design (Models PCM99.8J and larger)

- Easy to increase flow capacity by adding additional unit
- Stable dew point even when trouble occurs (independent unit operation)
- Multi-unit integrated control with master controller (Optional)

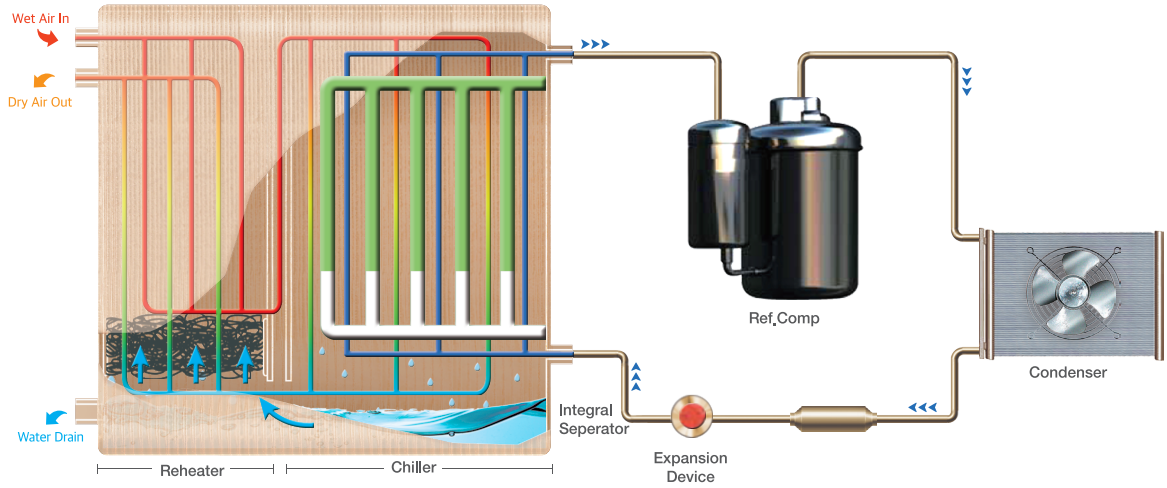


Common inlet /outlet air header with isolation valve (Models PCM99.8J and larger)

(Front view)

Flow Diagram

PCM2.7~18.9J

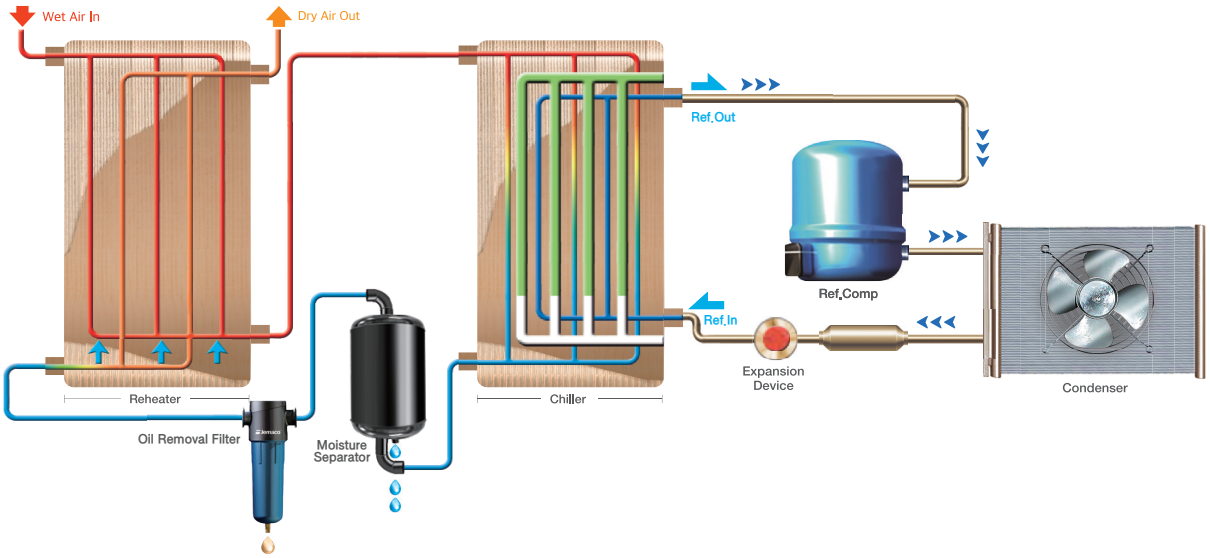


① Compressed air saturated with water vapor enters the stainless steel brazed plate air-to-air heat exchanger, is pre-cooled by the outgoing chilled air, and then directed to the stainless steel brazed plate PCM-to-air heat exchanger (evaporator) where it is further cooled by the Phase Change Material (PCM).

② As the air is cooled, water vapor condenses into liquid droplets which are then removed by high efficiency integral moisture separator with No Loss Drain.

③ Chilled air returns through air-to-air heat exchanger (reheater) where it is reheated before exiting the air dryer. This is to prevent external sweating of piping when clean and dry compressed air travels to point of use.

PCM28.1J~PCM399.0J



① Compressed air saturated with water vapor enters the stainless steel brazed plate air-to-air heat exchanger, is pre-cooled by the outgoing chilled air, and then directed to the stainless steel brazed plate PCM-to-air heat exchanger (evaporator) where it is further cooled by the Phase Change Material (PCM).

② As the air is cooled, water vapor condenses into liquid droplets which are then removed by high efficiency external moisture separator with No Loss Drain.

③ Then aerosol and oil mist condensed from oil vapor are removed by high efficiency external oil filter with No Loss Drain.

④ Chilled air returns through air-to-air heat exchanger (reheater) where it is reheated before exiting the air dryer. This is to prevent external sweating of piping when clean and dry compressed air travels to point of use.

Phase Change in PCM Air Dryer

① When refrigeration compressor and condenser fan are running, the cold refrigerant in the chiller (evaporator) cools the liquid Phase Change Material (PCM) and it gradually freezes.

② When PCM is sufficiently cooled and frozen, the refrigeration compressor and condenser fan stop.

③ The compressed air is continuously cooled by PCM while the refrigeration compressor is inactive. No power is consumed during this period.

④ The PCM gradually melts as it adsorbs heat from the compressed air, and when fully melted, the refrigeration compressor and condenser fan resume to cool down the PCM.

Specification

Model	Flow Capacity (Nm^3/min)	Pressure Dew Point (°C)	Ambient Air Temperature (°C)	Inlet Air Temperature (°C)	Power Supply (V/Ph/Hz)	Installed Power (kW)	Inlet/Outlet* Connections	Weight (kg)	Dimensions** (H x W x D mm)	Refrigerants
PCM2.7J	2.7	4±2	2 ~ 43	4 ~ 49	220/1/60	0.54	PT 1"	54.5	751 x 363 x 593	R-134a
PCM3.5J	3.5					0.73		66.5	711 x 363 x 771	
PCM6.8J	6.8					1.30	PT 2"	98.5	761 x 443 x 951	R-407C
PCM14.1J	14.1					2.55		152	911 x 493 x 1,101	
PCM18.9J	18.9				380/3/60	3.53		192	1,032 x 493 x 1,243	
PCM28.1J	28.1					4.5	FLG 3"	498	1,620 x 820 x 1,372	
PCM42.7J	42.7					7.6	FLG 4"	753	1,880 x 1,000 x 1,360	
PCM49.9J	49.9					9.0		866	1,880 x 1,000 x 1,360	
PCM66.5J	66.5					11.0		1,020	1,880 x 1,000 x 1,580	
PCM99.8J	99.8					18.0	FLG 6"	1,732	1,880 x 2,003 x 1,360	
PCM133.0J	133.0					22.0	FLG 8"	2,040	1,880 x 2,003 x 1,580	
PCM199.5J	199.5					33.0	FLG 10"	3,060	1,880 x 3,603 x 1,580	
PCM266.0J	266.0					44.0		4,080	1,880 x 4,606 x 1,580	
PCM332.5J	332.5					55.0	FLG 12"	5,100	1,880 x 6,206 x 1,580	
PCM399.0J	399.0					66.0		6,120	1,880 x 7,209 x 1,580	

1. Standard rated condition : 38°C inlet air temperature, 38°C ambient air temperature, 7barG inlet pressure, 100% relative humidity.
2. For other power supply consult to factory
3. Max. / Min. Inlet Pressure : 16barG / 3barG (Max. inlet pressure for models PCM28.1J and larger : 9.7barG)
4. PCM2.7 ~18.9J : Integrated stainless steel plate heat exchanger
5. Models PCM28.1J and larger : Built-in cold coalescing filter
6. * Models PCM 28.1J and larger : JIS 10K SOFF for flange connection standard
7. * Models PCM99.8J and larger : Modular design where Common Inlet / outlet header and valves to be supplied by customer

Capacity Correction Factors

Inlet Air Pressure (barG)

barG	4	5	6	7	8	9	10	13	16
Factor	0.75	0.84	0.92	1.00	1.03	1.07	1.09	1.18	1.23

Inlet Air Temperature (°C)

°C	27	32	38	43	45	50
Factor	1.46	1.23	1.00	0.83	0.76	0.68

Ambient Air Temperature (°C)

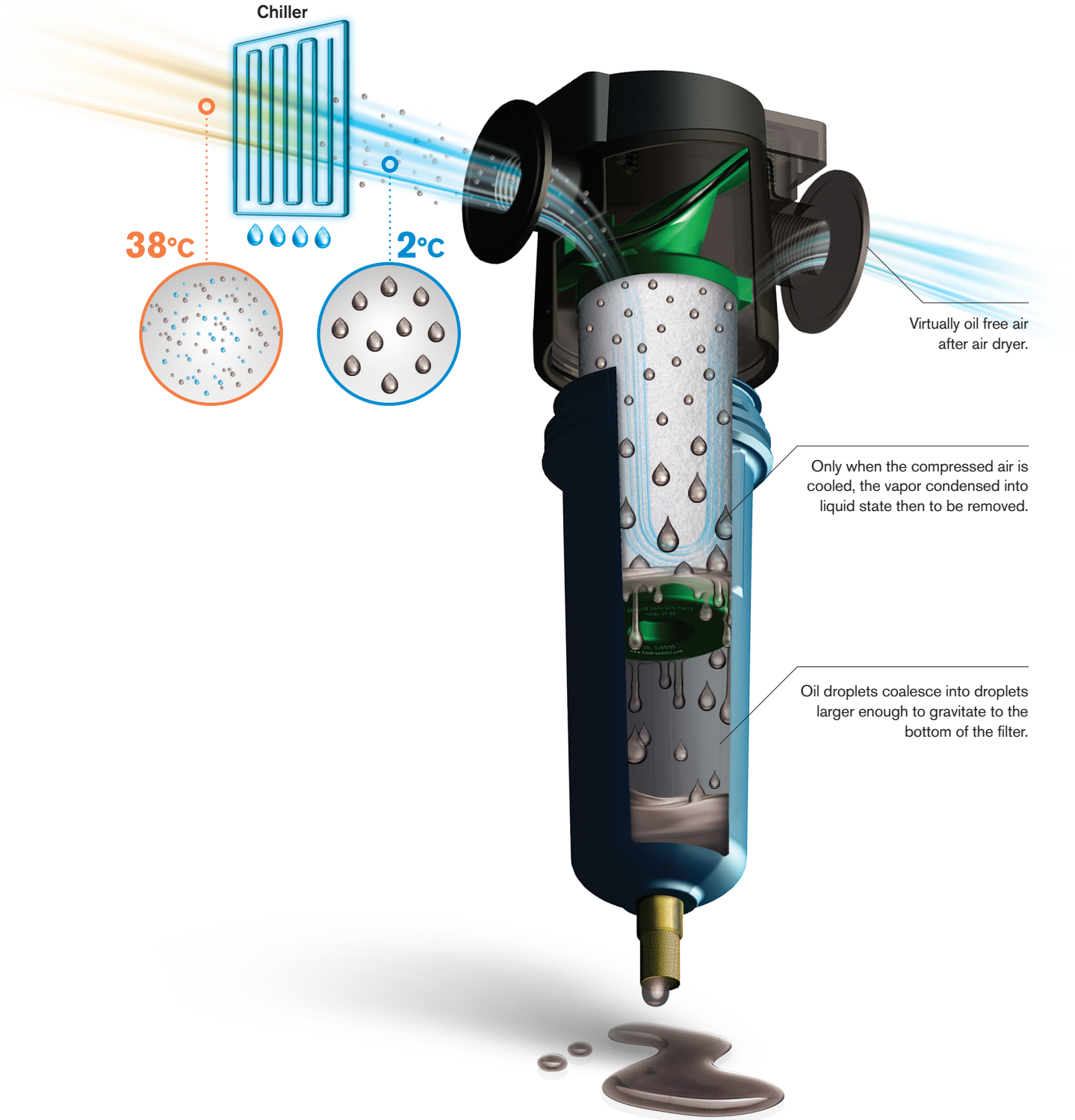
°C	25	27	32	35	38	43	45	50
Factor	1.14	1.12	1.06	1.03	1.00	0.84	0.80	0.68

Patented NGF Filter - High Oil Removal Efficiency PCM28.1J~PCM399.0J

The NGF oil filter removes up to 99.8% of aerosol and oil mist by condensing them into liquid droplet. Virtually oil free high quality compressed air.

Cold Coalescing

As the air is cooled, oil vapor condenses into liquid droplets which are then removed by high efficiency Cold Coalescing filter.
PCM series (Model PCM28.1J and above) has external high efficiency oil removal filter, which is installed at the downstream of chiller before reheater, where compressed air temperature is the lowest point.



Filter elements are performance validated to ISO 12500 ensuring air quality delivered is in accordance to ISO 8573-1:2010 classifications.

Element Grade - H	
Particle Retention Size (ISO 12500-3)	0.01㎛
Particle Removal Efficiency (ISO 12500-3)	99.999+%
Oil Removal Efficiency (ISO 12500-1)	99.9+%
Remaining Oil Content (ISO 12500-1)	< 0.01mg/m³

* **ISO 12500**

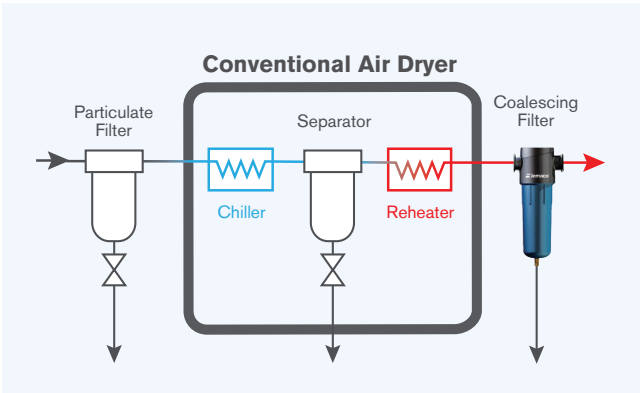
- ISO12500 defines a universal method for manufacturers to test and rate compressed air filter. Critical performance parameters are specified for inlet oil challenge and solid particulate size distribution.
- ISO 12500-1 : Oil (Oil removal performance test)
- ISO 12500-3 : Particle (Solid Particle removal performance test)

ISO 8573-1:2010 Air Quality Standard

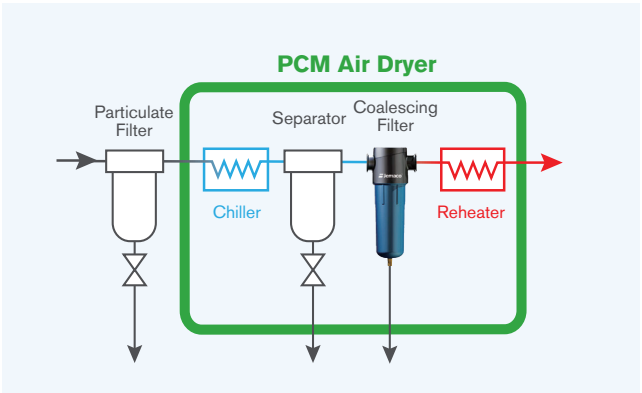
Air Quality Class	Solid Particles (Max. Number of Particle Per m³)			Water (Max. Pressure Dew point)	Oil (Total Oil Concentration - Aerosol, Liquid and Vapor)	
	0.1-0.5 micron	0.5-1.0 micron	1.0-5.0 micron	°C	mg/m³	ppm
0	As specified by the equipment user or supplier and more stringent than class 1					
1	≤ 20,000	≤ 400	≤ 10	≤ -70	≤ 0.01	0.008
2	≤ 400,000	≤ 6,000	≤ 100	≤ -40	≤ 0.1	0.08
3	-	≤ 90,000	≤ 1,000	≤ -20	≤ 1	0.8
4	-	-	≤ 10,000	≤ +3	≤ 5	4
5	-		≤ 100,000	≤ +7	-	-

Oil Removal Efficiency Comparison

General System



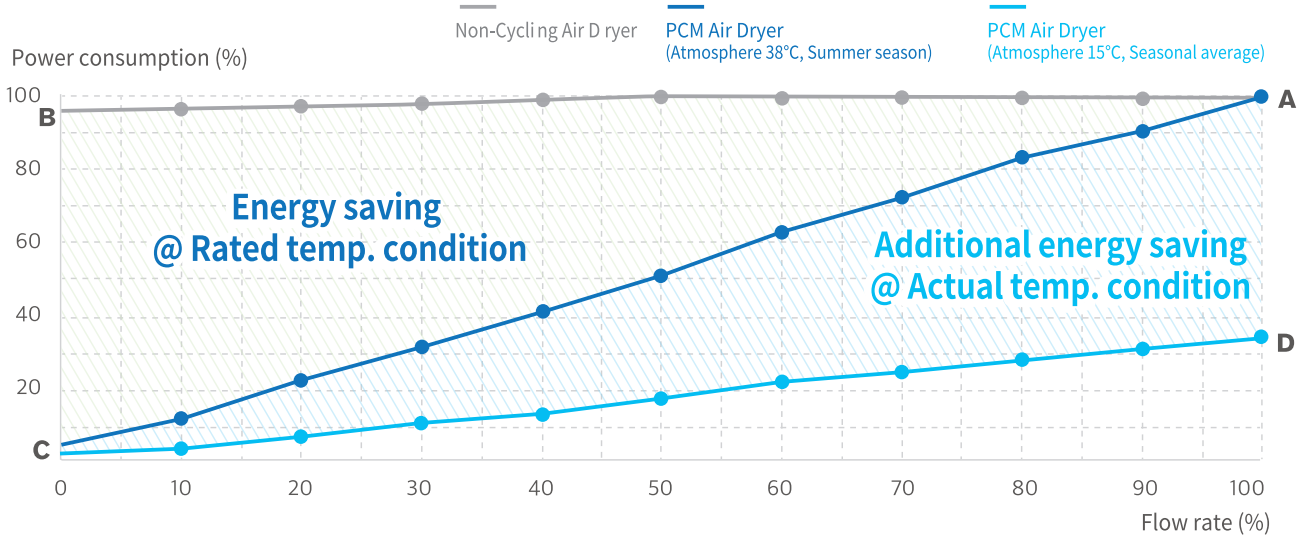
Cold Coalescing System



System	Filtration Temperature (℃)	Hydrocarbon Concentration (ppm)						Actual Efficiency (%)
		At Filter Inlet			At Filter Outlet			
		Liquid	Vapor	Total	Liquid	Vapor	Total	
General System	38℃	2	0.62	2.62	0.0004	0.62	0.6204	76.3%
Cold Coalescing System	2℃	2.616	0.004	2.62	0.00052	0.004	0.00452	**99.8%**

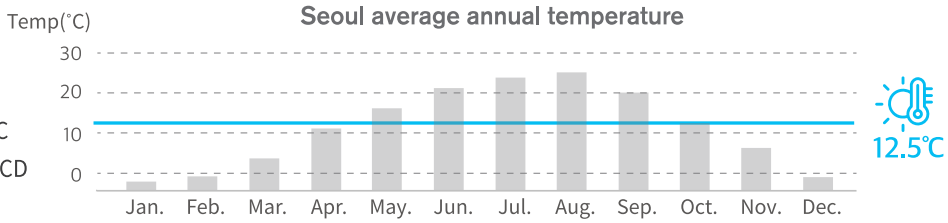
* Highly recommended to install a NGF(Grade P) filter at the upstream of the air dryer to prevent heat exchanger from contamination

Energy Saving Comparison (Against Non-Cycling Air Dryer)

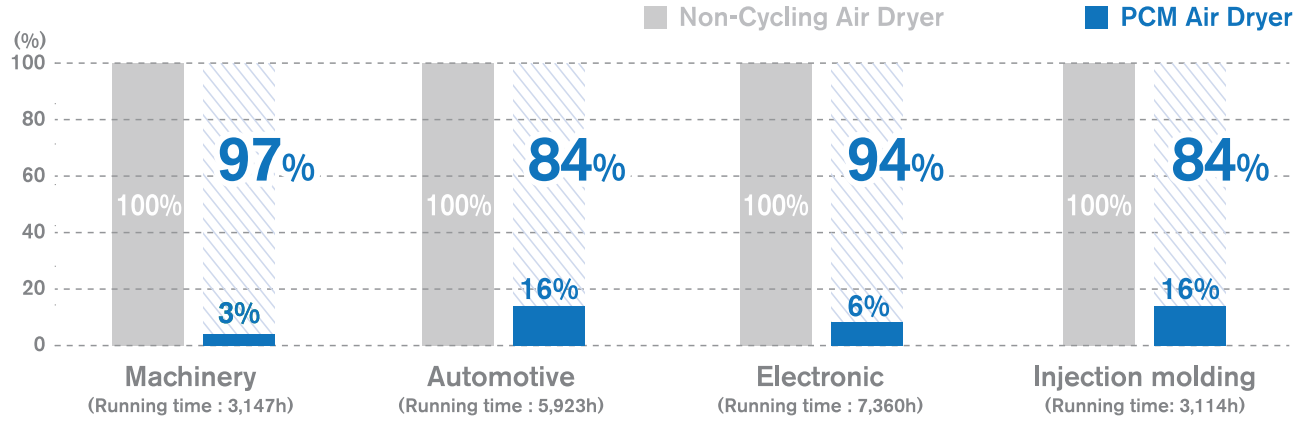


Energy Saving

1. @ Rated temp. : Area ABC
2. @ Actual temp. : Area ABCD



Installation Examples



※ 2p.m., 28th, Feb., 2017

Example of installation in "H Electric" 400HP PCM air dryer

: Until March 2018, records 82% of energy savings

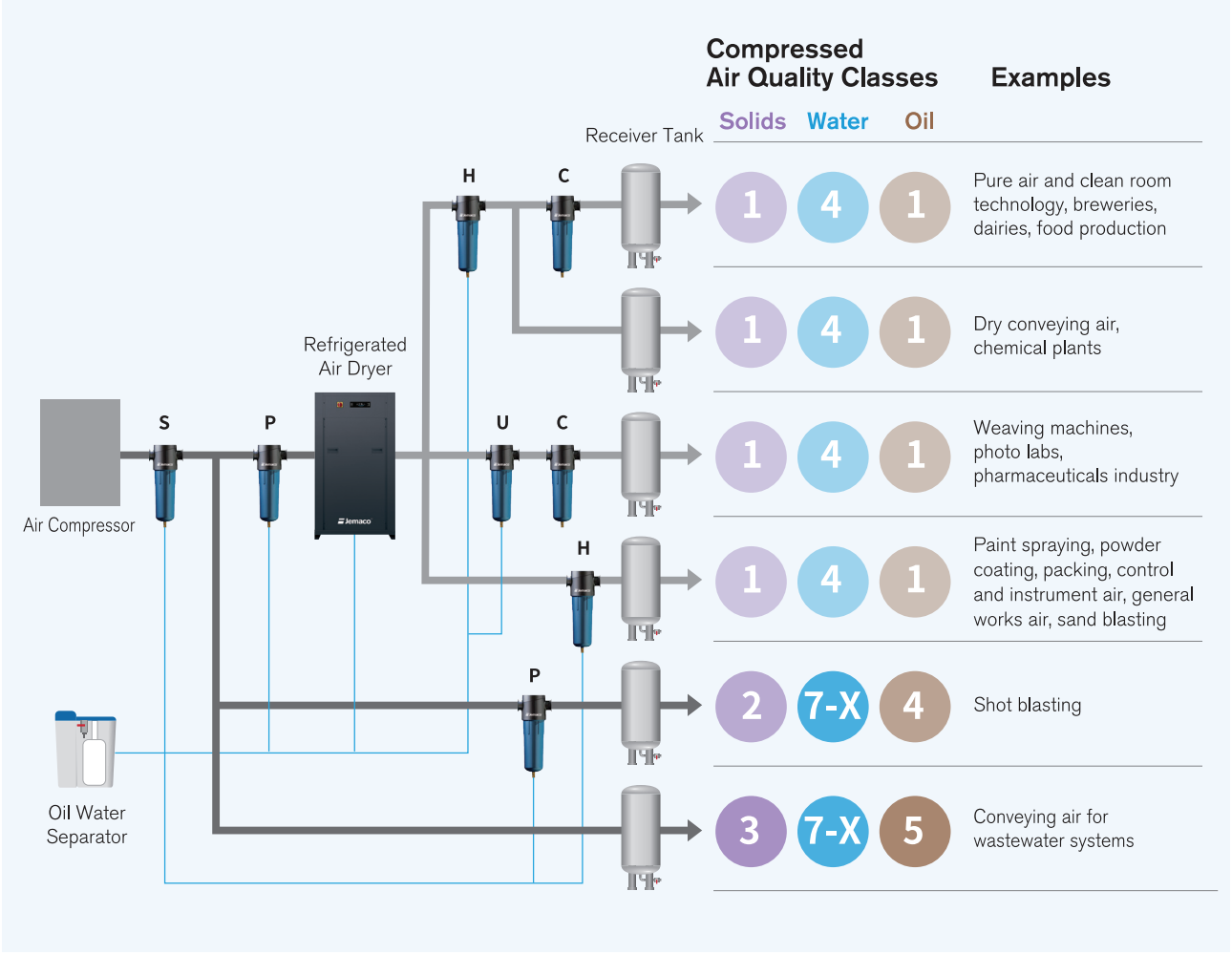
: Compared to conventional air dryer, annual energy costs is about 18%

Air Dryer	Power Consumption	Annual Power Consumption	Annual Energy Costs
Conventional air dryer	10.6kW	92,856kW	USD 10,214
PCM49.9J	9kW	14,191.2kW **Energy savings 82%**	USD 1,561 **Cost savings USD 8,653**

* USD0.11/kWh

International Organization for Standardization

Compressed Air Treatment with Refrigerated Air Dryer (Pressure dew point +3˚C and above)



S : Bulk liquid separator / filter **P or PD :** General purpose filter **H :** High efficiency oil removal filter
U : Ultra high efficiency oil removal filter **C :** Oil removal filter

ISO 8573-1:2010 Air Quality Class

Solid Particles

Class	Max. number of particles per m^3 in d micron size in [㎛]		
	0.1 < d ≤0.5	0.5 < d ≤1.0	1.0 < d ≤5.0
0	Consult for super dry air		
1	≤20,000	≤400	≤10
2	≤400,000	≤6,000	≤100
3	-	≤90,000	≤1,000
4	-	-	≤10,000
5	-	-	≤100,000
Class	Particle concentration C_P [mg/m^3]		
6	0 < C_P ≤5		
7	5 < C_P ≤10		
X	C_P > 10		

Water

Class	Pressure dew point, in ˚C
0	Consult for super dry air
1	≤– 70 ˚C
2	≤– 40 ˚C
3	≤– 20 ˚C
4	≤+ 3 ˚C
5	≤+ 7 ˚C
6	≤+ 10 ˚C
Class	Concentration of liquid water C_W [g/m^3]
7	C_W ≤0.5
8	0.5 < C_W ≤5
9	5 < C_W ≤10
X	C_W > 10

Oil

Class	Total oil concentration [mg/m^3]
	Aerosal, liquid and vapor
0	Consult for super dry air
1	≤0.01
2	≤0.1
3	≤1.0
4	≤5.0
X	> 5.0

* With reference conditions 20 ˚C, 1(barG), 0(%) humidity