

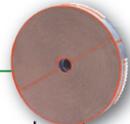
# AQSOA™ Desiccant Air-Conditioner AQSOA™ Adsorption Heat Pump

Complete systems are also for sale.

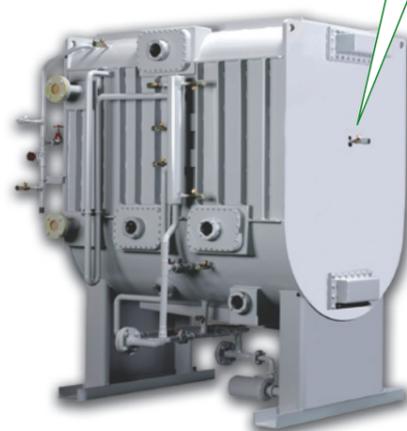
AQSOA™  
Desiccant Air-Conditioner



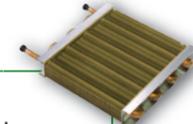
AQSOA™  
Honeycomb Wheel



AQSOA™  
Adsorption Heat Pump



AQSOA™  
Coated Heat Exchanger



Manufactured by MAYEKAWA MFG. CO., LTD

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AQSOA™ is a trademark of MITSUBISHI PLASTICS, INC.(In Japan)

**MITSUBISHI PLASTICS, INC.**

<http://www.mpi.co.jp/>

AQSOA Project

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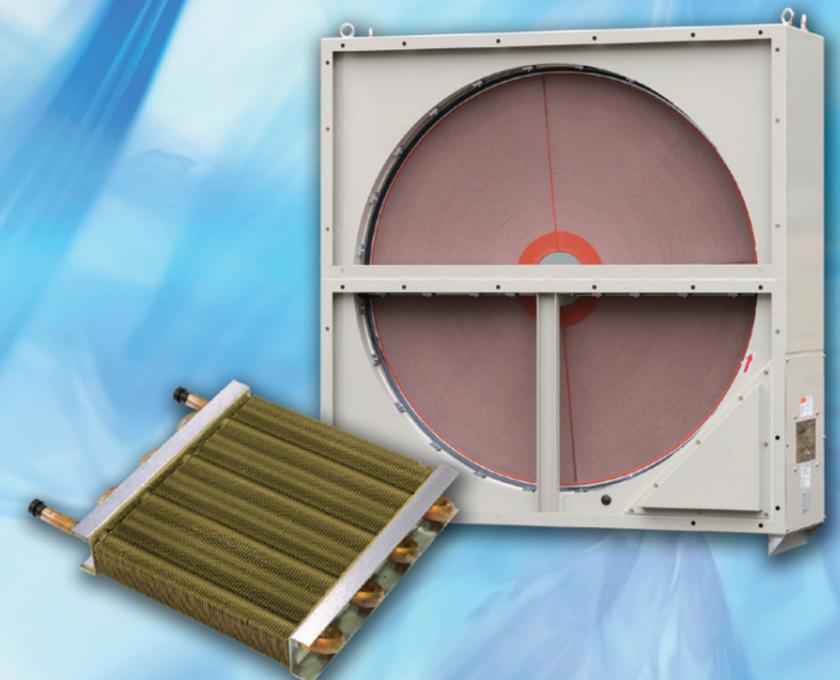
**MITSUBISHI PLASTICS**

Zeolitic Water Vapor Adsorbent

# AQSOA™

AQSOA™ Honeycomb Wheel

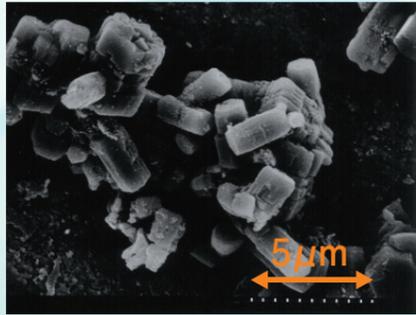
AQSOA™ Coated Heat Exchanger



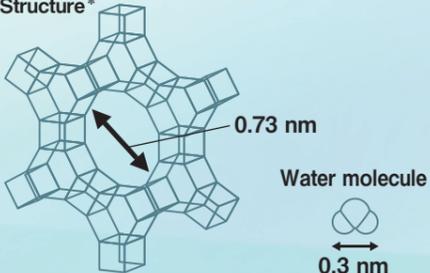
# AQSOA™ is

a novel inorganic "AQua SOrb" zeolitic adsorbent originally developed by Mitsubishi Chemical Corporation.

**Structure and Electron Photomicrograph of AQSOA™**

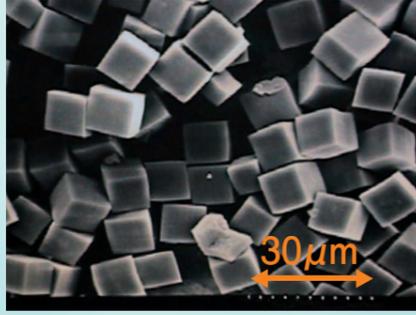


**AQSOA™-Z01**  
AQSOA™-Z05  
AFI Structure\*

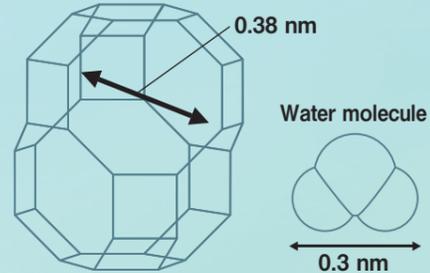


0.73 nm

Water molecule  
0.3 nm



**AQSOA™-Z02**  
CHA Structure\*



0.38 nm

Water molecule  
0.3 nm

\* International Classification by Zeolite Association.

## The Features of AQSOA™

### 1 Regenerated by Low Temperature Heat Source



Due to the low temperature of regeneration, AQSOA™ is environmentally friendly equipment which uses alternative heat sources such as solar heat and exhaust heat for regeneration.

### 2 Large Amount of Adsorption in a Narrow Range of Operations.



Depending on temperature, there is a large change in the adsorption amount with in a narrow range of operational temperature and humidity. It makes possible the construction of compact AQSOA™ heat pumps.

### 3 Humidity Control



Achieves a comfortable atmosphere with controlled humidity.

### 4 Durability



High durability, at least 200,000 cycles of vapor adsorption.

### 5 Type of products

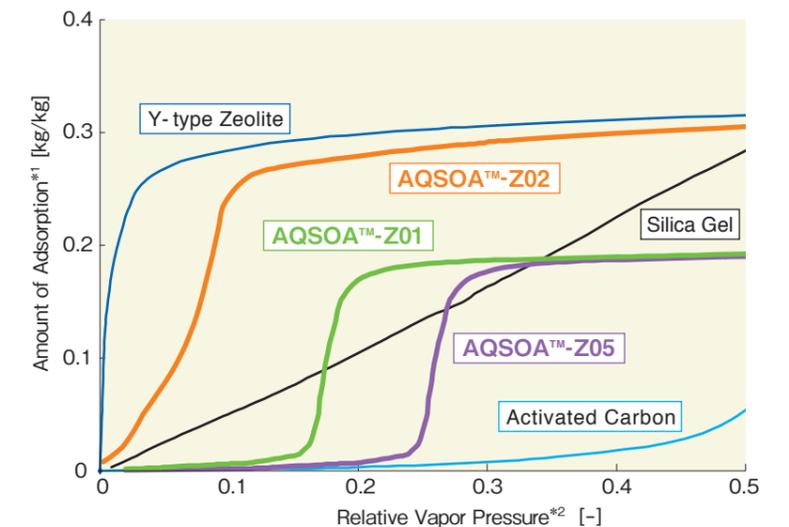


Three different types of AQSOA™ were created for application in different temperature and humidity conditions. For humidity control we have available the honeycomb wheel and the AQSOA™ desiccant air conditioner, and for cold water we have available the AQSOA™ coated heat exchanger and the AQSOA™ adsorption heat pump.

### Adsorption Isotherm of AQSOA™

\*Our experimental value

There are three different types of AQSOA™ (AQSOA™-Z01, AQSOA™-Z02, and AQSOA™-Z05).

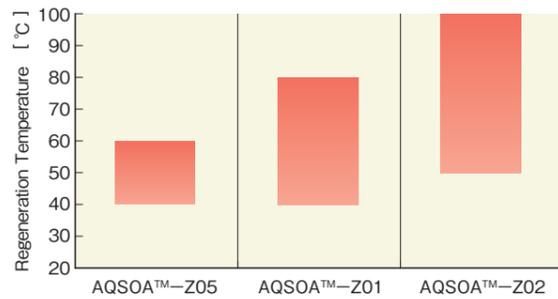


\*1 Amount of adsorption means amount of water [kg] which 1kg of dried adsorbent can adsorb.  
\*2 Relative vapor pressure is (the pressure of water vapor around the adsorbent) ÷ (adsorbent saturation at a given temperature of the water vapor pressure). (Relative vapor pressure corresponds to relative humidity when the ambient air temperature is equal to the adsorbent temperature.)

# AQSOA™ Honeycomb Wheel

• Recommended Regeneration Temperature

• Example of regeneration temperature range



# Merits of AQSOA™ Dessiccant Air-Conditioner are to

**Control Humidity and Temperature**

**Reduction**

Condensation Frost

**For low dew point**

Dry room  
Clean room

**Regenerates at Low Temperature (40°C~)**

Solar Heat  
Exhaust Heat

Energy Saving

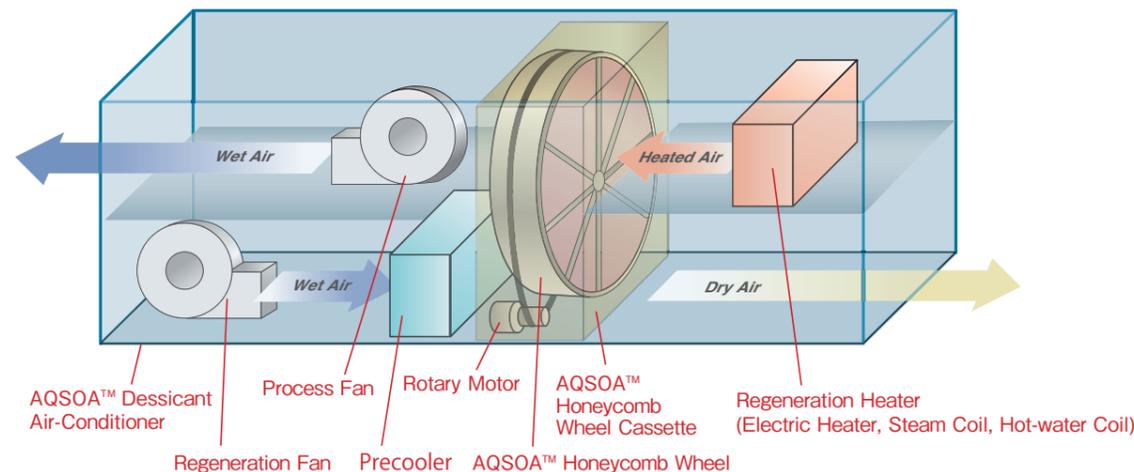
**Humidity Control**

**Manufacturing Process Humidity Control**

Product Quality  
Productivity

# Mechanism of Desiccant Air-Conditioner

In the AQSOA™ desiccant air-conditioning, moisture in wet air is adsorbed through AQSOA™ honeycomb wheel and dry air is supplied.



# Applied Locations of AQSOA™ Honeycomb Wheel Cassette

## Applications

- For Humidity Conditioning AQSOA™ Desiccant Air-Conditioners
- For low dew point AQSOA™ Desiccant Air-Conditioners

## Applied Locations

- Office Buildings
- Humidity Controlled Plants
- Cold Storage Rooms
- Hospitals
- Nursing Homes
- Supermarkets
- Household Humidity Conditioners

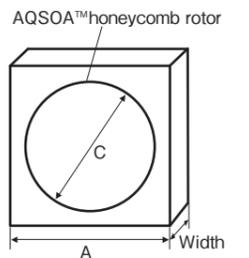


\*An AQSOA™ honeycomb wheel cassette consists of an AQSOA™ honeycomb wheel, a support a seal and a wheel drive.

## Typical Dimensions (Cassette)

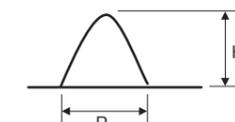
Model	Supplied Air Flow [m³/h]	Energy Consumption [kW] 3φ/200V 50Hz/60Hz	Approximate Weight [kg]	Dimensions [mm]		
				A	Width	C
AQSOA®-0965H20	2,600~3,900	0.04	220	1,200	440	965
AQSOA®-1060H20	3,100~4,700	0.06	250	1,300	440	1,060
AQSOA®-1220H20	4,200~6,300	0.09	300	1,450	440	1,220
AQSOA®-1525H20	6,500~9,800	0.09	380	1,750	440	1,525
AQSOA®-1730H20	8,400~12,600	0.10	450	1,950	440	1,730
AQSOA®-1940H20	10,600~15,900	0.10	600	2,150	520	1,940

\*Zone ratio 1:1.  
\*Feel free to ask us to custom build a honeycomb wheel with different dimensions.



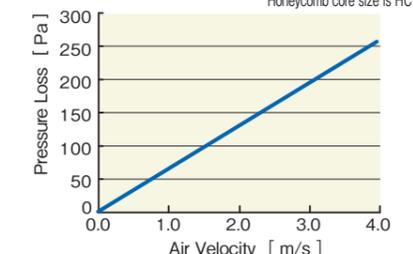
## Dimensions of Honeycomb Core

Designation	HC320	HC190
P [mm]	2.6	3.4
H [mm]	1.5	1.8
Surface Area [m²/m³]	3,500	2,400
Number of Cells [cells / inch²]	About 320	About 190



## Pressure Loss

\*Condition: Measured temperature is 20 °C. Width of wheel is 200mm. Honeycomb core size is HC190

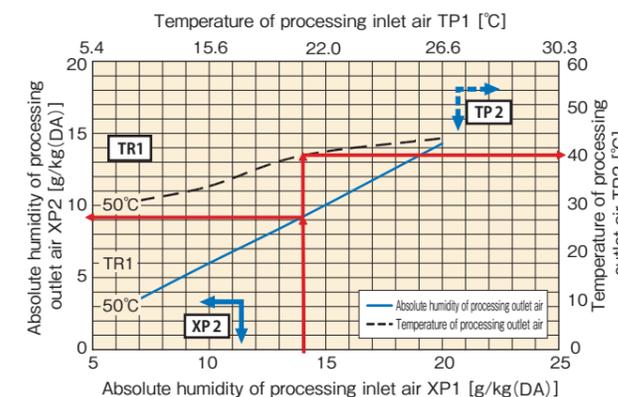


\*The values are for reference, not guaranteed.

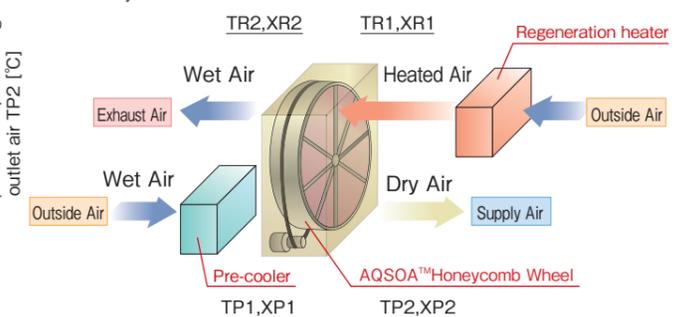
## Performance of Dehumidification (AQSOA™-Z01)

- Correlations of absolute humidity of inlet air and absolute humidity and temperature of outlet air

\*Condition: Regeneration temperature 50°C / Zone ratio 1:1 / Air flow ratio 1:1 / wheel thickness 200mm / Wind speed (20°C) 2m/s  
Absolute humidity of processing inlet air 90RH% / Absolute humidity of regeneration processing inlet air 20g/kg (DA)



After the pre-cooler, the latent heat is processed with the AQSOA™ Honeycomb Wheel. It is regenerated by heating the outlet air using the air conditioning machine of the forced system of ventilation.

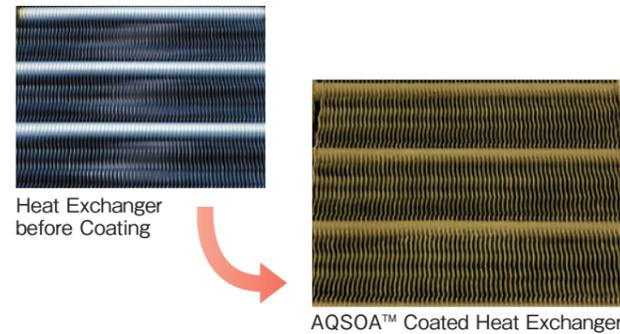
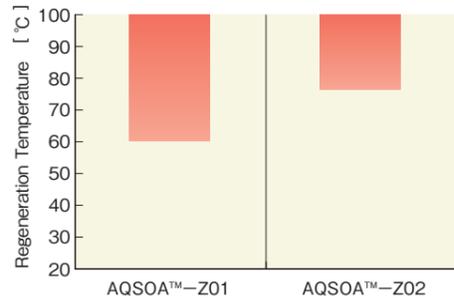


\*The performance is not a guaranteed value.

# AQSOA™ Coated Heat Exchanger

Recommended Regeneration Temperature Range

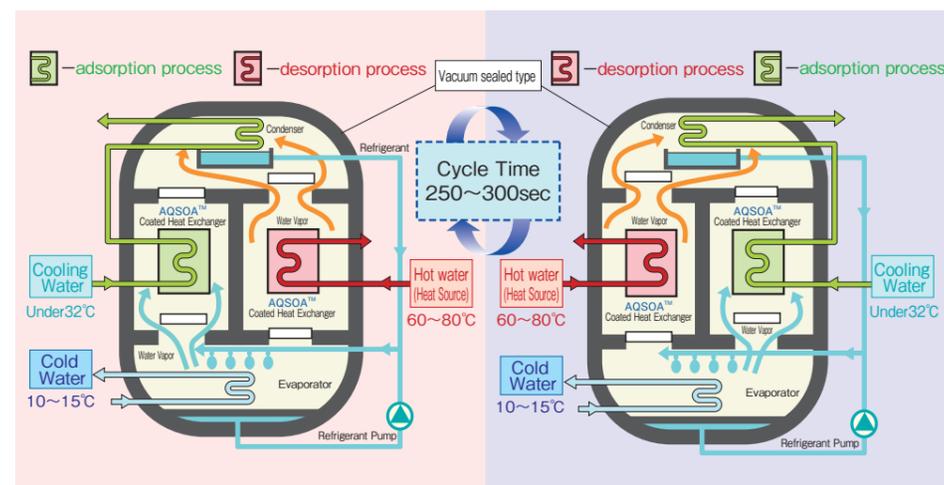
• Example of regeneration temperature range



# Merits of AQSOA™ Adsorption Heat Pump are

- Regenerates at Low Temperature (60°C~)**  
Solar Heat Exhaust Heat  
Energy Saving
- COP10**  
AQSOA™ Adsorption Heat Pump  
Electric Energy 1.1kw, Cooling Capacity 350kw
- The coolant is water**  
CFC
- Adsorption**  
Adsorption phenomenon is used instead of compressor  
low noise type, low oscillation

# Mechanism of AQSOA™ Adsorption Heat Pump



- 1 Evaporation**  
Water (refrigerant) evaporates in the evaporator. Cold water is generated by the evaporative latent heat.
- 2 Adsorption**  
AQSOA™ coated heat exchanger adsorbs vapor from the evaporator.
- 3 Desorption**  
We have desorption of vapor from AQSOA™ by passing hot water through the AQSOA™ coated heat exchanger. The released vapor flows to the condenser.
- 4 Condensation**  
The vapor becomes water in the condenser and it moves to the evaporator.

AQSOA™ adsorption heat pump produces cold water (or hot water) continuously utilizing phenomena of water vapor adsorption and desorption by exhaust heat alternately without a compressor.

# Suitable locations for AQSOA™ Coated Heat Exchanger application

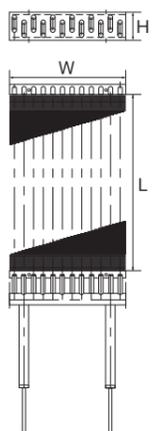
- Applications**
  - For air-conditioning AQSOA™ Adsorption Heat Pump
  - For various cooling processes AQSOA™ Adsorption Heat Pump
- Applied Locations**
  - Steelmaking Plants
  - Cast Incinerator Plants
  - Chemical Plants
  - Food Processing Facilities
  - Hot Springs
  - Cogeneration Plants



## Standard Unit Specifications

Model	Dimensions [ mm ]			Volume [ L ]	Outside Diameter of Copper Tubes [ mm ]	Aluminum Fins		Weight of AQSOA™ [ kg ]	Nominal Cold Output*	
	Width	Length	Height			Fin Pitch [ mm ]	Fin Thickness [ mm ]		Z01 [ kW ]	Z02 [ kW ]
HEX-400A	250	400	50	5	9.53	1.8	0.115	1	1	2
HEX-600A	250	600	100	15	9.53	1.8	0.115	3	4	6

\* Nominal cold output is latent heat of evaporation in 5 minutes assuming that AQSOA™-Z01 adsorbs 0.18kg/kg, AQSOA™-Z02 adsorbs 0.25kg/kg, and all latent heat is effectively used for cooling.



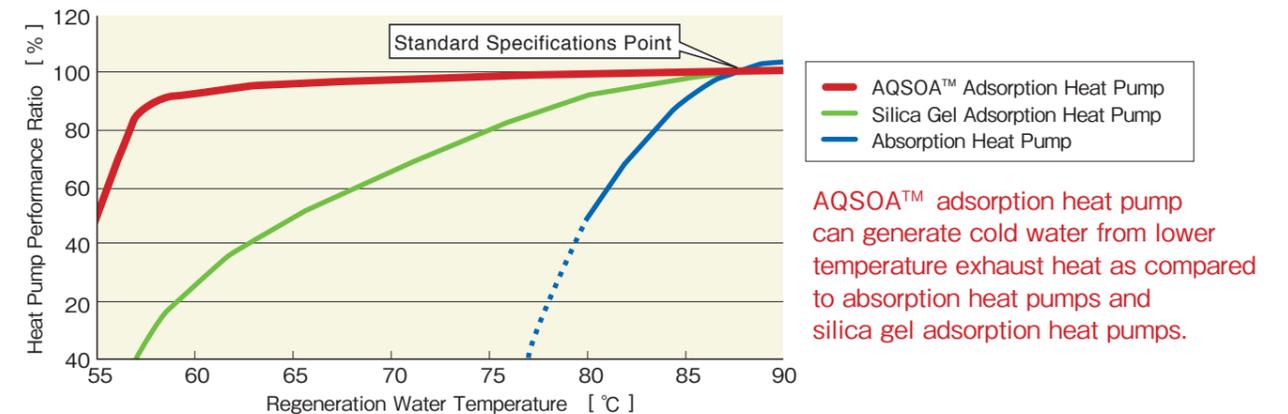
## Typical Dimensions

Dimensions [ mm ]			Outside Diameter of Copper Tubes [ mm ]	Aluminum Fins		AQSOA™ Weight* [ kg/ℓ ]
Width	Length	Height		Fin Pitch [ mm ]	Fin Thickness [ mm ]	
50~330	150~2200	25~108	9.53	2	0.115	0.2

\* Is the weight of AQSOA™ by equipment volume (W×L×H).  
\* Feel free to ask us to custom build an AQSOA™ coated heat exchanger with different dimensions.

## Performance of AQSOA™-Z01 adsorption heat pump compared with silica gel adsorption heat pump and absorption heat pump.

• Expected Performance Ratio of The Heat Pumps with Decreasing Regeneration Temperature. 100% standard performance is defined that at 88 °C for regeneration, 31 °C for cooling water and 9 °C for producing cold water.



AQSOA™ adsorption heat pump can generate cold water from lower temperature exhaust heat as compared to absorption heat pumps and silica gel adsorption heat pumps.

\* The dotted parts of the absorption heat pump curve is evaluated on the basis of Dühring diagram of lithium bromide.  
\* Performance of AQSOA™ adsorption heat pump is evaluated on the basis of AQSOA™'s isotherm.