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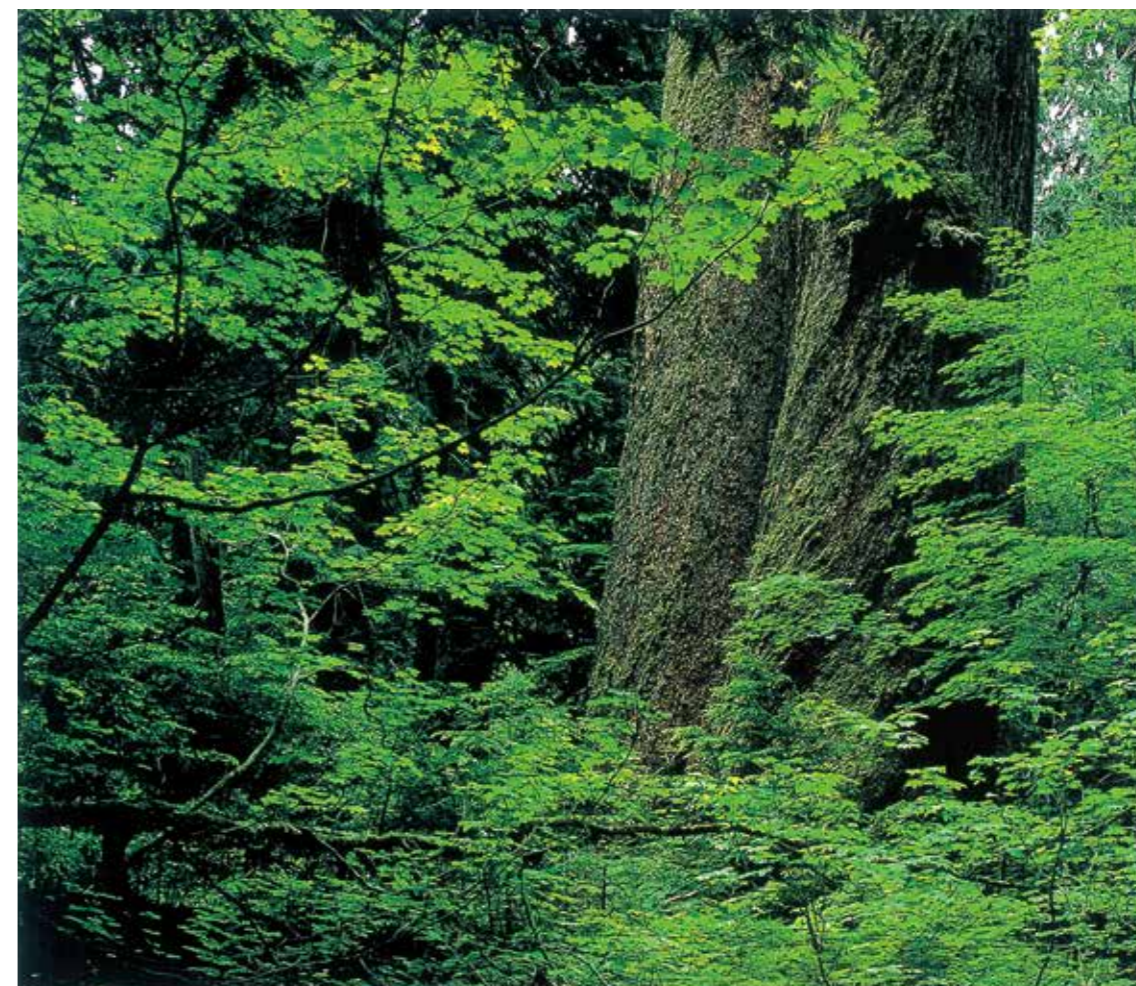
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"DRY-SAVE[®]"

Honeycomb Type Desiccant Dehumidifier



More advantages, more applications being expanded



Seibu Giken Honeycomb Type Desiccant Dehumidifier Advantages of "DRY-SAVE®" dehumidifier

1. Workable under 100 % relative humidity

Since special silica gel is synthesized into the inorganic fiber, it is workable under 100% relative humidity without its deliquescence and refilling the adsorbent because of non shedding out of adsorbent.

2. Stable dehumidification performance under the low temperature range

As a desiccant rotor directly adsorbs the moisture from the air, the dry air can be effectively produced under such condition.

3. Super low dew point air can be achieved

Even with a single rotor, it is easy to obtain super low dew point air (up to -80°C.D.P.).

4. Non flammable, and safer

Desiccant rotor is made of all inorganic material, it is non flammable, and safe.

5. Easy maintainability

Excels in maintainability and easy operation because of simple and compact design.

6. Simple operation

Easy operation and low maintenance cost because of less wearing and rotating parts.

7. Broad range of model line-up

Various applications including large air volume applications can be broadly handled by our compact standard models and large, custom designed special units.

unlimitedly from various industries to the space.

The performance of desiccant type dehumidifier is determined by a desiccant rotor "the heart of the dehumidifier unit". SSCR® metal silicate desiccant rotor that Seibu Giken as a leading manufacturer of desiccant rotor developed first in the world is used and given a high reputation by numerous users in worldwide. It was a trigger to accumulate a lot of know-how regarding Desiccant rotor such as development and commercialization of SSCR®-L, a low regeneration temperature type rotor, happened afterward. And then, we have successfully developed brand new metal-silicate desiccant rotor D-MAX® in 2012 as much

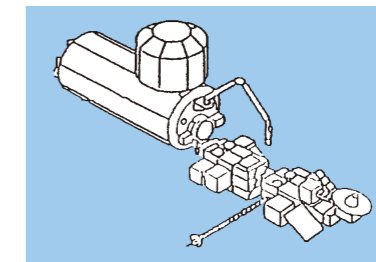
improved performance due to new substrate, raw material and intensive R&D work. D-MAX® is a new generation rotor which is not only high performance but also safety for human body is improved simultaneously. It must be a new standard in Desiccant rotor. SZCR®, molecular-sieve rotor which can achieve up to -70°C.D.P. by a single rotor is also in our rotor line-up for super low dew point application. As such, ROTOR which can be applied for various purposes and "DRY-SAVE®" Seibu Giken Desiccant type dehumidifier mounting this keeps contributing for humidity control getting more important in the industries.



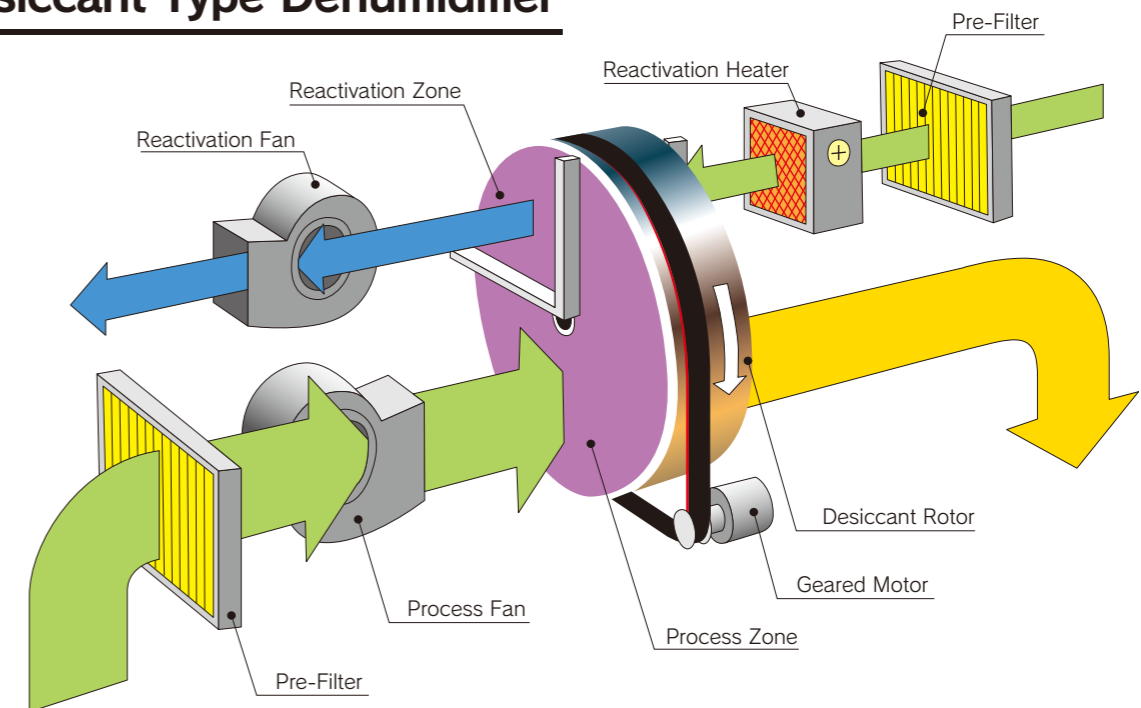
SZCR ROTORS

Air Lock Module

The left desiccant rotor will be installed in the air lock module in order to control the humidity in the anti-pressure chamber (where astronauts go in and out) adjacent to the chamber for the crew.



Basic Structure and Principle of Desiccant Type Dehumidifier



The desiccant rotor is divided into a process and a reactivation zones by the casing structure and heat resistance air sealing. The rotor is constantly and very slowly rotated at an optimum rotation speed for the condition by a geared motor. High moisture air is drawn into the honeycomb matrix of the rotor through the pre-filter by the process fan. When the air is passing through the honeycomb matrix, moisture in the air is adsorbed and dried air is

discharged from the process outlet by the process fan. The rotor adsorbed moisture is rotated into the reactivation zone before it is saturated. Simultaneously, the reactivation air is drawn from the counter side through the pre-filter and is heated and enters the reactivation zone of the rotor and desorbs the moisture adsorbed in the rotor and then is exhausted to the outside by a reactivation fan. This cycle of operation is continuously conducted.

SG Desiccant Rotors and their features

1.D-MAX®

Standard Silica Gel (Metal Silicate) Rotor
Special glass fiber paper made by optimized fiber diameter is used as a substrate. D-MAX® is the rotor which uses activated silica-gel synthesized into honeycomb matrix and micro pore sizes for the silica-gel are controlled in order to maximize dehumidification capacity in the most demanded dew point ranges, -10 - -40°C D.P. It is a next generation rotor which is enhanced dehumidification capacity beyond current SSCR® (40% up against SSCR®) and remarkably improved safety level.

Note: In case water wash cleaning is necessary, it is only allowed certified person to work.

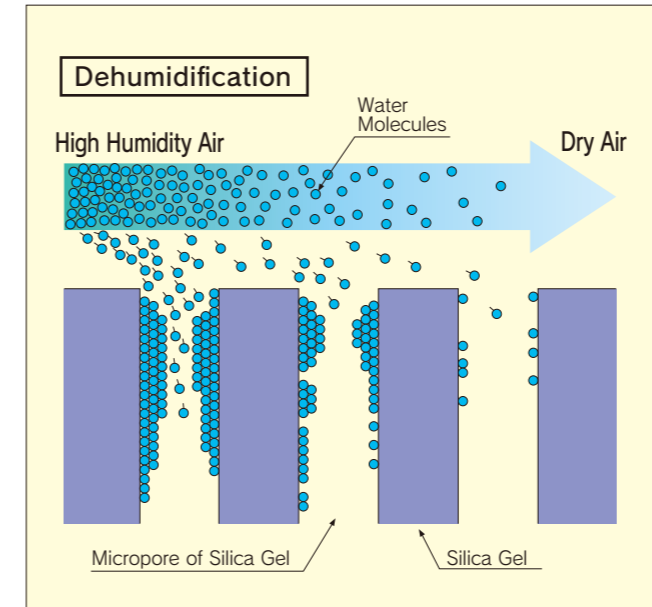
2.SSCR®-L

Low Temp. Reactivation Type Silica Rotor
SSCR®-L was developed for Desiccant cooling AHU with low waste-heat for reactivation around 80°C. SSCR®-L is made with glass fiber paper and the production does not include high temperature bake-out process. According to this reason, it is not incombustible but still flameproofed. Therefore it is safely used for air conditioning with reactivation temp up to 80°C. In addition SSCR®-L is designed for low energy consumption as well as 20 - 30% less pressure loss than other industrial product.

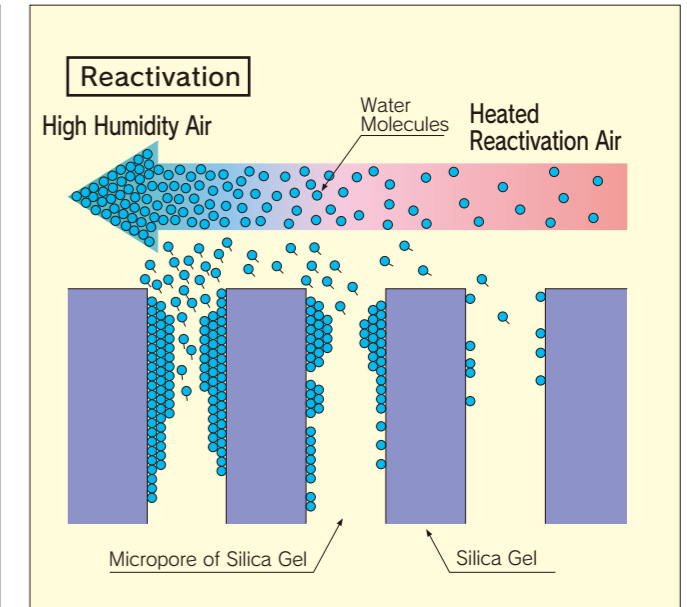
3.SZCR® Molecular Sieve Rotor

Molecular Sieve Rotor
SZCR® which utilizes Synthesized Zeolite as an adsorbent has high heat resistance material such as substrate and adsorbent, and therefore high temperature reactivation heat up to 220°C can be used. So that it can apply for not only low humidity area, high temperature process air but also the air containing of high boiler VOCs. Similar to D-MAX®, the rotor is made of inorganic fiber paper with which the special synthesized zeolite is firmly fixed and impregnated by means of special chemical treatment with inorganic binder. The rotor becomes very strong in physical strength and non-shedding as same as our other desiccant rotors. Due to flow diagram and inlet condition, -70°C D.P. will be achievable with single rotor design.

Principle of Desiccant Dehumidification



Water molecules laden in the air are adsorbed by hydroxyl groups existing inside of micropores of silica gel. Besides, capillary condensation of micropores adsorb large volume of water laden in the air.

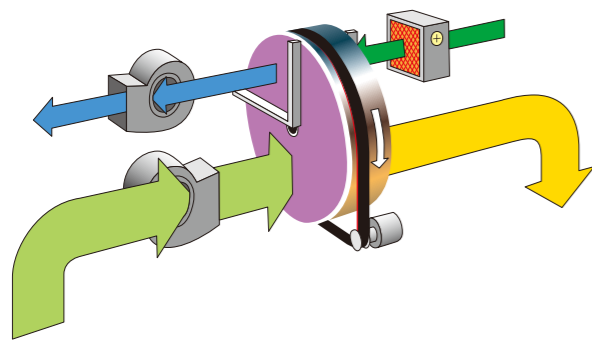


Water molecules adsorbed in the micropores get activated because of temperature rise by feeding the heated reactivation air into the reactivation zone from counter side so that the adsorption force gets weakened and water molecules get out from the micropores of silica gel.

Air Flow Patterns and their features

According to the applications and conditions, the best model can be selected from the broad range of products.

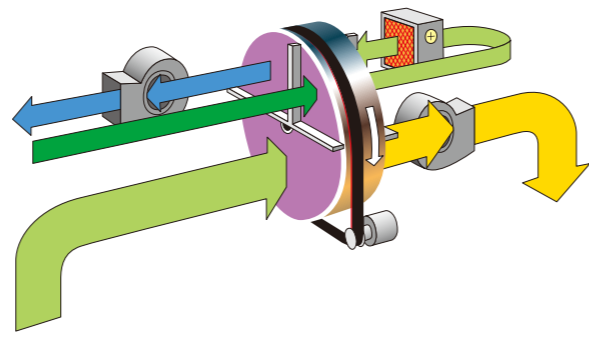
Standard



Feature
From small compact models up to large models

Application
General applications

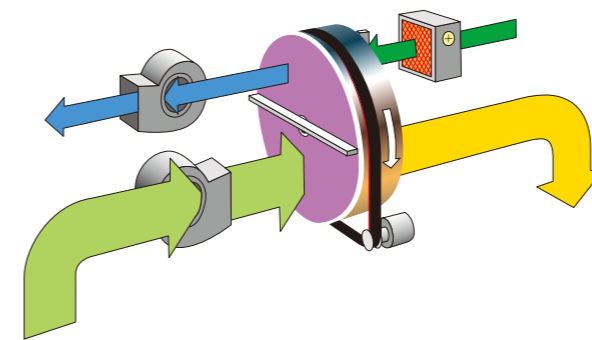
Energy Saving



Feature
Energy Saving by Heat Recovery Flow System

Application
General applications but for Energy Saving

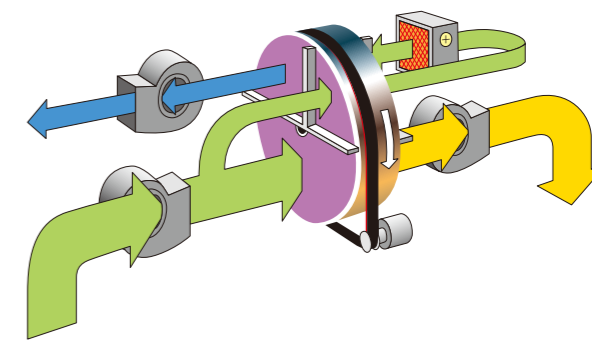
Low Reactivation Temperature



Feature
Energy Saving by utilizing waste heat lower than 100°C

Application
Desiccant Cooling Systems

Low Dew Point



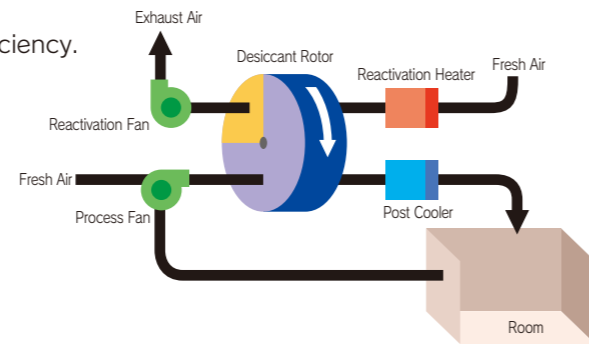
Feature
Dry air from -20 up to -80°C D.P.

Application
Dry-Rooms, Low Dew Point Environmental Rooms

Examples of application and Air Flow System

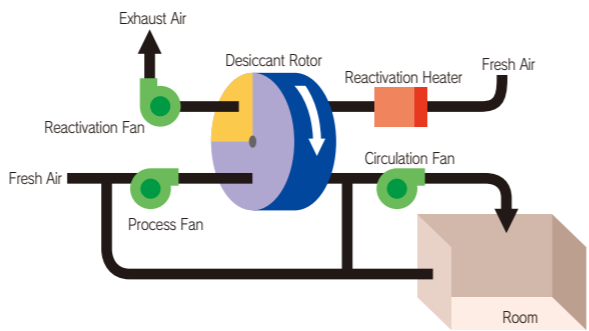
1. Preservation and production line for pharmaceutical, chemical industries, archives.

Pharmaceutical, chemical fertilizer and food processing industries use a lot of hygroscopic raw materials. To keep the quality level and enhance the production efficiency.



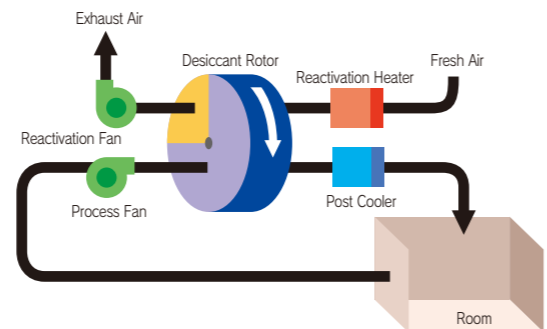
2. Rust, condensation Protections for Power Plant Equipment, Cargo Ships and Precision Electronics Parts

To protect big turbine of power plants and cargo transported by ships from rusting. To keep the quality of electronics parts, high exposure films during storing time.



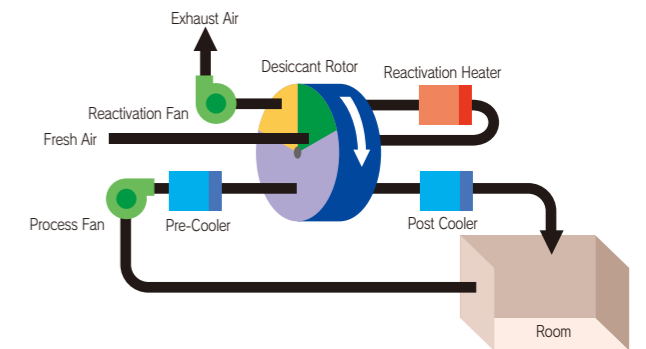
3. Keeping Crops, Tea Leaves, Dried-Sea Weeds, Lumbers in dry condition

To keep the dried crops, tea leaves, sea weeds, lumbers, mushrooms and fishes in the low humid storage.



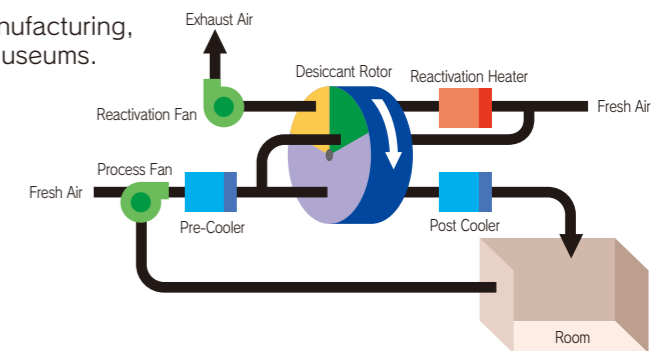
4. Rust, Condensation Protections for Aviation/Space/Defense Equipment, Cargo Ships and Precision Electronics Parts

Aviation/Space/Defense Equipment (Tanks, Airplanes/Missiles/Controls of Rockets)



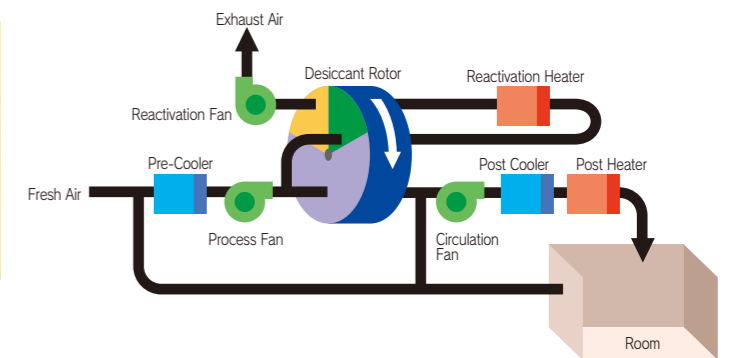
5. Air Conditioning for Clean-Rooms, Museums, Environmental Test Chambers

Constant temperature constant humidity controls for clean-rooms of pharmaceutical, semi-conductors manufacturing, environmental test chambers, experimental rooms and museums.

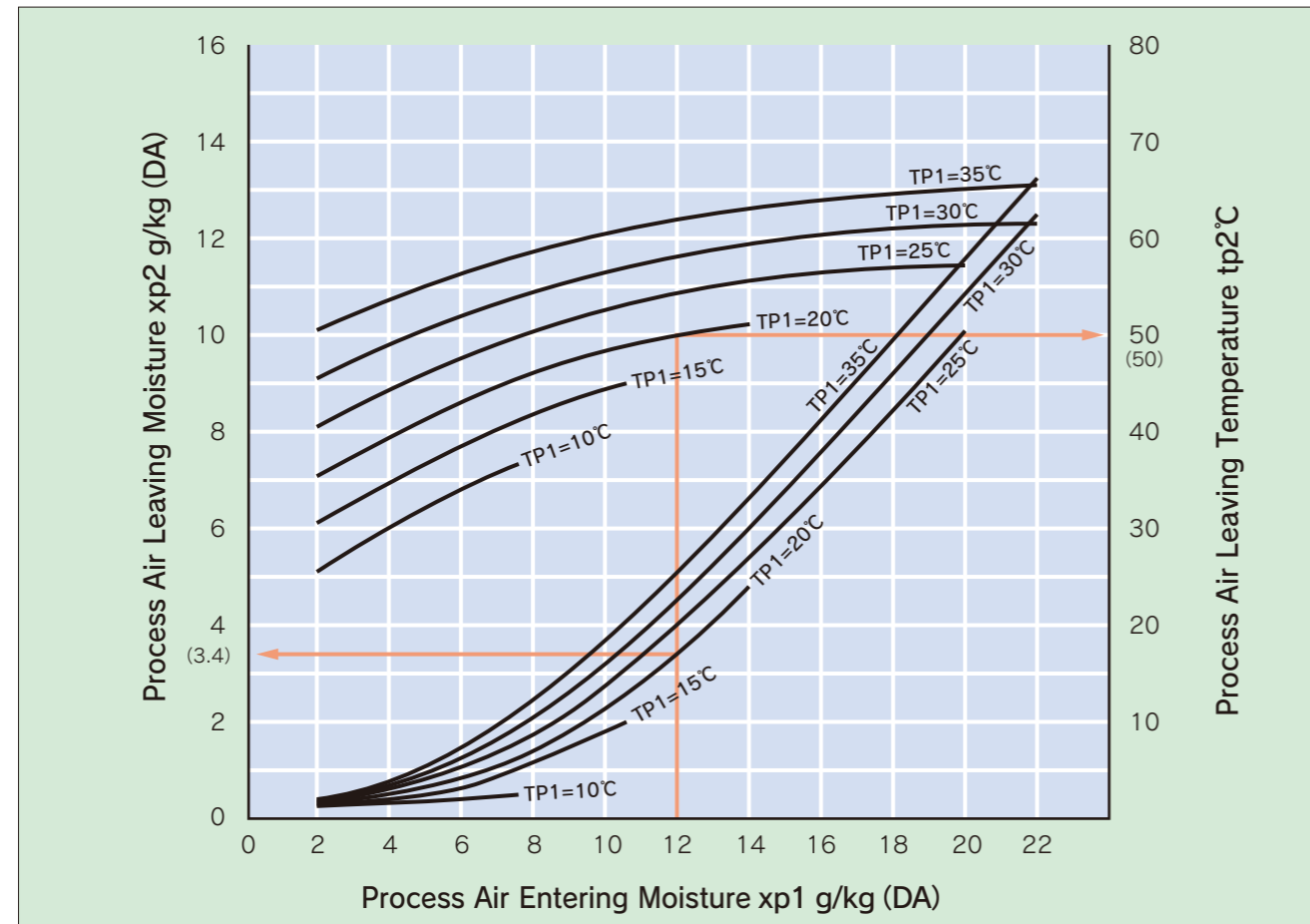


6. Keeping the plastic materials, producing the lithium batteries in the low humidity condition.

To keep the quality of molded plastics, and lithium batteries during the production process.



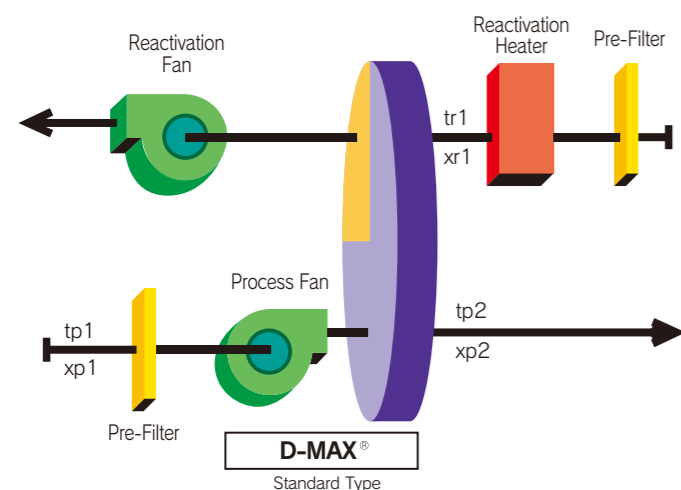
Performance Chart 1 and Flow Diagram Standard Type



How to read the performance chart

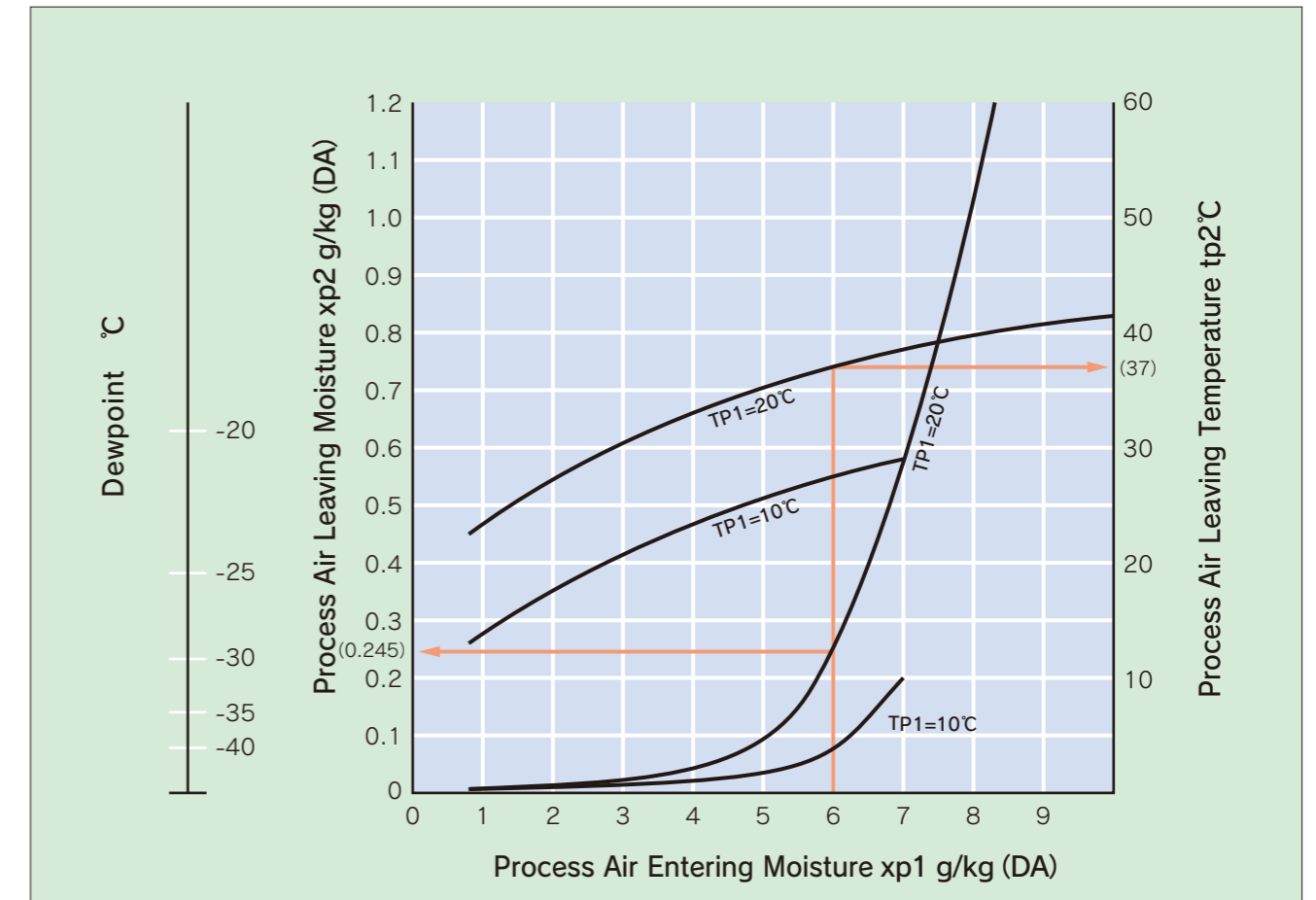
Process Leaving Moisture:
In case of dehumidifying the process air with 20°C, 12g/kg(DA), enter the chart from the X-axis at entering moisture(12g/kg) and move vertically in a straight line to intersect the curve of the entering temperature (20°C). Move horizontally to the left after intersection of entering temperature curve and intersect the Y-axis. The value(3.4g/kg) at this point indicates the process air leaving moisture from the dehumidifier.

Process Leaving Temperature:
Enter the chart from the X-axis at entering moisture (12g/kg) and move vertically in a straight line to intersect the curve of entering temperature (20°C). Move horizontally to the right after intersection of entering temperature curve and intersect the Y-axis. The value (50°C) at this point indicates the process air leaving temperature from the dehumidifier.



Process / Reactivation Zone Ratio = 3 : 1
 Process / Reactivation Air Volume Ratio = 3 : 1
 Desiccant Rotor Thickness = 200mm
 Rotor Face Velocity = 2 m/s at 20°C
 Reactivation Temperature tr1 = 140°C
 Reactivation Air Entering Moisture xr1 = 23 g/kg(DA)
 Process Air Entering Temperatures tp1 = 10, 20, 30°C

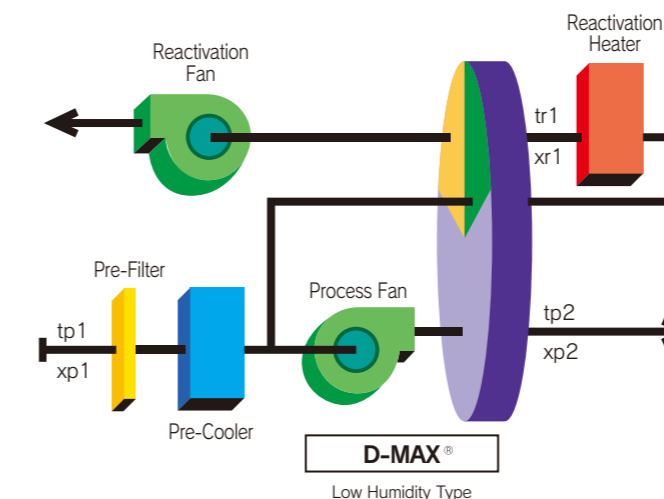
Performance Chart 2 and Flow Diagram Low Humidity Type



How to read the performance chart

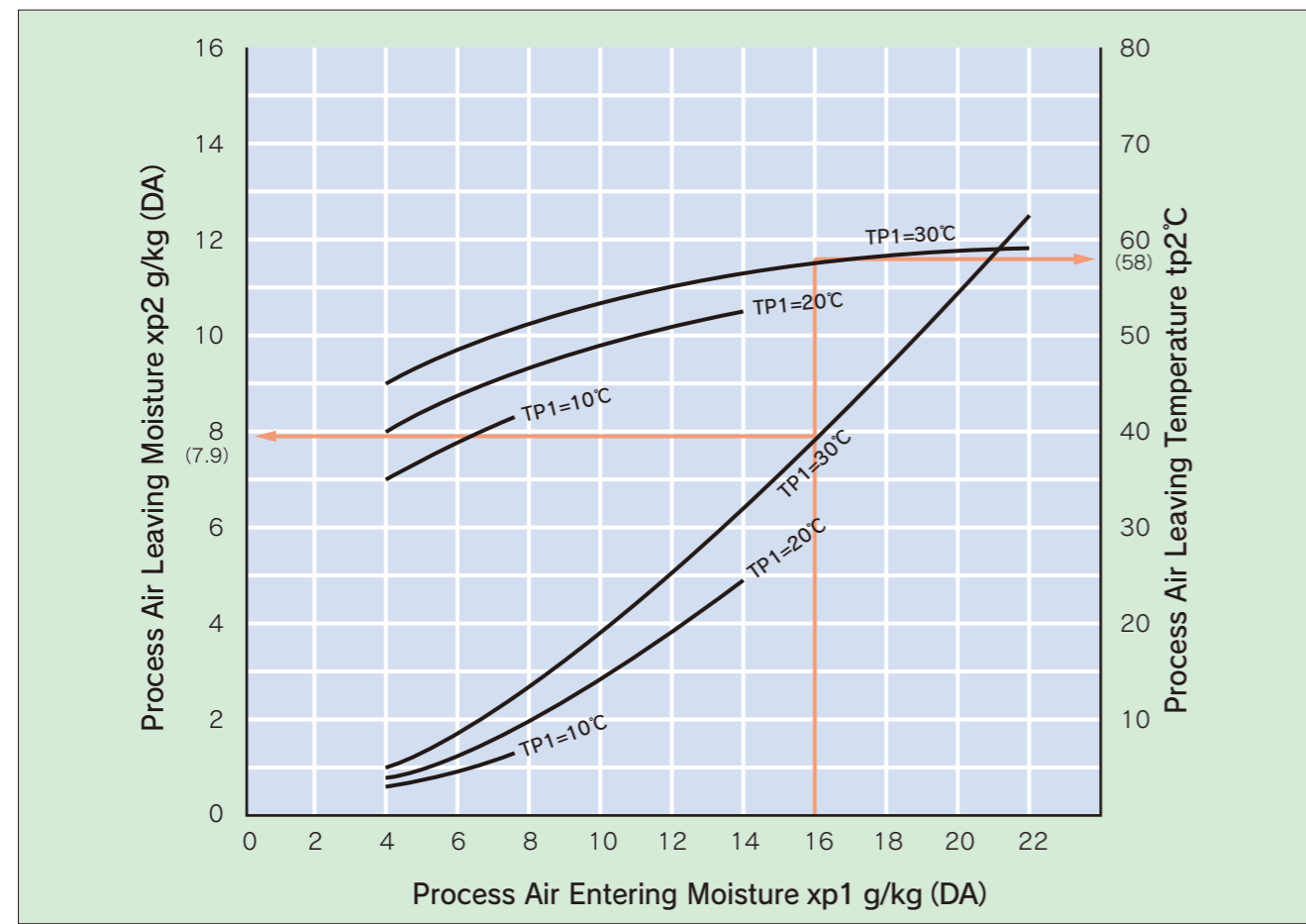
Process Leaving Moisture:
In case of dehumidifying the process air with 20°C, 6g/kg(DA), enter the chart from the X-axis at entering moisture (6 g/kg) and move vertically in a straight line to intersect the curve of the entering temperature (20°C). Move horizontally to the left after intersection of entering temperature curve and intersect the Y-axis. The value (0.245 g/kg) at this point indicates the process air leaving moisture from the dehumidifier.

Process Leaving Temperature:
Enter the chart from the X-axis at entering moisture (6g/kg) and move vertically in a straight line to intersect the curve of entering temperature (20°C). Move horizontally to the right after intersection of entering temperature curve and intersect the Y-axis. The value (37°C) at this point indicates the process air leaving temperature from the dehumidifier.



Process Zone / Cooling (Purge) Zone / Reactivation Zone Ratio = 3 : 1 : 1
 Process / Cooling (Purge) / Reactivation Air Volume Ratio = 3 : 1 : 1
 Desiccant Rotor Thickness = 400mm
 Rotor Face Velocity = 2 m/s at 20°C
 Reactivation Temperature tr1 = 140°C
 Reactivation Air Entering Moisture xr1 = Process Air Entering Moisture xp1 g/kg(DA)
 Process Air Entering Temperatures tp1 = 10, 20°C

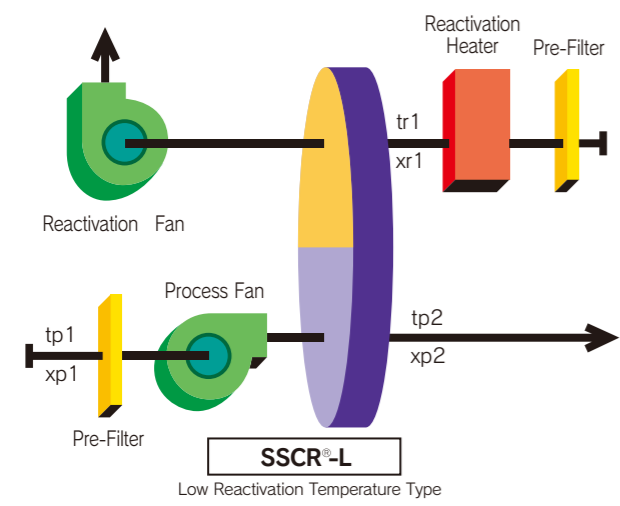
Performance Chart 3 and Flow Diagram Low Reactivation Temperature Type



How to read the performance chart

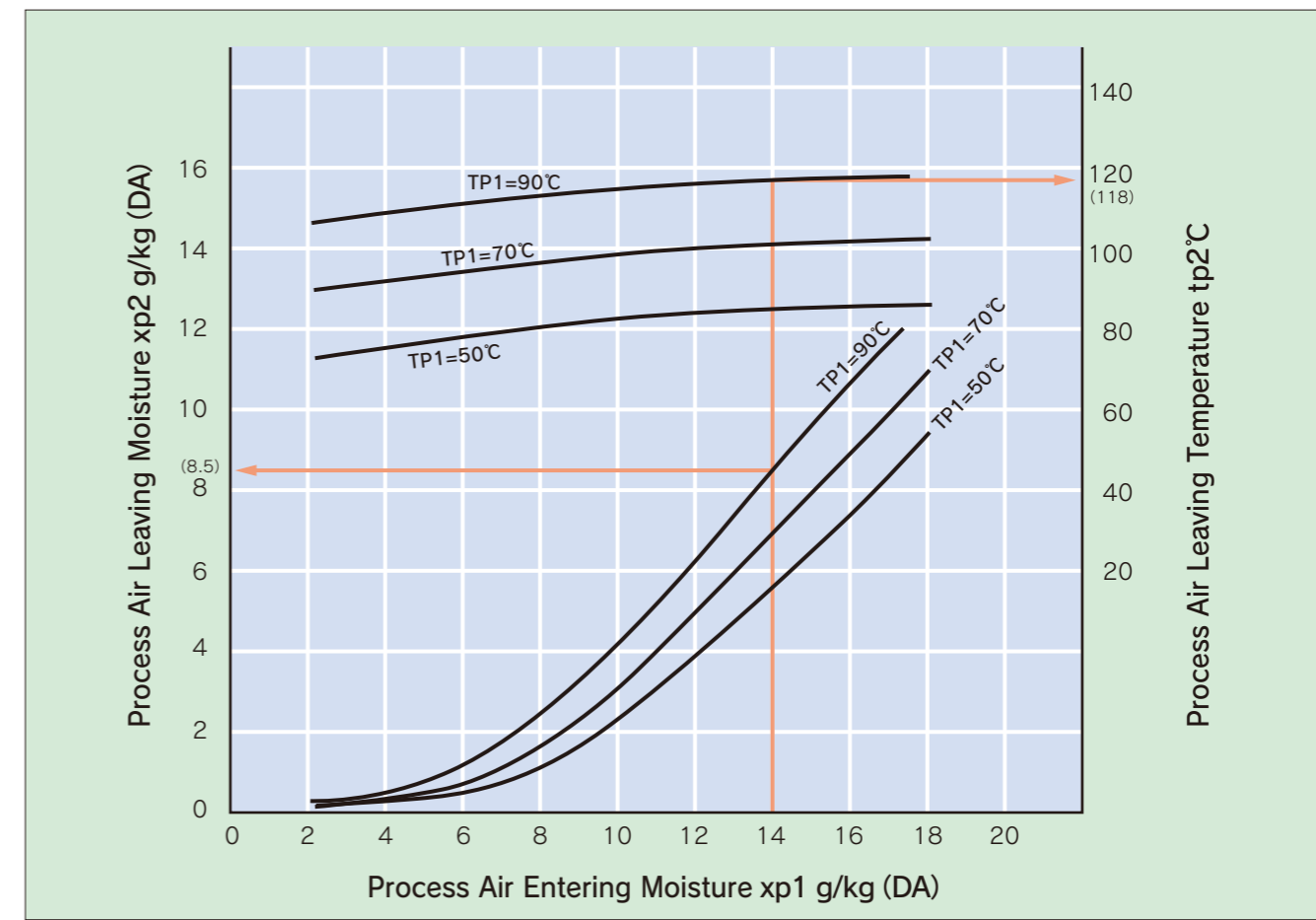
Process Leaving Moisture:
In case of dehumidifying the process air with 30°C, 16g/kg(DA), enter the chart from the X-axis at entering moisture(16g/kg) and move vertically in a straight line to intersect the curve of the entering temperature(30°C). Move horizontally to the left after intersection of entering temperature curve and intersect the Y-axis. The value(7.9g/kg) at this point indicates the process air leaving moisture from the dehumidifier.

Process Leaving Temperature:
Enter from the X-axis at entering moisture (16g/kg) and move vertically in a straight line to intersect the curve of entering temperature (30°C). Move horizontally to the right after intersection of entering temperature curve and intersect the Y-axis. The value (58°C) at this point indicates the process air leaving temperature from the dehumidifier.



Process / Reactivation Zone Ratio = 1 : 1
 Reactivation / Process Air Volume Ratio = 1 : 1
 Desiccant Rotor Thickness = 200mm
 Rotor Face Velocity = 2 m/s at 20°C
 Reactivation Temperature tr1 = 80°C
 Reactivation Air Entering Moisture xr1 = Process Air Entering Moisture xp1 g/kg(DA)
 Process Air Entering Temperatures tp1 = 10, 20, 30°C

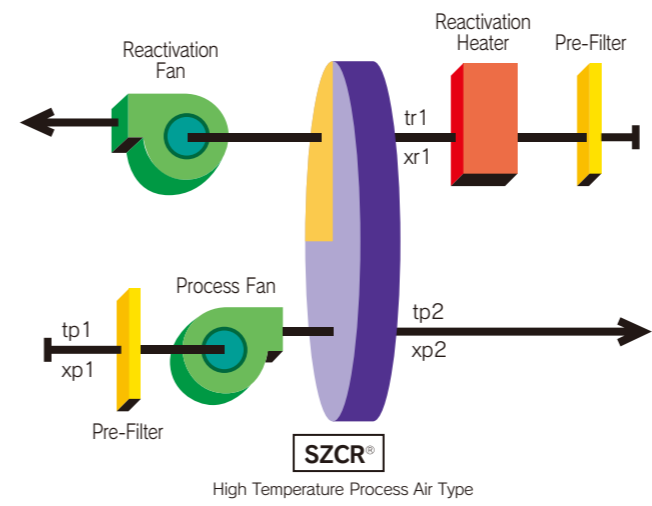
Performance Chart 4 and Flow Diagram High Temperature Process Air Type



How to read the performance chart

Process Leaving Moisture:
In case of dehumidifying the process air with 90°C, 14g/kg(DA), enter the chart from the X-axis at entering moisture(14g/kg) and move vertically in a straight line to intersect the curve of the entering temperature(90°C). Move horizontally to the left after intersection of entering temperature curve and intersect the Y-axis. The value(8.5g/kg) at this point indicates the process air leaving moisture from the dehumidifier.

Process Leaving Temperature:
Enter from the X-axis at entering moisture (14g/kg) and move vertically in a straight line to intersect the curve of entering temperature (90°C). Move horizontally to the right after intersection of entering temperature curve and intersect the Y-axis. The value (118°C) at this point indicates the process air leaving temperature from the dehumidifier.



Process / Reactivation Zone Ratio = 3 : 1
 Process / Reactivation Air Volume Ratio vs. = 3 : 1
 Desiccant Rotor Thickness = 200mm
 Rotor Face Velocity = 2m/s at 90°C
 Reactivation Temperature tr1 = 180°C
 Reactivation Air Entering Moisture xr1 = Process Air Entering Moisture xp1 g/kg(DA)
 Process Air Entering Temperatures tp1 = 50, 70, 90°C

Quick Reference Table of Dehumidification Capacity

Model	Nominal Process Air Volume	Water Removal Rate
	2.0m/sec ~ 4.0m/sec	2.0m/sec ~ 4.0m/sec
SSP-0250H20	200m ³ /hr. ~ 390m ³ /hr.	1.9kg/hr ~ 3.3kg/hr
SSP-0350H20	430m ³ /hr. ~ 860m ³ /hr.	4.2kg/hr ~ 7.3kg/hr
SSP-0450H20	730m ³ /hr. ~ 1,460m ³ /hr.	7.1kg/hr ~ 12.5kg/hr
SSP-0550H20	1,100m ³ /hr. ~ 2,300m ³ /hr.	10.8kg/hr ~ 19.6kg/hr
SSP-0660H20	1,600m ³ /hr. ~ 3,200m ³ /hr.	15.7kg/hr ~ 27.4kg/hr
SSP-0770H20	2,200m ³ /hr. ~ 4,400m ³ /hr.	21.6kg/hr ~ 37.6kg/hr
SSP-0965H20	3,500m ³ /hr. ~ 7,000m ³ /hr.	34.4kg/hr ~ 59.9kg/hr
SSP-1060H20	4,200m ³ /hr. ~ 8,500m ³ /hr.	41.3kg/hr ~ 72.8kg/hr
SSP-1220H20	5,700m ³ /hr. ~ 11,500m ³ /hr.	56.1kg/hr ~ 98.4kg/hr
SSP-1525H20	8,900m ³ /hr. ~ 17,800m ³ /hr.	87.6kg/hr ~ 152.4kg/hr
SSP-1730H20	11,600m ³ /hr. ~ 23,300m ³ /hr.	114.2kg/hr ~ 199.5kg/hr
SSP-1940H20	14,800m ³ /hr. ~ 29,500m ³ /hr.	145.7kg/hr ~ 252.6kg/hr
SSP-2190H20	19,000m ³ /hr. ~ 38,100m ³ /hr.	187.1kg/hr ~ 326.3kg/hr
SSP-2450H20	22,800m ³ /hr. ~ 45,600m ³ /hr.	224.5kg/hr ~ 390.5kg/hr
SSP-2650H20	26,400m ³ /hr. ~ 52,700m ³ /hr.	260.0kg/hr ~ 451.3kg/hr
SSP-2950H20	33,100m ³ /hr. ~ 66,300m ³ /hr.	326.0kg/hr ~ 567.8kg/hr
SSP-3550H20	48,300m ³ /hr. ~ 96,500m ³ /hr.	475.7kg/hr ~ 826.5kg/hr
SSP-3950H20	60,300m ³ /hr. ~ 120,700m ³ /hr.	593.9kg/hr ~ 1,033.8kg/hr
SSP-4250H20	70,300m ³ /hr. ~ 140,500m ³ /hr.	692.4kg/hr ~ 1,203.4kg/hr

Model	Nominal Process Air Volume	Water Removal Rate
	2.0m/sec ~ 4.0m/sec	2.0m/sec ~ 4.0m/sec
SSP-0250H40	200m ³ /hr. ~ 390m ³ /hr.	2.1kg/hr ~ 3.6kg/hr
SSP-0350H40	430m ³ /hr. ~ 860m ³ /hr.	4.5kg/hr ~ 8.0kg/hr
SSP-0450H40	730m ³ /hr. ~ 1,460m ³ /hr.	7.6kg/hr ~ 13.6kg/hr
SSP-0550H40	1,100m ³ /hr. ~ 2,300m ³ /hr.	11.5kg/hr ~ 21.4kg/hr
SSP-0660H40	1,600m ³ /hr. ~ 3,200m ³ /hr.	16.8kg/hr ~ 29.8kg/hr
SSP-0770H40	2,200m ³ /hr. ~ 4,400m ³ /hr.	23.1kg/hr ~ 41.0kg/hr
SSP-0965H40	3,500m ³ /hr. ~ 7,000m ³ /hr.	36.9kg/hr ~ 65.2kg/hr
SSP-1060H40	4,200m ³ /hr. ~ 8,500m ³ /hr.	44.2kg/hr ~ 79.2kg/hr
SSP-1220H40	5,700m ³ /hr. ~ 11,500m ³ /hr.	60.1kg/hr ~ 107.2kg/hr
SSP-1525H40	8,900m ³ /hr. ~ 17,800m ³ /hr.	93.8kg/hr ~ 165.9kg/hr
SSP-1730H40	11,600m ³ /hr. ~ 23,300m ³ /hr.	122.3kg/hr ~ 217.2kg/hr
SSP-1940H40	14,800m ³ /hr. ~ 29,500m ³ /hr.	156.0kg/hr ~ 275.0kg/hr
SSP-2190H40	19,000m ³ /hr. ~ 38,100m ³ /hr.	200.3kg/hr ~ 355.1kg/hr
SSP-2450H40	22,800m ³ /hr. ~ 45,600m ³ /hr.	240.4kg/hr ~ 425.1kg/hr
SSP-2650H40	26,400m ³ /hr. ~ 52,700m ³ /hr.	278.3kg/hr ~ 491.2kg/hr
SSP-2950H40	33,100m ³ /hr. ~ 66,300m ³ /hr.	349.0kg/hr ~ 618.0kg/hr
SSP-3550H40	48,300m ³ /hr. ~ 96,500m ³ /hr.	509.3kg/hr ~ 899.6kg/hr
SSP-3950H40	60,300m ³ /hr. ~ 120,700m ³ /hr.	635.8kg/hr ~ 1,125.2kg/hr
SSP-4250H40	70,300m ³ /hr. ~ 140,500m ³ /hr.	741.3kg/hr ~ 1,309.7kg/hr

Process Air Entering Condition 25°C 80%RH = 16 g/kg(DA)

Reactivation Air Entering Condition 140°C 16g/kg(DA)

Air Flow Pattern Standard

Note)

·SSP model is packaged unit with process/reactivation fans, reactivation heater and control panel.

·Basic chamber unit so called SSU model, without process/reactivation fans nor reactivation heater, is also available upon request.

Introduction of DRY-SAVE® Products

DRY-SAVE® Special Medium, Large / Low Dew Point Units / Standard Medium Units



DRY-SAVE® Small Compact Units/Standard Units



DRY-SAVE® Desiccant Rotor Cassettes/Rotors



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