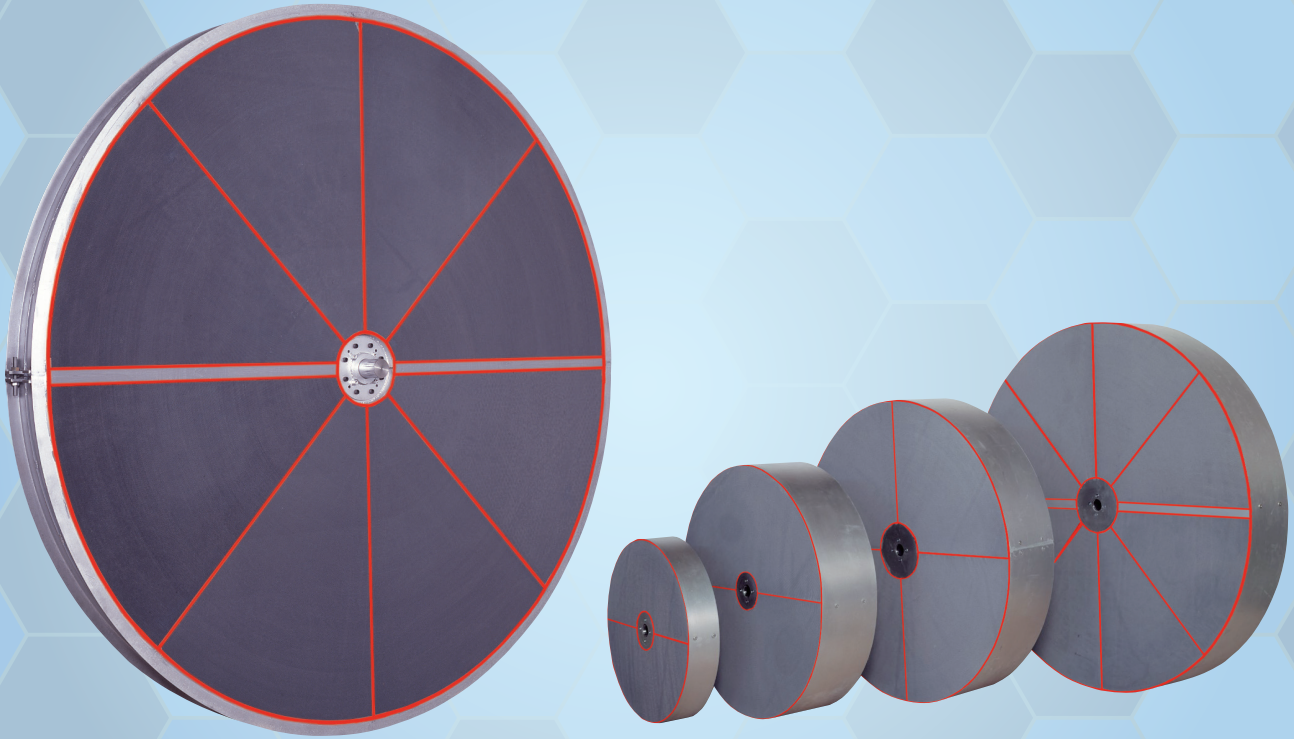


TOMBO™ BRAND

Jan. 2024

Industrial desiccant rotor

HONEYCLE™ desiccant

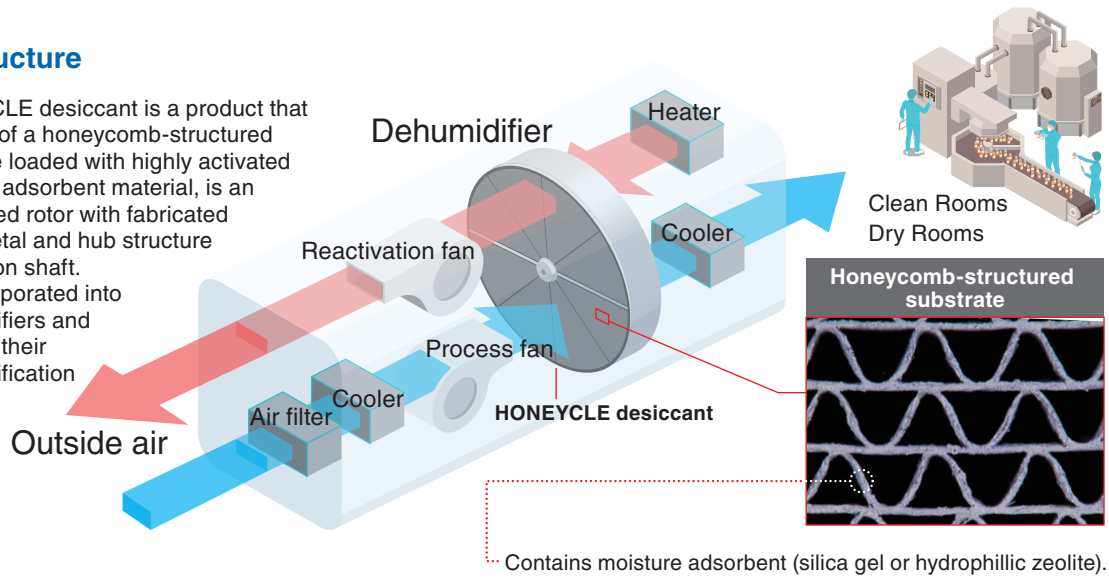


Outline

In recent years, humidity control has become indispensable in a variety of industrial fields, such as, pharmaceutical production, food process, chemical industry, semiconductor production process, and lithium-ion battery production, because of the quality problems that moisture in the air can cause. Dehumidification methods for controlling and managing moisture include desiccant dehumidification, which uses moisture adsorbents, and dehumidification by condensation, which reduces moisture under overcooled condition. We have been supplying the market with honeycomb rotors for dehumidification (hereinafter referred to as HONEYCLE desiccant) for many years.

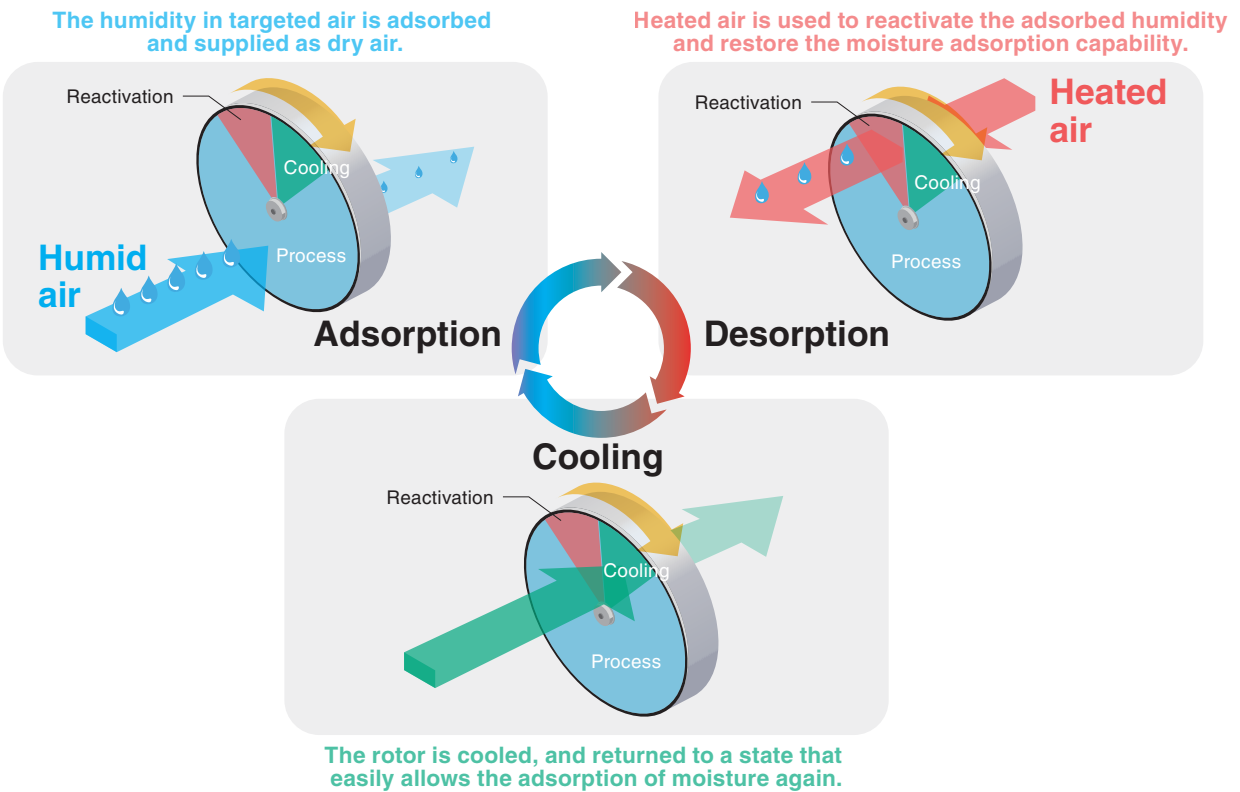
Structure

HONEYCLE desiccant is a product that consists of a honeycomb-structured substrate loaded with highly activated moisture adsorbent material, is an assembled rotor with fabricated sheet metal and hub structure for rotation shaft. It is incorporated into dehumidifiers and provides their dehumidification function.



Basic mechanism

HONEYCLE desiccant rotor is used in the devices with heat-resistant seals that are divided into either (A) a process zone and a reactivation zone, or (B) a process zone, a cooling zone, and a reactivation zone. Dehumidification (adsorption) and reactivation (desorption) are performed by rotation at the optimal speed as determined by the condition of the air, making it possible to supply a dry air continuously.



Features

01

Possible to process a larger airflow volume

Thanks to honeycomb structure, adsorbent has a low pressure loss (= air flow resistance) and can dehumidify a large airflow volumes with less power for airflow.

02

Possible to dehumidify a low temperature process air

In comparison with compressor dehumidification, HONEYCLE desiccant can consistently dehumidify the moisture under low temperature environments without loss of dehumidification performance.

03

Easy maintenance

The desiccant rotor unit is a simple structure and is easy to maintain it.

04

Long life

Every product in this lineup utilizes material with excellent water and heat resistance to ensure a long lifespan.

Product lineup

| | AC-SG/EX-SG | MS-D | DH |
|----------------------------------|---|---|---|
| Application | <ul style="list-style-type: none"> Relatively high-humidity air conditions in lithium-ion battery plants, office buildings, chemicals, food, and pharmaceutical plants. Suitable for semiconductor factory, Li-ion battery factory, and others for low dew point. | <ul style="list-style-type: none"> Suitable for plastic-molding process (hopper dryers). Drying for high temperature air. | <ul style="list-style-type: none"> Suitable for semiconductor factory, Li-ion battery factory, and others for low dew point. |
| Moisture adsorbent | Silica gel | Hydrophilic zeolite | Silica gel + hydrophilic zeolite |
| Features | <ul style="list-style-type: none"> High adsorption capacity, ideal for high humidity. Low-temperature reactivation is possible. Dehumidifying performance tends to decrease at higher temperatures. | <ul style="list-style-type: none"> Available consistent adsorption in high temperature, low humidity air. Low adsorption capacity, unsuitable for more humid air. Performance hardly degrades even under circulated air conditions. | <ul style="list-style-type: none"> Dehumidification at ultra-low dew points is achieved using rotors in series (silica gel for the first stage and zeolite for the second stage). |
| Maximum reactivation temperature | 140°C | 180°C | 180°C |

Application



LiB production



Pharmaceutical production



Data centers



Paint booth (automotive)



Food process

Plastics

Clean Rooms

Dry Rooms

Office building air conditioning

School and hospital air conditioning

Supermarket air conditioning

Dehumidification of swimming pools and ice skating rinks

Water damage by flooding
Drying crawlspaces and lofts

Dehumidifiers for event spaces and events

Rust prevention for bridge piers and wind power generation
Preventing rust on steel pylons

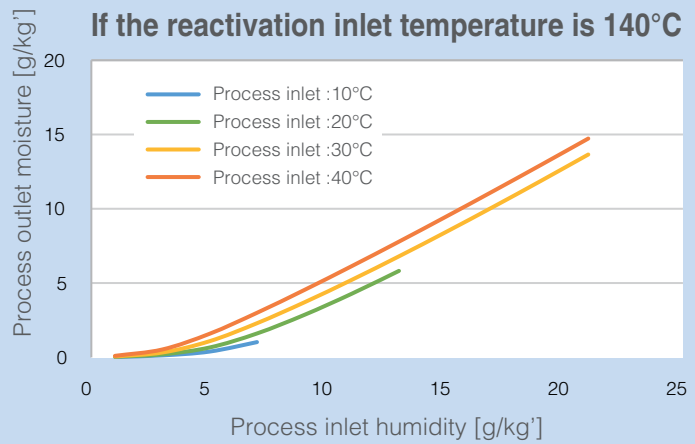
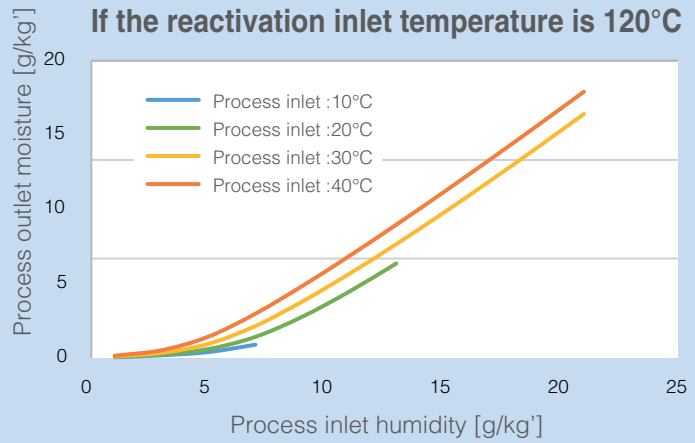
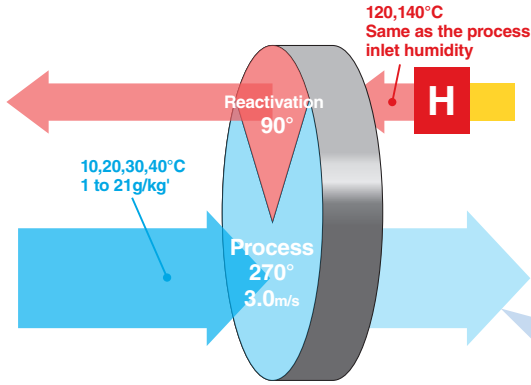
Examples of dehumidification performance using HONEYCLE™ desiccant industrial dehumidification rotor

*These are not a guaranteed value but is a typical values for reference.

Commercial and general industrial applications (office buildings, supermarkets, schools, manufacturing facilities, etc.)

EX-SG

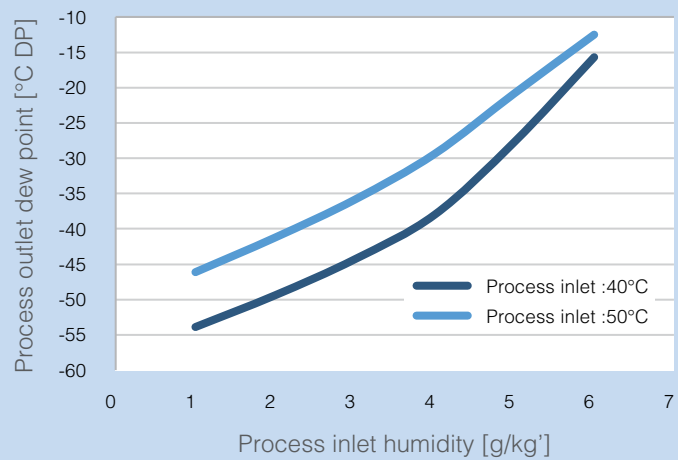
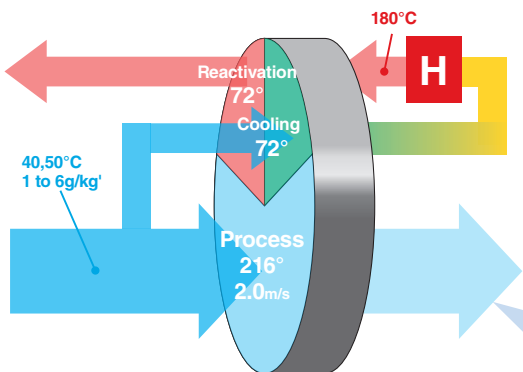
Thickness: 200 mm
Airflow ratio
(process : reactivation) = 3:1



Application when process inlet temperature is higher.

MS-D

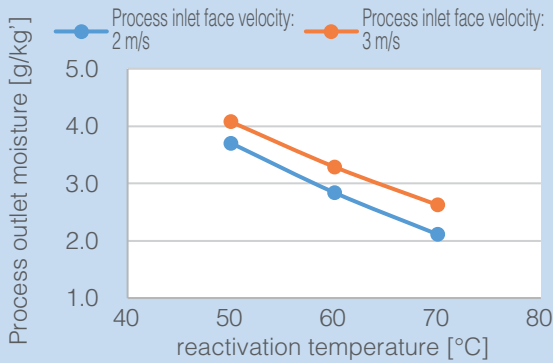
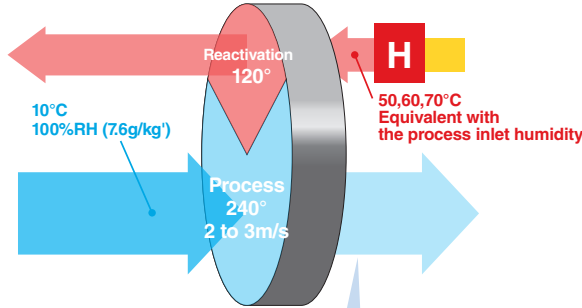
Depth: 400 mm
Airflow ratio
(process : reactivation) = 3:1



Applications involving low-temperature reactivation, such as those utilizing waste heat

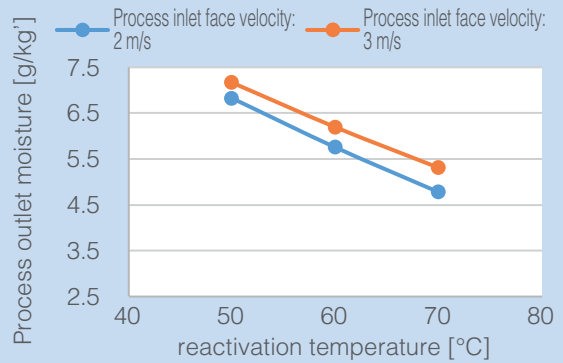
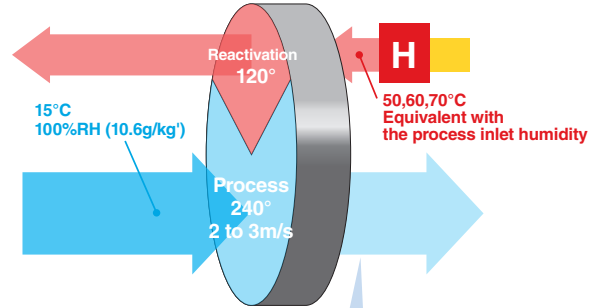
EX-SG

Depth: 200 mm
Airflow ratio
(process : reactivation) = 2:1



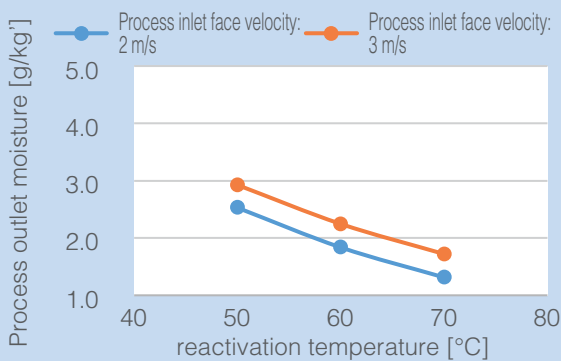
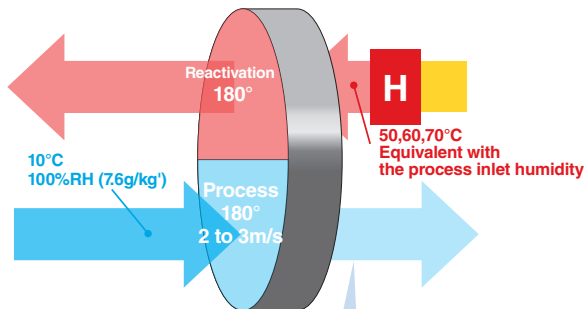
EX-SG

Depth: 200 mm
Airflow ratio
(process : reactivation) = 2:1



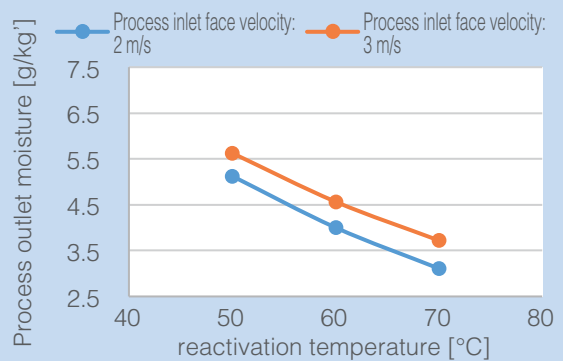
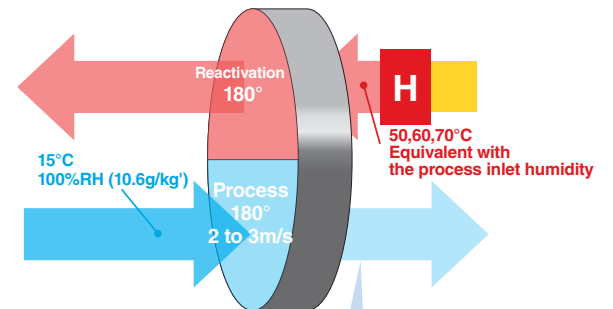
EX-SG

Depth: 200 mm
Airflow ratio
(process : reactivation) = 1:1

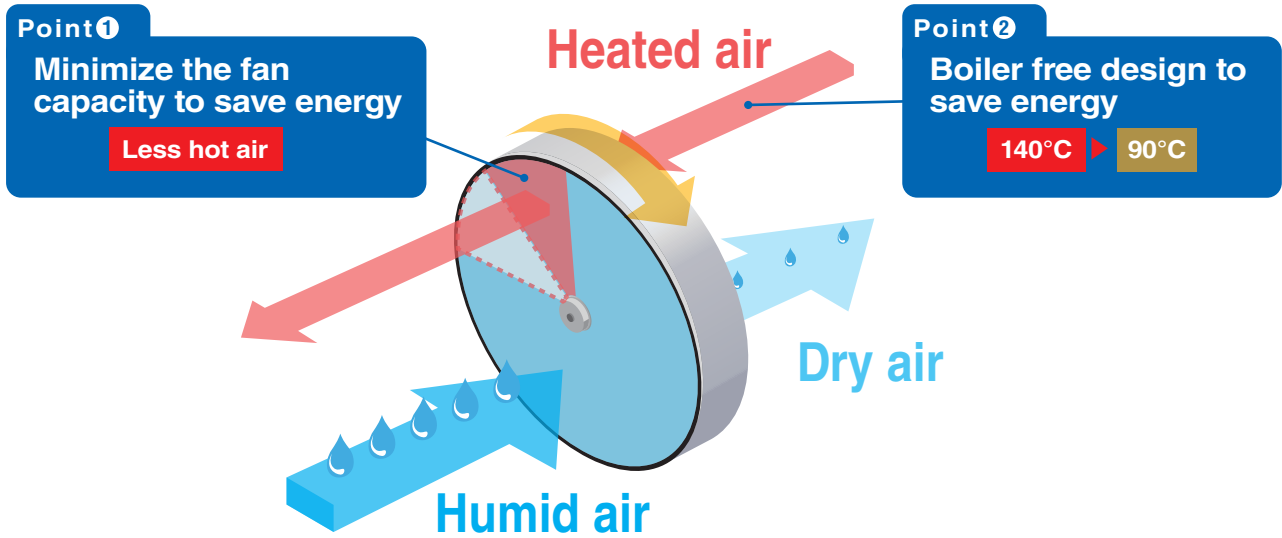


EX-SG

Depth: 200 mm
Airflow ratio
(process : reactivation) = 1:1



Low dew point application in LiB production process

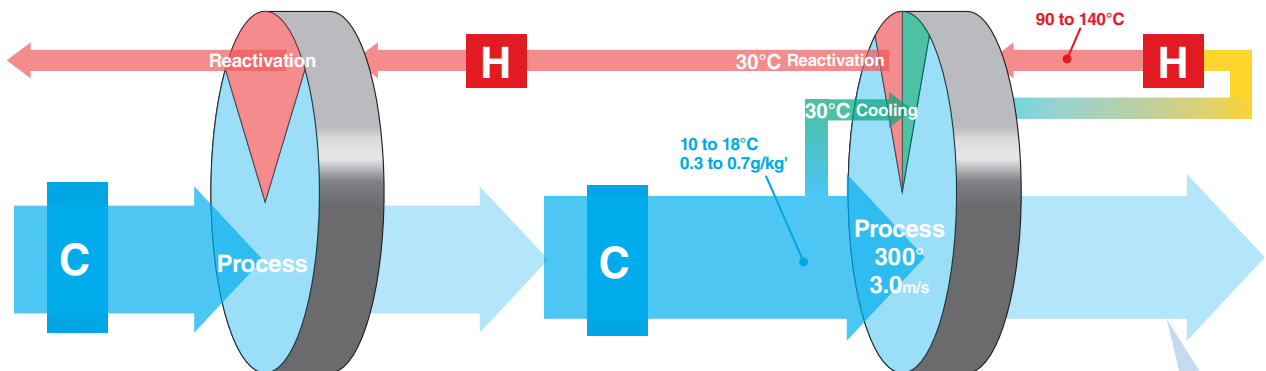


Stage 1 rotor

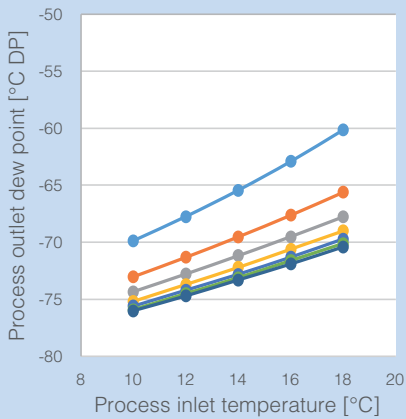
Stage 2 rotor

EX-SG

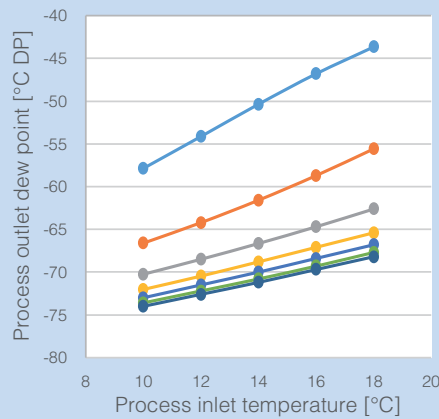
Depth: 400 mm
Airflow ratio
(process : reactivation) = 10:1



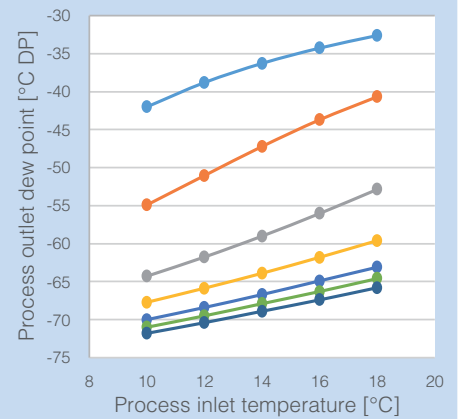
Process inlet moisture 0.3g/kg'



Process inlet moisture 0.5g/kg'



Process inlet moisture 0.7g/kg'



Typical Example — 80°C reactivation — 90°C reactivation — 100°C reactivation — 110°C reactivation — 120°C reactivation — 130°C reactivation — 140°C reactivation

Product type

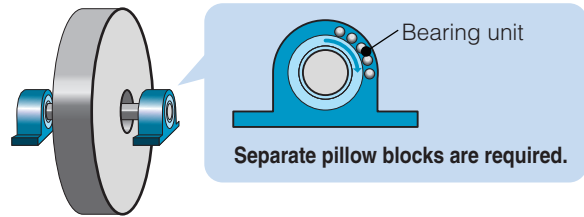
Product type notation

NR (1) - (2) - (3) - (4)

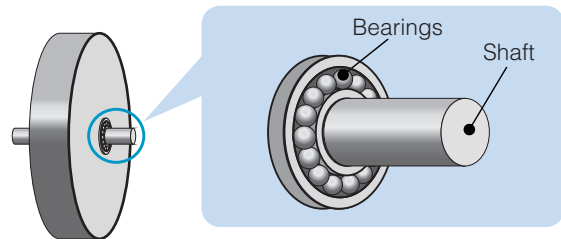
(1) Difference in rotor hub structure

- Type A: No bearing
- Type B: Internal bearing

Type A Rotor specifications without internal bearings

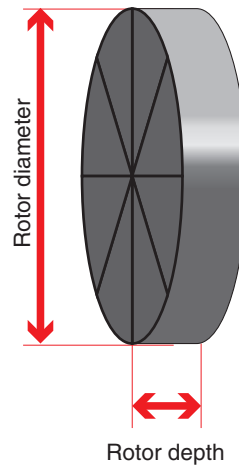


Type B Rotor specifications with internal bearings



(2) Rotor diameter [mm]

| | |
|------|------|
| 250 | 1525 |
| 370 | 1650 |
| 440 | 1740 |
| 550 | 1940 |
| 770 | 2190 |
| 965 | 2450 |
| 1050 | 2650 |
| 1220 | 2950 |
| 1370 | |



(3) Rotor depth [mm]

| |
|-----|
| 200 |
| 300 |
| 400 |

(4) Rotor type

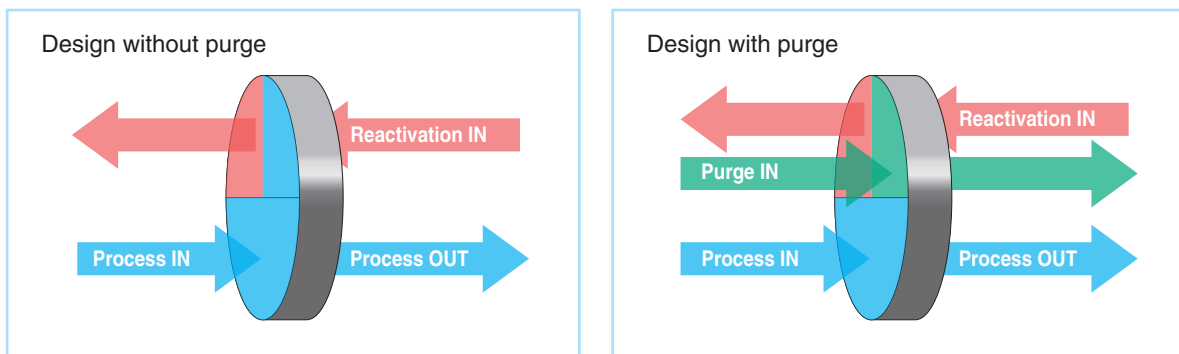
| |
|-------|
| AC-SG |
| EX-SG |
| MS-D |
| DH |

HONEYCLE desiccant rotor inquiry sheet

This inquiry sheet provides the necessary information to determine HONEYCLE desiccant specifications. Please show us the possible design condition. Design flow sheets are also available by design program. If you need it, please give us the following air conditions.

| | | | |
|------------------------------|--|-----------------|-------|
| Company name | | | |
| Department name | | Name of contact | |
| Telephone | () - | FAX | () - |
| Name of company for delivery | | | |
| Territory for delivery | (Examples: Kanagawa Prefecture, Japan; Shanghai, China) | | |
| Application | (Examples: air conditioning for lithium-ion battery manufacturing process; office building air conditioning) | | |

Required air conditions to design a dehumidification rotor



| | | |
|------------|--------------|---|
| Zone Angle | Process | ° |
| | Reactivation | ° |
| | Purge | ° |

| | | |
|------------|----------------|---|
| Process IN | Airflow volume | <input type="checkbox"/> CMH <input type="checkbox"/> CFM |
| | Temperature | <input type="checkbox"/> °C <input type="checkbox"/> °F |
| | Humidity | <input type="checkbox"/> g/kg' <input type="checkbox"/> %RH <input type="checkbox"/> dp°C |

| | | |
|-----------------|----------------|---|
| Reactivation IN | Airflow volume | <input type="checkbox"/> CMH <input type="checkbox"/> CFM |
| | Temperature | <input type="checkbox"/> °C <input type="checkbox"/> °F |
| | Humidity | <input type="checkbox"/> g/kg' <input type="checkbox"/> %RH <input type="checkbox"/> dp°C |

| | | |
|----------|----------------|---|
| Purge IN | Airflow volume | <input type="checkbox"/> CMH <input type="checkbox"/> CFM |
| | Temperature | <input type="checkbox"/> °C <input type="checkbox"/> °F |
| | Humidity | <input type="checkbox"/> g/kg' <input type="checkbox"/> %RH <input type="checkbox"/> dp°C |

| | | |
|-------------|----------|---|
| Process OUT | Humidity | <input type="checkbox"/> g/kg' <input type="checkbox"/> %RH <input type="checkbox"/> dp°C |
|-------------|----------|---|

Contribute to the earth's bright future through our **TATSU-TAMOTSU™** (Insulation and Protection) technologies.

The NICHIAS Group started in 1896 as a pioneer in the field of temperature control and thermal insulation. Over our 120-year history, we've expanded our activities from basic industries such as electric power, gas, oil refining and petrochemicals, chemicals, shipbuilding, steel, automobiles, and construction to electronics, environment-related industries, and other industrial fields.

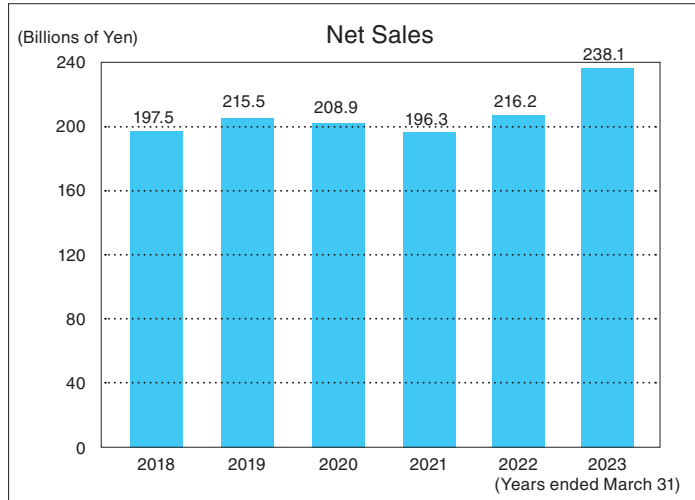
We shall continue to contribute to the earth's bright future through our TATSU-TAMOTSU (Insulation and Protection) technologies.



■ Outline (As of March 31, 2023)

| | |
|----------------|---|
| Corporate name | NICHIAS Corporation |
| Founded | April 9, 1896 |
| Head Office | 6-1, Hatchobori 1-Chome, Chuo-ku, Tokyo 104-8555, Japan |
| Capital | 12,128 million yen |
| Employees | 6,445 |

Consolidated Sales Performance



Group companies in Japan

■ Sales & Construction companies

- NICHIAS CERATECH CO., LTD.**
Manufacture and sale of insulation materials and building materials
- TOKYO MATERIALS CORPORATION**
Sale of fluoropolymer products
- NICHIAS KANTO SALES CORPORATION**
Sale of sealing materials, insulation materials and fluoropolymer products
- NISHI-NIPPON NICHIAS CO., LTD.**
Sale of sealing materials and fluoropolymer products
- HAMAASU CORPORATION**
Sale of sealing materials, insulation materials, fluoropolymer products and building materials, installation work of building materials
- NIPPON THERMAL ENGINEERING CORPORATION**
Engineering and construction of insulation materials
- NICHIAS ENGINEERING SERVICE CORPORATION**
Engineering and construction of insulation materials
- INOCRETE CO., LTD.**
Engineering and construction of insulation materials
- NICHIAS KYUSHU SALES CO.,LTD**
Sale of sealing materials, insulation materials and fluoropolymer products
- NIPPON ROCKWOOL CORPORATION**
Sale of building materials and agricultural products
- NICHIAS CEMCRETE CORPORATION**
Sale and construction of building materials

■ Factories

- NICHIAS CERATECH CO., LTD.**
Manufacture and sale of insulation materials and building materials
- SAKAI NICHIAS CORPORATION**
Manufacture of insulation materials
- KOKUBU INDUSTRY CORPORATION**
Manufacture of insulation materials and auto parts
- TATSUTA INDUSTRY CORPORATION**
Manufacture of insulation materials, Filters, auto parts, and building materials
- OHTA KASEI CORPORATION**
Manufacture of insulation materials
- NICHIAS MECHATECHNO CO., LTD.**
Manufacture of sealing materials and fluoropolymer products
- NISHI-NIPPON NICHIAS CO.,LTD.**
Sale of sealing materials and fluoropolymer products
- FUKUSHIMA NICHIAS CORPORATION**
Manufacture of fluoropolymer products and insulation materials
- KUMAMOTO NICHIAS CORPORATION**
Manufacture of fluoropolymer products
- METAKOTE INDUSTRY CORPORATION**
Manufacture of auto parts
- APJ Corporation**
Manufacture of auto parts
- N&A TECH CO.,LTD.**
Manufacture of auto parts

Global Network

■ Sales & Construction companies

- Indonesia**
PT. NICHIAS SUNIJAYA
Sales of sealing materials, insulation materials, fluoropolymer products, auto parts, building materials, and Engineering and insulation work
- Malaysia**
NICHIAS SOUTHEAST ASIA SDN. BHD.
Sales of insulation materials, and Engineering and insulation work
- Singapore**
NICHIAS SINGAPORE PTE. LTD.
Sales of sealing materials, insulation materials, Filters, fluoropolymer products, auto parts, and building materials
- Vietnam**
NICHIAS VIETNAM CO., LTD.
Sales of sealing materials, insulation materials, fluoropolymer products, and auto parts
- Thailand**
NICHIAS (THAILAND) CO., LTD.
Manufacture and Sales of auto parts
THAI NICHIAS INTERNATIONAL CO., LTD.
Sales of sealing materials, insulation materials, and fluoropolymer products
- China**
NICHIAS (SHANGHAI) TRADING CO., LTD.
(霧佳斯(上海)貿易有限公司)
Sales of sealing materials, insulation materials, filters, fluoropolymer products, and building materials
NICHIAS (SHANGHAI) TRADING CO., LTD. GUANGZHOU BRANCH
(霧佳斯(上海)貿易有限公司 廣州分公司)
Sales of sealing materials, insulation materials, filters, fluoropolymer products, and building materials
NICHIAS (SHANGHAI) AUTOPARTS TRADING CO.,LTD.
(霧佳斯(上海)汽車零件貿易有限公司)
Sales of auto parts
SHANGHAI XINGSHENG GASKET CO., LTD.
(上海興盛密封墊有限公司)
Manufacture and Sales of auto parts
SUZHOU SHUANGYOU AUTOPARTS CO., LTD.
(蘇州雙友汽車零件有限公司)
Manufacture and Sales of auto parts
- India**
NICHIAS INDUSTRIAL PRODUCTS PRIVATE LTD.
Manufacture and Sales of auto parts
- Czech**
NICHIAS AUTOPARTS EUROPE a.s.
Manufacture and Sales of auto parts
- Mexico**
NAX MFG, S. A. DE C. V.
Manufacture and Sales of auto parts

■ Factories

- Indonesia**
PT. NICHIAS ROCKWOOL INDONESIA
Manufacture of sealing materials, insulation materials, and auto parts
PT. NICHIAS METALWORKS INDONESIA
Manufacture of sealing materials and building materials
- Malaysia**
NICHIAS FGS SDN. BHD.
Manufacture and Sales of sealing materials, fluoropolymer products, auto parts, building materials, and Sales of insulation materials
NT RUBBER-SEALS SDN. BHD.
Manufacture of sealing materials
- Vietnam**
NICHIAS HAIPHONG CO., LTD.
Manufacture and Sales of sealing materials, filters, and fluoropolymer products
- Thailand**
NICHIAS (THAILAND) CO., LTD.
Manufacture and Sales of auto parts
THAI-NICHIAS ENGINEERING CO., LTD.
Sales of insulation materials, and Engineering and insulation work
- China**
SUZHOU NICHIAS INDUSTRIAL PRODUCTS CO., LTD.
(蘇州霧佳斯工業製品有限公司)
Manufacture of fluoropolymer products and auto parts
SUZHOU NICHIAS SEAL MATERIAL CO., LTD.
(蘇州霧佳斯密封材料有限公司)
Manufacture of sealing materials, insulation materials, and filters
SHANGHAI XINGSHENG GASKET CO., LTD.
(上海興盛密封墊有限公司)
Manufacture and Sales of auto parts
SUZHOU SHUANGYOU AUTOPARTS CO., LTD.
(蘇州雙友汽車零件有限公司)
Manufacture and Sales of auto parts
- India**
NICHIAS INDUSTRIAL PRODUCTS PRIVATE LTD.
Manufacture and Sales of auto parts
- Czech**
NICHIAS AUTOPARTS EUROPE a.s.
Manufacture and Sales of auto parts
- Mexico**
NAX MFG, S. A. DE C. V.
Manufacture and Sales of auto parts





Head Office

6-1, Hatchobori 1-chome, Chuo-ku, Tokyo 104-8555, Japan
International Marketing and Sales Group
 Phone: 81-3-4413-1132 Fax: 81-3-3552-6108
 Web Site: <https://www.nichias.co.jp/>

Overseas Sales Companies

Indonesia

PT. NICHIAS SUNIJAYA

Sequis Tower Level 19 Suite 1&2,
 Jl. Jend Sudirman Kav. 71, Jakarta 12190, Indonesia
 Phone: +62-21- 2277-6101 Fax: +62-21- 2793-8033

Malaysia

NICHIAS SOUTHEAST ASIA SDN. BHD.

Suite A1102, 11th Floor, West Wing, Wisma Consplant 2,
 No. 7, Jalan SS 16/1, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia.
 Phone: +60-3-5636-4067 Fax: +60-3-5636-4078

Singapore

NICHIAS SINGAPORE PTE. LTD.

25 International Business Park, #01-15/17 German Centre,
 Singapore 609916
 Phone: +65-6571-0830/0838 Fax: +65-6265-7681

Vietnam

NICHIAS VIETNAM CO., LTD.

Room 709, Elite Business Center, 7th Floor Diamond Flower Building,
 48 Le Van Luong Street, Nhan Chinh Ward, Thanh Xuan District,
 Hanoi, Vietnam
 Phone: + 84-24-6664-3136 Fax: + 84-24-6666-8168

Thailand

NICHIAS (THAILAND) CO., LTD.

85 Moo 1, Wellgrow Industrial Estate T. Homsin, A. Bangpakong
 Chachoengsao 24180, Thailand
 Phone: +66-38-570-600 Fax: +66-38-570-601

THAI NICHIAS INTERNATIONAL CO., LTD.

Unit 1107, 11th Floor, AIA Capital Center
 89 Ratchadaphisek Road, Dindaeng, Dindaeng, Bangkok 10400 Thailand
 Phone: +66-2-001-2060 Fax: +66-2-001-2062

China

NICHIAS (SHANGHAI) TRADING CO., LTD.

霓佳斯（上海）贸易有限公司
 Room 1701, THE PLACE, Tower A, No. 100 Zun Yi Road,
 Changning District, Shanghai, P.R.China Postcode 200051
 中国上海市长宁区遵义路100号虹桥南丰城A栋1701室 邮编200051
 Phone: +86-21-6236-1783 Fax: +86-21-6236-1781

NICHIAS (SHANGHAI) TRADING CO., LTD. Guangzhou Branch

霓佳斯（上海）贸易有限公司 广州分公司
 17F-G, Gold Sun Building, No.109 Tiyu West Road, Guangzhou,
 Guang Dong Province, 510620, P.R.China
 中国广东省广州市天河区体育西路109号高盛大厦17楼G室 邮编 510620
 Phone: +86-20-3879-1640 Fax: +86-20-3879-1647

NICHIAS (SHANGHAI) AUTOPARTS TRADING CO., LTD.

霓佳斯（上海）汽车零部件贸易有限公司
 Room 1702, THE PLACE, Tower A, No. 100 Zun Yi Road,
 Changning District, Shanghai, P.R.China Postcode 200051
 中国上海市长宁区遵义路100号虹桥南丰城A栋1702室 邮编200051
 Phone: +86-21-6236-2668 Fax: +86-21-6236-2667

Overseas Construction Companies

Malaysia

NICHIAS SOUTHEAST ASIA SDN. BHD.

Suite A1102, 11th Floor, West Wing, Wisma Consplant 2,
 No. 7, Jalan SS 16/1, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia.
 Phone: +60-3-5636-4067 Fax: +60-3-5636-4078

Thailand

THAI-NICHIAS ENGINEERING CO., LTD.

45 Huaypong-Nongbon Road, Huaypong, Muang Rayong,
 Rayong Province 21150, Thailand
 Phone: +66-38-682-242 Fax: +66-38-691-156

Overseas Factories

Indonesia

PT. NICHIAS ROCKWOOL INDONESIA

PT. NICHIAS METALWORKS INDONESIA

Malaysia

NICHIAS FGS SDN. BHD.

NT RUBBER-SEALS SDN. BHD.

Vietnam

NICHIAS HAIPHONG CO., LTD.

China

SUZHOU NICHIAS INDUSTRIAL PRODUCTS CO., LTD.

(苏州霓佳斯工业制品有限公司)

SUZHOU NICHIAS SEAL MATERIAL CO., LTD.

(苏州霓佳斯密封材料有限公司)

SHANGHAI XINGSHENG GASKET CO., LTD.

(上海兴盛密封垫有限公司)

SUZHOU SHUANGYOU AUTOPARTS CO., LTD.

(苏州双友汽车零部件有限公司)

India

NICHIAS INDUSTRIAL PRODUCTS PRIVATE LTD.

Czech

NICHIAS AUTOPARTS EUROPE a.s.

Mexico

NAX MFG, S.A.DE C.V.

⚠ Cautions

- The products included in this catalog are intended for common use, including those presented in the catalog. If you intend to use any of the products in a way that requires extremely high quality and reliability such that any possible defect may directly affect the safety of human lives, please make sure to consult with our company in advance and take necessary measures at your responsibility.
- Because the stated material values may vary according to actual usage environments or circumstances, please consider such figures as indications for reference.
- The content of the catalog explains the features of the products when they are used alone. When actually using the products, please start using them after testing them under the actual usage environment.
- The content of the explanation of the products may be modified without any advance notice, and the production of the product may also be discontinued without advance notice. Please obtain the latest version of the catalog, and confirm the content thereof. The date of issuance of this catalog is printed on this page.
- The standards, accreditation and provisions of laws included in the catalog may not conform with the latest version thereof.
- We strictly prohibit any acts of infringement upon our rights that are protected by the Copyright Act with regard to information included in the catalog, through the production of copies or imitations, misappropriation or unauthorized reprinting.
- Please be informed that, in the case where any problem involving a third party's industrial property right arises due to the use of any product included in the catalog, our company shall not be responsible for any problems other than the problems arising strictly due to reasons related to only such products.
- Please be aware that our company will not bear any responsibility for the following damage related to our products:
 - Damage arising due to natural disasters or accidents occurring for reasons that are not attributable to our company;
 - Damage arising due to remodeling, repairing or other acts by a third party;
 - Damage arising due to the willful intent or negligence of the customer or the user, or due to the improper use or use under abnormal conditions of the products;
 - Damage arising due to the failure to carry out regular checkups and appropriate repairs, maintenance and part replacements, considering various conditions, such as the usage conditions, usage environment and usage period, etc., of the product;
 - Indirect damage (including any operational damage, lost profits, opportunity losses, etc.) arising due to the use of or inability to use our company's product;
 - Damage arising due to a situation which was unforeseeable under the technical standards at the time of the shipment of our company's product; or
 - Damage arising due to reasons that are not attributable to our company.