



# DEHUMIDIFIER SIZING AND SELECTION GUIDE

Condair DA  
Desiccant dryer

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# 1 Introduction to Desiccant Drying

Dehumidification is a commonly required process that has many applications in a wide range of industries. The two most common dehumidification technologies are dehumidification through condensation (condensing dehumidifiers) and drying through sorption using a desiccant (desiccant dryers). Each technology has advantages depending on the application and target conditions to be achieved.

Desiccant dryers are best suited for applications requiring tight humidity control ( $\pm 2\%$  RH) and dehumidification tasks where a relative humidity below 40%RH needs to be maintained at low to very low temperatures.

Condensing dehumidifiers are of limited use for such tasks and are typically used in applications where the relative humidity level must remain between 45-60%RH at a room temperature of 50°F to 95°F and the humidity control requirement is in the range of  $\pm 10\%$ RH.

The graphs below illustrate the areas of optimal performance for each type of dehumidifier. For applications in the intermediate area either type of dehumidifier may be suitable.

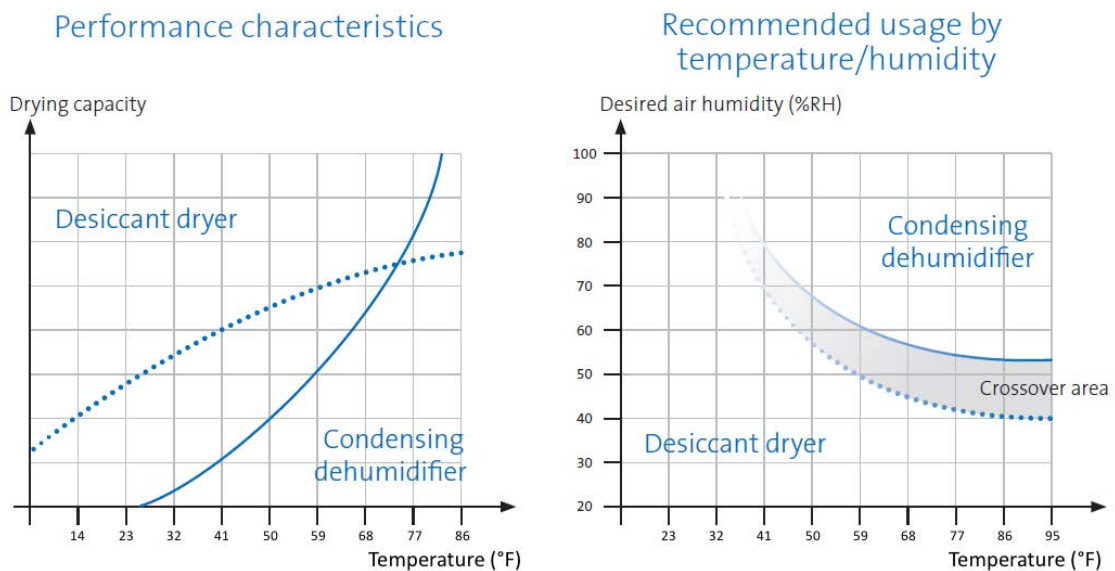


Fig. 1: Areas of performance of condensing dehumidifiers and desiccant dryers

Desiccant dryers are typically used in industries and applications with needs for environments maintained below 40% RH, or when dehumidification is required at cool temperatures. Common industries and applications include:

- Food industry: storage of goods, protection of raw and production materials, dehumidified conveyor belts
  - Pharmaceutical industry: protection and preservation of raw materials and active substances, hygienic production, prevention of corrosion damage to installations
  - Electronics industry: dry storage, prevention of condensation, and corrosion on electronic components
  - Breweries: hygienic production, packaging, and storage, prevention of corrosion damage to installations
  - Power Plants: controlled humidity for the operation of parts and components, prevention of corrosion and rust on turbines and other plant equipment
  - Storage: Military equipment storage, metal storage, marine storage, corrosion control
  - Cold Storage: prevention of excessive humidity when storing meat, dairy products, pasta, frozen foods
- ... and many more.

For more information on selecting dehumidifiers, planning applications, and understanding dehumidification performance, please refer to the Condaire Dehumidification Planning Guide [21-552-dehumidification-planning-guide.pdf \(condair.com\)](#).

The sizing and selection process of a dehumidification system requires:

- Defining the application/dehumidification task
- Defining the basic site conditions
- Defining the target conditions: temperature, humidity, and control accuracy levels
- Identifying moisture sources (external and internal) and calculating the moisture loads
- Selecting and sizing the dehumidification system components.

Table 1: Dehumidifier characteristics

North America		DA 300N	DA 400N	DA 600N	DA 800N	DA 1400N	DA 2000N	DA 2400N
Process Air Volume (CFM)	Minimum	118	206	294	294	588	588	824
	Nominal	290	406	580	812	1392	1972	2320
	Maximum	471	471	647	941	1589	2236	2471
Regeneration Air Volume (CFM)	Minimum	59	59	147	206	235	235	441
	Nominal	88	129	206	235	294	324	500
	Maximum	118	147	265	265	353	382	500
Reference Drying Capacity @ 20°C (68°F) / 60 %RH (lbs/hr)		7.3	11.2	15.6	22	29.7	31.9	44.1
Voltage Supply (V/Ph/Hz)		208/3/50-60 OR 480/3/50-60	208/3/50-60 OR 480/3/50-60	208/3/50-60 OR 480/3/50-60	208/3/50-60 OR 480/3/50-60	208/3/50-60 OR 480/3/50-60	208/3/50-60 OR 480/3/50-60	480/3/50-60

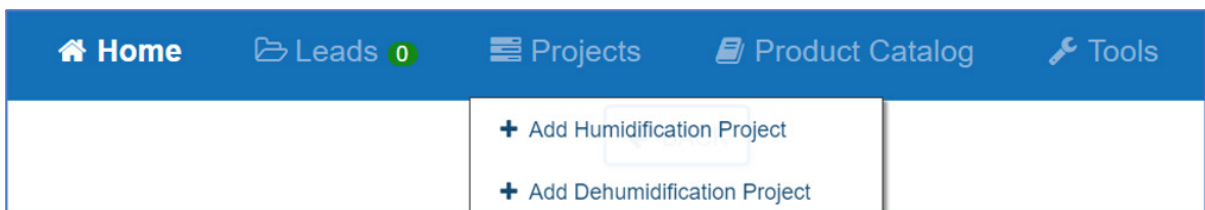
## 2 DA series Help Software Selection Guide

The following guide provides the sequence for selecting the appropriate dehumidification system for a given application for which site location details, design data, and room conditions are known. The tool will not return an appropriate selection if any of this information is incorrect. It is recommended to validate the dehumidifier selection or to seek guidance for complex applications and for cases where design factors such as air quality and chemical contamination may hinder the performance of the dehumidifier. To do so, contact the applications team at [na.applications@condair.com](mailto:na.applications@condair.com).

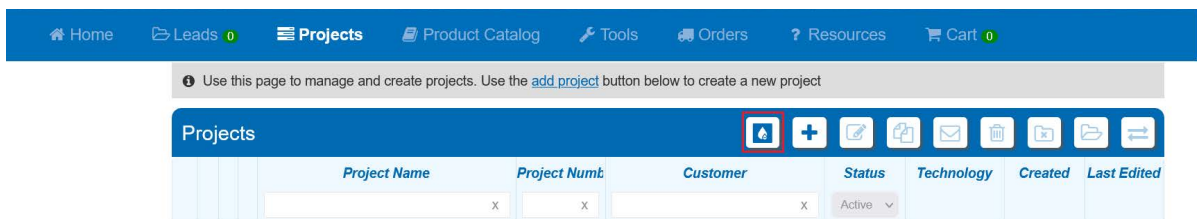
### STEP A: Create a new project

To create a new dehumidification project, either:

- Hover with the mouse over the **Projects tab** and click on **Add Dehumidification Project**.



- Click to open the **Projects tab**, then click on the dehumidification icon.



The dehumidification project layout has 4 tabs identified below:

- Configuration
- Zones
- Documents
- Summary

## – Configuration tab

Input the project general information such as:

- Project Name
- Units of Measure: Imperial or Metric
- Weather Data: Enter weather data based on the regions ASHRAE weather condition.

**Note:** In a future HELP update we will have a Use Weather Data box which will automatically use the regions dehumidification weather data for the project.

The screenshot shows the Configuration tab with the following fields and options:

- Project Name:** Test 01
- Project Number:** (empty)
- Units of Measure:** Imperial
- Currency:** United States Dollar
- Business Segment:** Food & Beverage: Manufacturing, P
- Business Subsegment:** Cold Storage (Food)
- Collaboration:** Private: Just for me (selected)
- Scope:** (empty text area)
- Notes:** (empty text area)
- Use Weather Data:**
- Country:** United States
- State/Province:** Texas
- City:** Dallas-Fort Worth Intl Ap
- Design Tolerance (%):** 99.60
- Altitude:** 597 ft
- Average Annual Temperature:** 26 °F
- Average Annual Relative Humidity:** 42 %

Buttons: Cancel, Save

## – Zones tab

- Add a new dehumidification zone by clicking on **Process Dehumidification**. A new zone is created which is where the dehumidifier will be designed.
- To add additional zones, click again on **Process Dehumidification** and a subsequent zone will be created.

The screenshot shows the Zones tab for 'Test 01' with the following elements:

- Select Application:** Process Dehumidification (highlighted with a red box), MC Humidification
- Zone Name:** (empty)
- Instruction:** Select Application above.

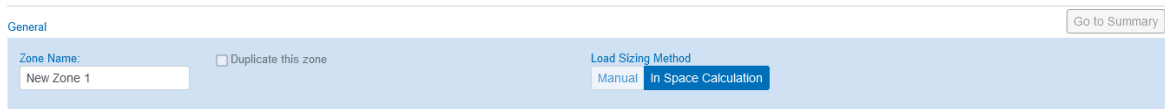
## STEP B: Select a dehumidifier

Enter the required information in the new zone for an initial dehumidifier selection. The dehumidifier design process is typically iterative (see **STEP 3**).

### 1. General

Select load sizing method:

- **Manual:** the tool will prompt the user to enter air volume, dehumidification load, and starting conditions  
**Note:** Only the **In Space Calculation** method is available currently.
- **In Space Calculation:** the tool will calculate the air volume to process, and dehumidification load based on the airflow details and starting conditions.



### 2. Ventilation/Infiltration

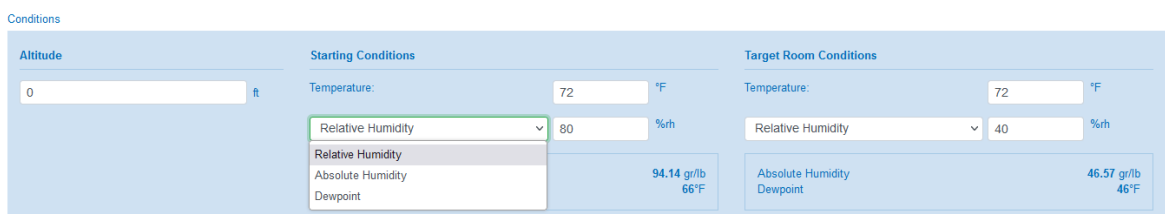
If **In Space Calculation** is selected, proceed with entering the airflow details. Select airflow type and volume:

- **Ventilation:** fresh air mechanical ventilation
- **Infiltration:** unwanted ventilation/air infiltration through leaks, holes, and door openings.



### 3. Conditions

- **Starting Conditions:** Enter the current room temperature AND relative humidity, dewpoint, or absolute humidity. These conditions are the conditions that would exist if dehumidification was not present.
- **Target Room Conditions:** room design temperature AND relative humidity, dewpoint, or absolute humidity. These conditions are the conditions that are desired.



## 4. Other Moisture Loads

Occupants in the building, water features, and processes can contribute moisture to the air which must be removed by the dehumidifier. The loads are specified in the **Other Moisture Loads** section.

### i. Staff

- Low Activity: the space occupants are doing light work: seated, standing, office activities
- Medium Activity: the space occupants are doing moderate work: walking, light machine work
- High Activity: the space occupants are doing heavy work: heavy machine work, handling packages, physical activities

### ii. Open Water Surface

Cleaning work will introduce water in the production facilities. There may also be open tanks from which water will evaporate into the air. A still open water surface rate of evaporation will increase when the open water surface temperature increases (i.e. an increase of the surface vapor pressure). The air is at ambient temperature.

### iii. Custom Moisture Sources

The user can click *Add Another* to itemize various moisture sources: for example moisture loads from products or exhaust from machines that are calculated separately, and the values are entered directly in the tool.

Other Moisture Loads

<input type="checkbox"/> Staff	<input type="checkbox"/> Open Water Surface	Custom Moisture Sources	
Occupants: 0 Activity Level: High Load / Person: 0.408 lbs/h	Length: 0 ft Width: 0 ft Area: 0 sq.ft	Source name: [ ] 0 lbs/h	<input type="button" value="Add Another"/>
Moisture Addition: 0 lbs/h	Moisture Addition: 0 lbs/h	Moisture Addition: 0 lbs/h	Moisture Addition: 0 lbs/h

## 5. Dehumidifier Initial Selection

After the space conditions and moisture loads have been entered, the system will provide an **initial DA model recommendation**. The initial selection is based on the total air volume to dehumidify/process. Click on the **DA (...)** button for an initial model selection

### Space Load Calculation

This is an initial estimate. Select a model, complete the System Design section, and click the Calculate button to calculate the final load for this project.

Air Volume 1,000 CFM	Dehumidification Load 40.25 lbs/h
-------------------------	--------------------------------------

### Model Selection

DA (North America)

**Note:** The system will not provide any recommendation if there is an invalid entry for air volume and the system will display the notification below:

Unable to find a recommended unit - try adjusting air volume.

### Model selection details

This section displays the HELP recommended model details based on the air volume to dehumidify.

However, the user can select another model from a dropdown of suitable models: only dehumidifiers that can accommodate the specified process air volume will be displayed in the dropdown. The supply voltage can also be adjusted based on availability.

A link to the product datasheet is available for consultation/download.

Model Selection

	Country	Model	Supply Voltage
	United States	DA 2400 Desiccant Dehumidifier, 48C	480/3/60
	Model DA 2400 Desiccant Dehumidifier, 480/3/60		
Part Number	List Price	Nominal Airflow	Nominal Capacity
DA_N_EL_2400_480	\$33,988.00	824.01 2472.03 CFM	44.09 lbs/h (20C / 60%)
<a href="#">Datasheet</a>			

## STEP C: Design the dehumidifier system

In this step, the dehumidifier is designed to meet the targeted room temperature and the dehumidifying load (moisture load to remove).

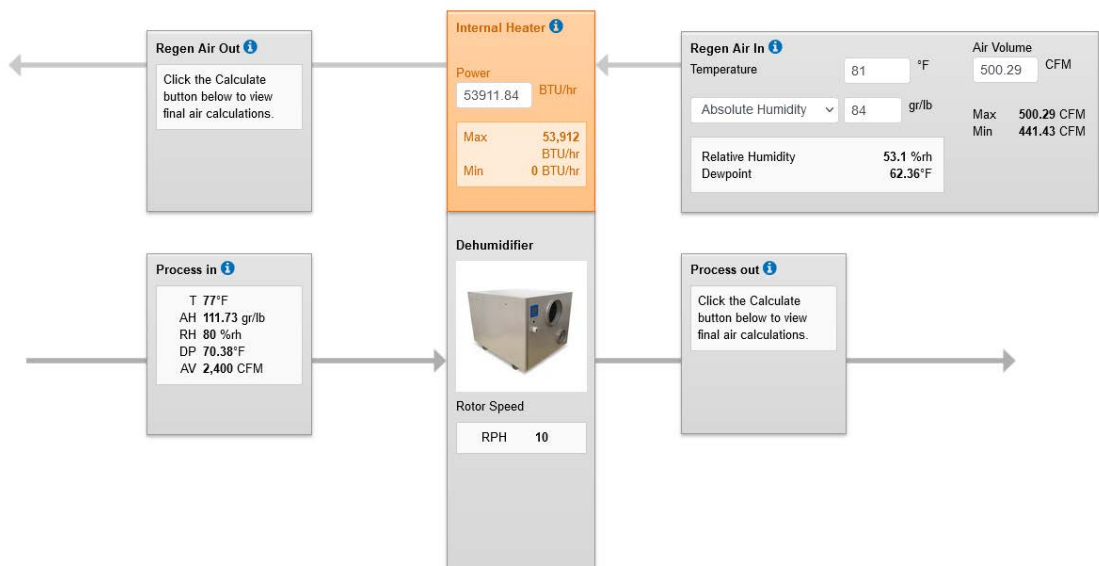
### 1. Dehumidifier design

The dehumidifier diagram allows the user to modify the following variables or keep the default values:

- The **Regen Air In** (regeneration air entering the heater) conditions: Temperature, Humidity, and Air Volume. Help displays predefined default conditions, but these conditions must be adjusted to reflect the available conditions. The air volume must remain within the regeneration air volume range for the selected humidifier. Reducing the air volume will serve to reduce the amount of heat that the PTC heaters can introduce into the air stream, limiting the regeneration capability of the rotor, and thus limiting the capacity of the dehumidifier.
- The **Internal Heater Power** (can be lowered only) cannot exceed the maximum heater power for the selected dehumidifier. Depending on the stages available reducing **the Internal Heater Power** will lower the regeneration capability of the rotor and thus the drying capacity of the dehumidifier. Lowering the internal heater power is recommended to be done during the installation and/or commissioning of the unit.

Note: The process air conditions are pre-set and fixed based on target conditions entered in [Step B](#) above.

- Click on the Calculate button to determine the system final air outputs: the Regeneration Air Out and Process Out (dry/target room air) conditions.



## 2. Understanding Calculations Results

Dehumidification calculations are often iterative. The results of the air calculations obtained with the initial selection of the dehumidifier can lead to different scenarios. In some instances, pre-cooling and/or post-cooling coils are required to achieve the desired moisture removal or target discharge temperature. When cooling coils are required, they will automatically appear on the screen. Cooling coils can be supplied by checking the box: **Supplied by Condair** (see [Fig. 2](#)), or they may be supplied by others. There are 4 possible scenarios detailed on the following pages and in the diagram at [Fig. 3](#).

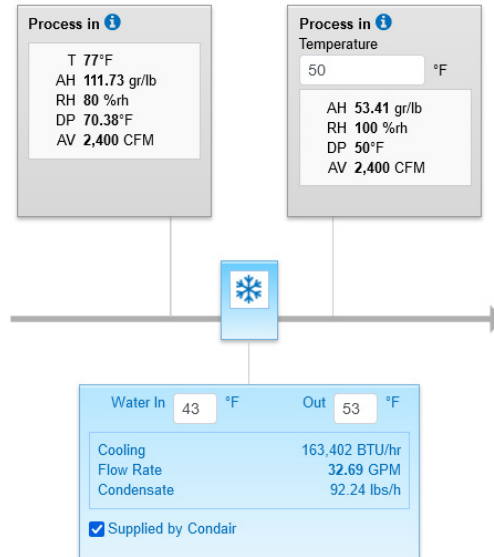


Fig. 2: Condair supplied cooling coils

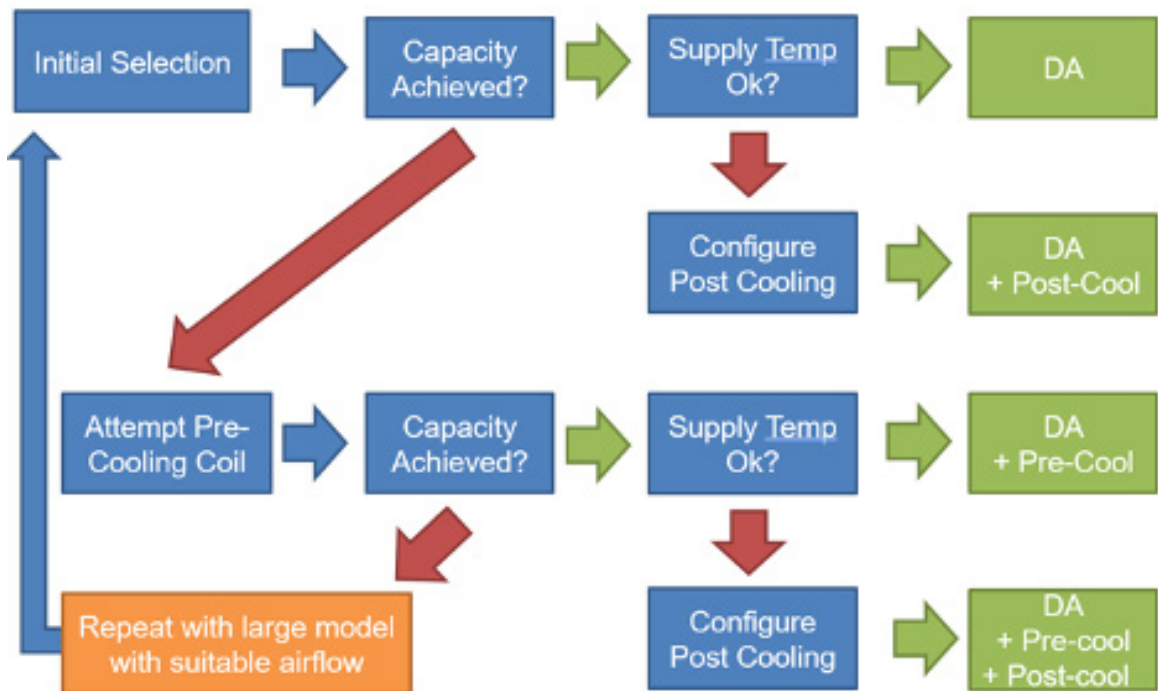


Fig. 3: Selection Diagram

## Scenario 1: No Cooling Coils Required

The selected dehumidifier capacity is **GREATER** than the dehumidification load

**AND**

The **Process Out** temperature **MATCHES/IS LOWER THAN** the **Target Room** temperature.

Conditions

Altitude	Starting Conditions	Target Room Conditions
0 ft	Temperature: 77 °F Relative Humidity: 83 %rh Absolute Humidity Dewpoint: 116.03 gr/lb / 71°F	Temperature: 115 °F Relative Humidity: 22 %rh Absolute Humidity Dewpoint: 98.15 gr/lb / 67°F


### Space Load Calculation

This is an initial estimate. Select a model, complete the System Design section, and click the Calculate button to calculate the final load for this project.

**Air Volume**  
2,400 CFM

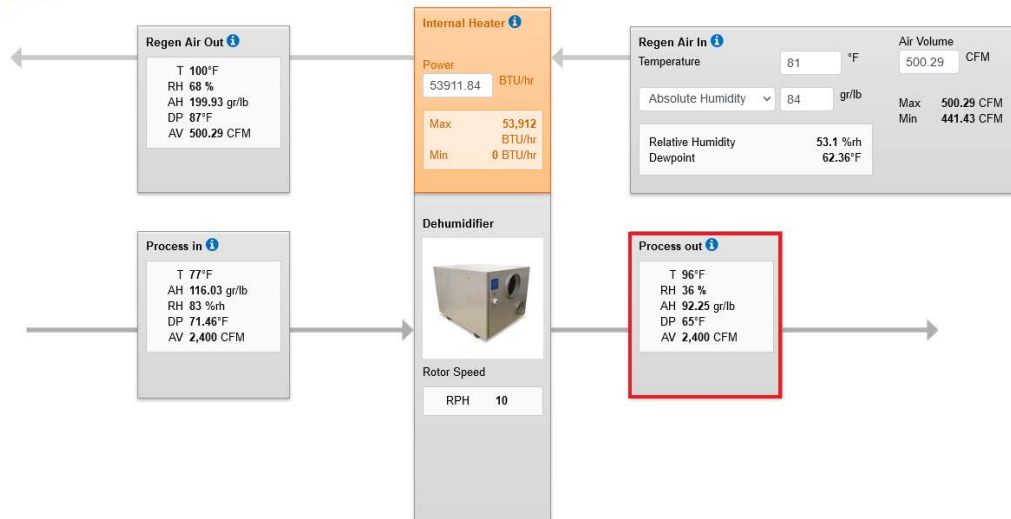
**Dehumidification Load**  
26.48 lbs/h

Model Selection

	Country: United States	Model: DA 2400 Desiccant Dehumidifier, 480/3/60	Supply Voltage: 480/3/60
Model: DA 2400 Desiccant Dehumidifier, 480/3/60		Part Number: DA_N_EL_2400_480	List Price: \$33,988.00
		Nominal Airflow: 824.01-2472.03 CFM	Nominal Capacity: 44.09 lbs/h (20C / 60%)

[Datasheet](#)

### Dehumidifier Design



Calculate

### Calculation Results

Sensible Heat Load  
Latent Heat Load  
Total Heat Load

47,335 BTU/hr  
-36,970.4 BTU/hr  
10,364.6 BTU/hr

**Air Volume**  
2,400 CFM

**Max System Capacity**  
36 lbs/h

➔ The selected dehumidifier doesn't require any adjustment and the user can proceed with generating a quote or adding another dehumidification zone.

## Scenario 2: Pre-Cooling Coil Required

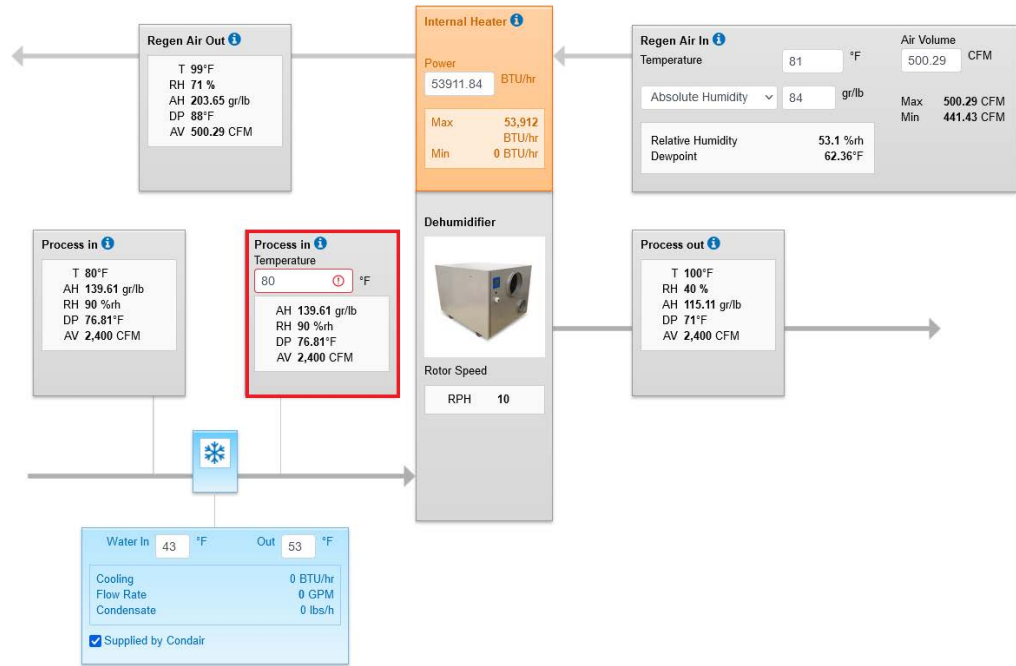
Conditions

Altitude	Starting Conditions	Target Room Conditions
0 ft	Temperature: 80 °F Relative Humidity: 90 %rh Absolute Humidity: 139.61 gr/lb Dewpoint: 77°F	Temperature: 90 °F Relative Humidity: 45 %rh Absolute Humidity: 95.2 gr/lb Dewpoint: 66°F

### Space Load Calculation

This is an initial estimate. Select a model, complete the System Design section, and click the Calculate button to calculate the final load for this project.

Air Volume 2,400 CFM	Dehumidification Load 65.05 lbs/h
-------------------------	--------------------------------------

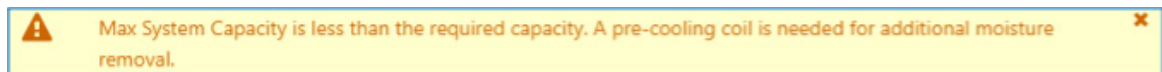


Calculate

### Calculation Results

Sensible Heat Load Latent Heat Load Total Heat Load Pre-Cooling	49,289.3 BTU/hr -37,626.3 BTU/hr 11,663 BTU/hr 0 BTU/hr	Air Volume 2,400 CFM	Max System Capacity 37 lbs/h
--	--	-------------------------	---------------------------------

The user receives the following warning:



➔ The selected dehumidifier requires adjustments:

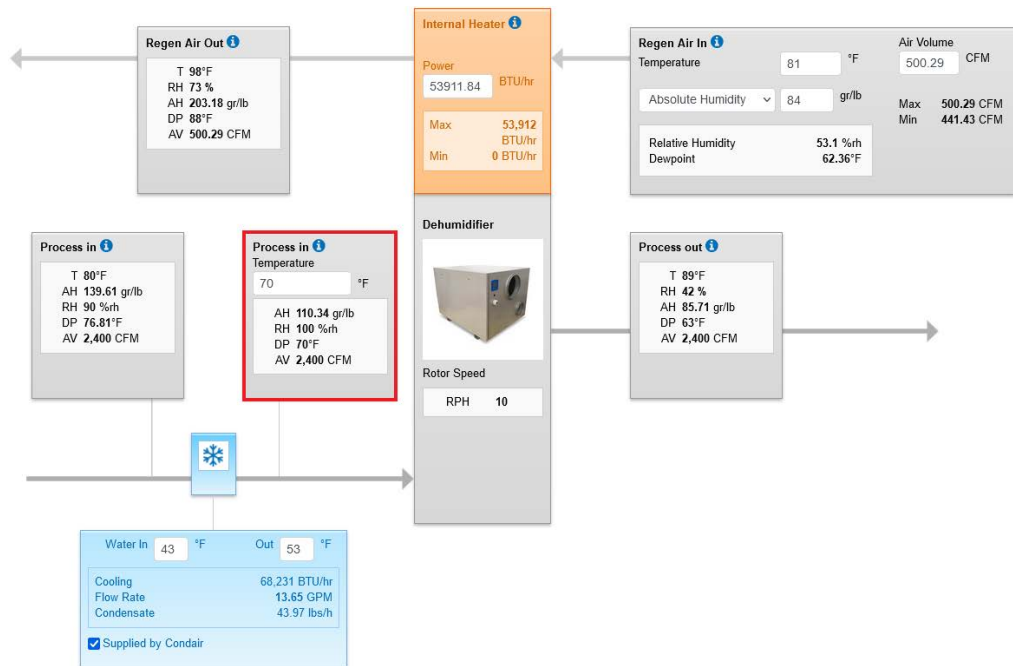
- **Either**, add a pre-cooling coil to lower the **Process In** temperature at the entrance of the dehumidifier
  1. Enter a lower **Process In** temperature
  2. Enter the site chilled **Water In** and **Water Out/Return** temperatures: the system will calculate the flow rate

**Note:** **Water Out** temperature must be greater than **Water In** temperature, otherwise the tool will display the below warning.

**⚠ Max System Capacity is less than the required capacity. A pre-cooling coil is needed for additional moisture removal.**

3. If the user chooses to have the pre-cooling coil supplied by Condair:
  4. If the water temperatures are within the pre-cooling coil cooling capacity, the software will automatically add Condair supplied coils based on the model requirements to the bill of material with pricing included.
  5. Click the **Calculate** button to recalculate the system and confirm the pre-cooling coil and dehumidifier solution can handle the load.
- **Or**, select a unit with a higher drying capacity:
    1. Click the **Calculate** button to recalculate the system and confirm the selected dehumidifier.

**Pre-cooling coil addition**



Calculate

**Calculation Results**

Sensible Heat Load	48,021.6 BTU/hr	Air Volume	2,400 CFM	Max System Capacity	80.97 lbs/h
Latent Heat Load	-39,009.7 BTU/hr				
Total Heat Load	9,012 BTU/hr				
Pre-Cooling	68,231 BTU/hr				

### Scenario 3: Post-Cooling Coil Required

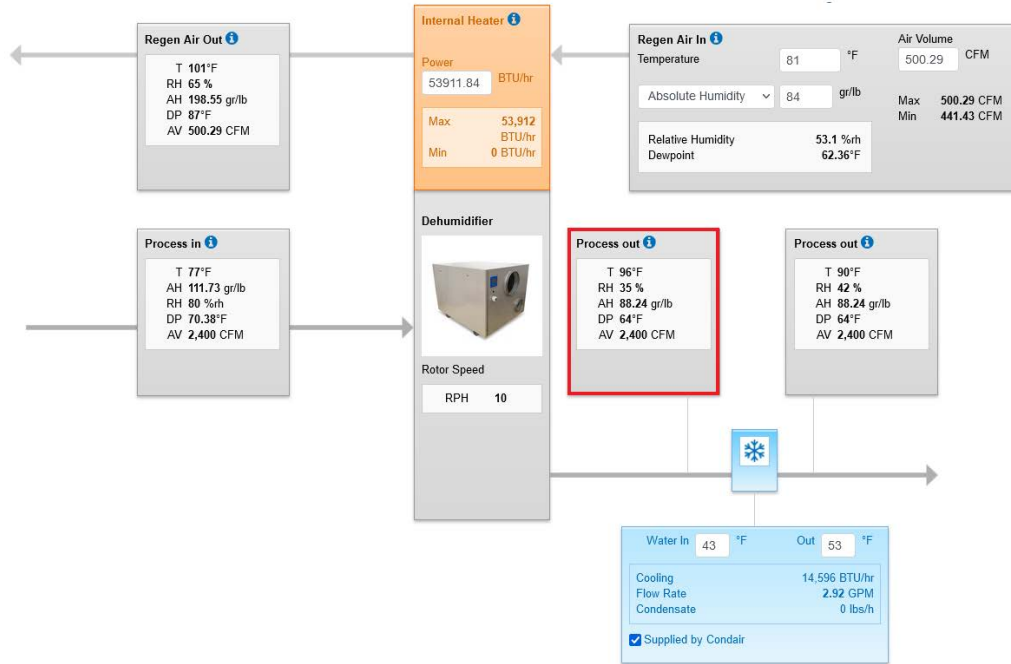
Conditions

Altitude	Starting Conditions	Target Room Conditions
0 ft	Temperature: 77 °F Relative Humidity: 80 %rh Absolute Humidity: 111.73 gr/lb Dewpoint: 70°F	Temperature: 90 °F Relative Humidity: 42 %rh Absolute Humidity: 88.73 gr/lb Dewpoint: 64°F

Space Load Calculation

This is an initial estimate. Select a model, complete the System Design section, and click the Calculate button to calculate the final load for this project.

Air Volume <b>2,400 CFM</b>	Dehumidification Load <b>34.1 lbs/h</b>
--------------------------------	--



Calculate

Calculation Results

Sensible Heat Load Latent Heat Load Total Heat Load Post-Cooling	47,380.6 BTU/hr -36,356.1 BTU/hr 10,824.5 BTU/hr 14,596 BTU/hr	Air Volume <b>2,400 CFM</b>	Max System Capacity <b>36 lbs/h</b>
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→ The selected dehumidifier requires adjustments:

- Add a post-cooling coil to cool the **Process Out** temperature at the exit of the dehumidifier:
  1. Enter the site chilled Water In and Water Out/Return temperatures: the system will calculate the flow rate.

**Notes:**

- Water Out temperature must be greater than Water In temperature.
- The post-cooling coil is only for sensible cooling (no change in the moisture content).
- If condensate is generated on the post-cooling coil, the condensate value will be displayed in RED (see [Fig. 4](#)), and a warning message will inform the user to lower the Process In temperature or select a larger unit.

**⚠ Latent cooling is not possible on a post-cooling coil. Try decreasing the 'Process In' temperature, or selecting a different size dehumidifier. Contact Condaair for additional technical support.**

2. If the user chooses to have the post-cooling coil supplied by Condaair:  
If the water temperatures are within the post-cooling coil cooling capacity, the software will automatically add Condaair supplied coils based on the model requirements to the bill of material with pricing included.
3. Click the **Calculate** button to recalculate the system and confirm the post-cooling coil and dehumidifier solution allows to meet the target room temperature.

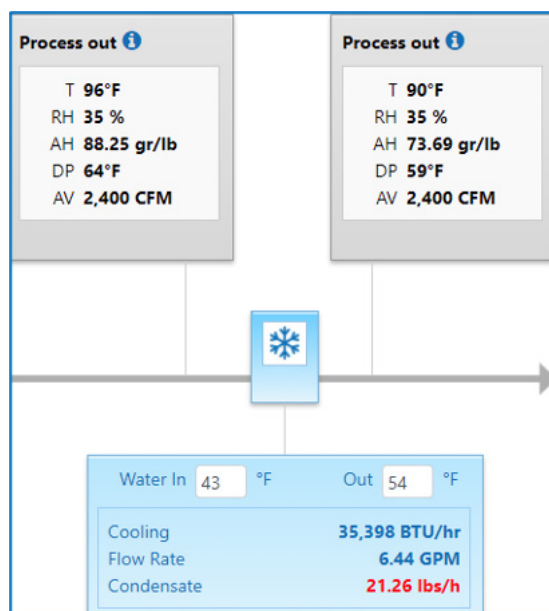


Fig. 4: Case of condensate generated on the post-cooling coil

## Scenario 4: Pre- and Post-Cooling Coils Required

The selected dehumidifier capacity is **LOWER** than the dehumidification load

**AND**

The **Process Out** temperature is **HIGHER** than the **Target Room** temperature.

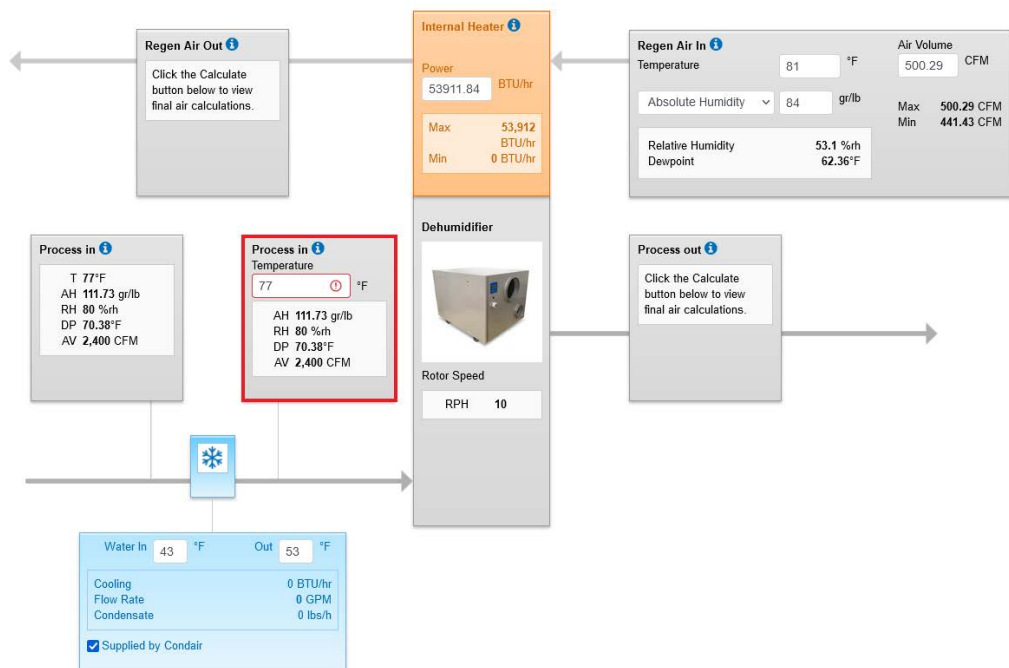
### Conditions

Altitude	Starting Conditions	Target Room Conditions
0 ft	Temperature: 77 °F Relative Humidity: 80 %rh Absolute Humidity: 111.73 gr/lb Dewpoint: 70°F	Temperature: 64 °F Relative Humidity: 40 %rh Absolute Humidity: 35.27 gr/lb Dewpoint: 39°F

### Space Load Calculation

This is an initial estimate. Select a model, complete the System Design section, and click the Calculate button to calculate the final load for this project.

Air Volume <b>2,400</b> CFM	Dehumidification Load <b>113.35</b> lbs/h
--------------------------------	--



### Calculation Results

Sensible Heat Load Latent Heat Load Total Heat Load Pre-Cooling	0 BTU/hr 0 BTU/hr 0 BTU/hr 0 BTU/hr	Air Volume <b>2,400</b> CFM	Max System Capacity <b>36</b> lbs/h
--	--	--------------------------------	--

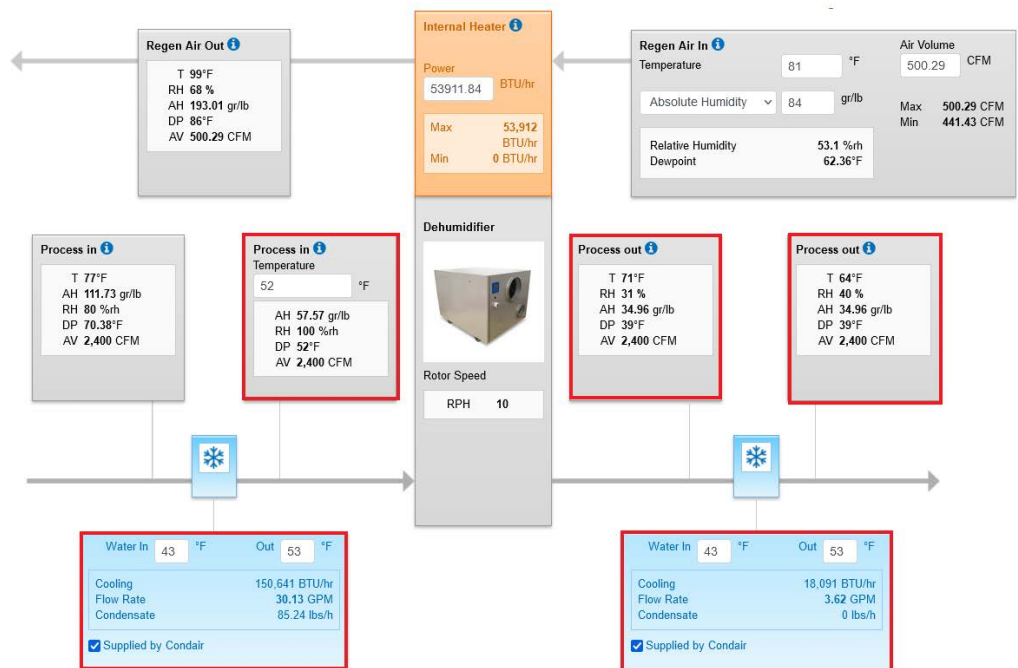
➔ The selected dehumidifier requires adjustments:

- Add a pre-cooling coil to lower the **Process In** temperature entering the dehumidifier
  1. Enter a lower **Process In** temperature
  2. Enter the site chilled **Water In** and **Water Out/Return** temperatures: the system will calculate the flow rate.
  3. Click the **Calculate** button to recalculate the system and confirm the pre-cooling coil and dehumidifier solution can handle the load

**AND**

- Add a post-cooling coil to cool the Process Out temperature at the exit of the dehumidifier
  1. Enter the site chilled **Water In** and **Water Out/Return** temperatures: the system will calculate the flow rate
  2. Click the **Calculate** button to recalculate the system and confirm the post-cooling coil and dehumidifier solution allows to meet the target room temperature.

**Pre-cooling and post-cooling coil addition**



Calculate

Calculation Results

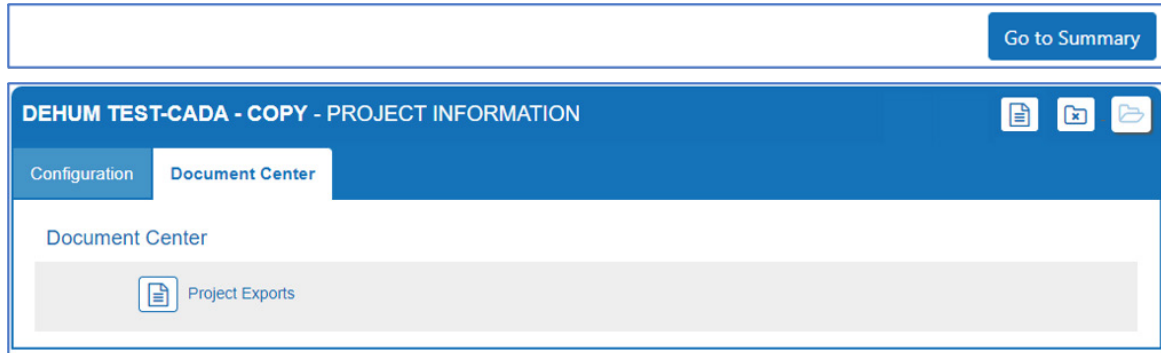
Sensible Heat Load	50,305.7 BTU/hr	Air Volume	2,400 CFM	Max System Capacity	119.24 lbs/h
Latent Heat Load	-37,862.5 BTU/hr				
Total Heat Load	12,443.2 BTU/hr				
Pre-Cooling	150,641 BTU/hr				
Post-Cooling	18,091 BTU/hr				

Calculation Results

Sensible Heat Load	50,305.7 BTU/hr	Air Volume	2,400 CFM	Max System Capacity	119.24 lbs/h
Latent Heat Load	-37,862.5 BTU/hr				
Total Heat Load	12,443.2 BTU/hr				
Pre-Cooling	150,642 BTU/hr				
Post-Cooling	18,091 BTU/hr				

## STEP D: Access the Project Documentation

The **Go to summary** button leads to the summary page: **Project Information**

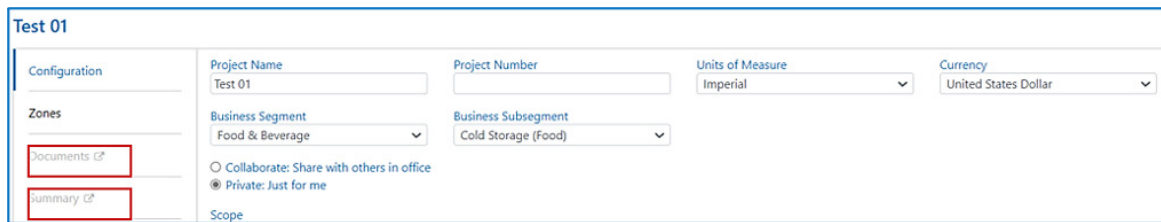


- The Document Center is accessed here
- Click on Project Exports to generate reports: specifications, datasheets, bill of materials, ...

### Documents and Summary tabs

The **Configuration** button on the **Project Information** page leads back to the dehumidification project main page.

- Click on **Documents** or **Summary** in the dehumidification project to be redirected to the **Project Information** page.

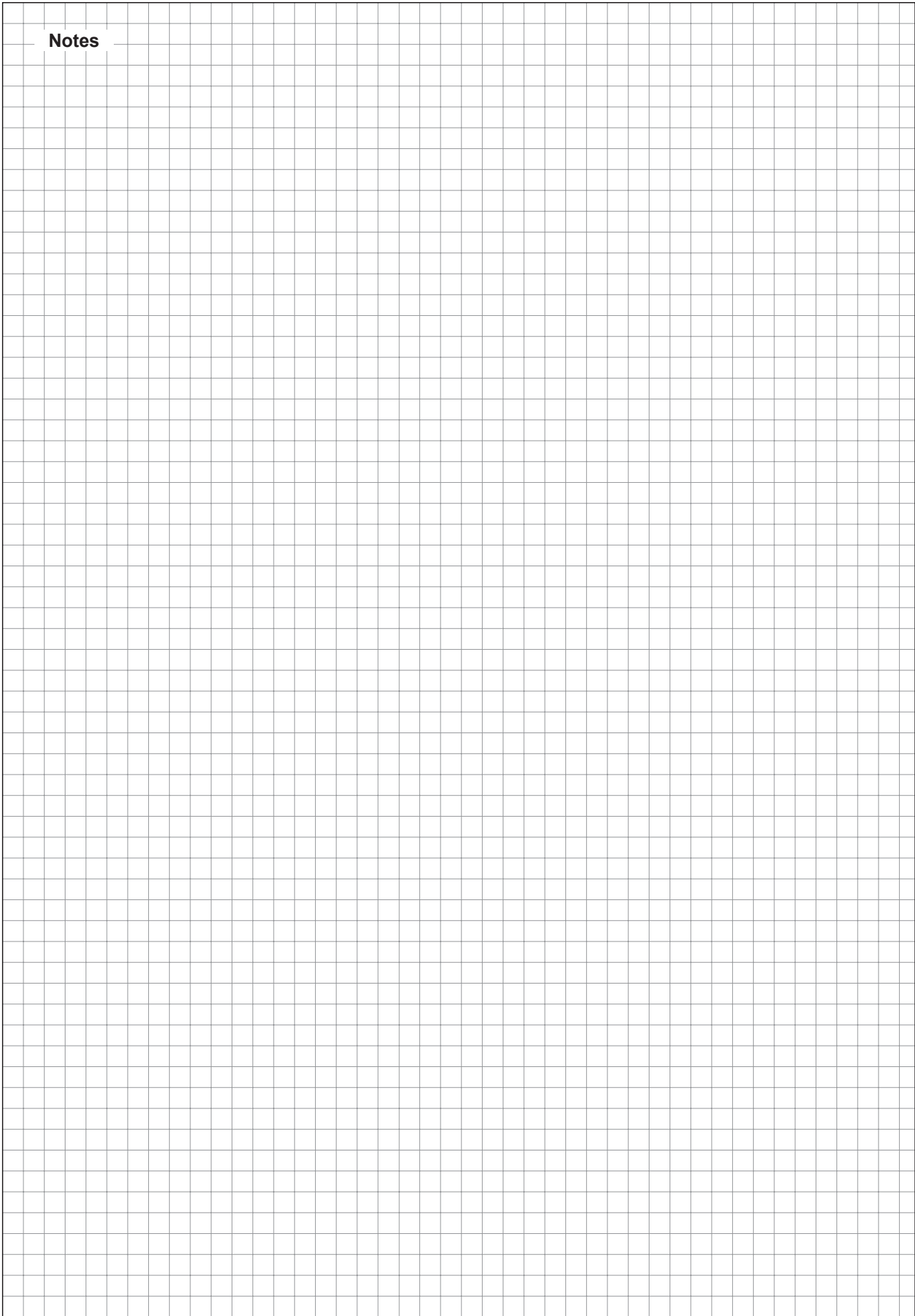


### 3 Additional Resources

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- Installation Operation and Maintenance Manual:
  - English: [2597586\\_B\\_EN\\_2107\\_DA\\_IOM \(condair.com\)](#)
  - French: [2597587\\_A\\_FR\\_2006\\_DA\\_IOM \(condair.com\)](#)
- Dehumidification Planning Guide: [21-552-dehumidification-planning-guide.pdf \(condair.com\)](#)
- Dehumidification Technical Guide: [21-653-1-da-series-technical-datasheet.pdf \(condair.com\)](#)
- Dehumidification Checklist: [da-series-checklist.pdf \(condair.com\)](#)
- Dehumidification Brochure: [20-626-condair-dehumidifier-brochure.pdf](#)
- Application Brochures:
  - [21-551-dehumidification-for-cold-storage.pdf \(condair.com\)](#)
  - [21-550-dehumidification-food-processing.pdf \(condair.com\)](#)
  - [Dehumidifier for Electronics Industry \(condair.com\)](#)

Notes





U.S.A.  
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