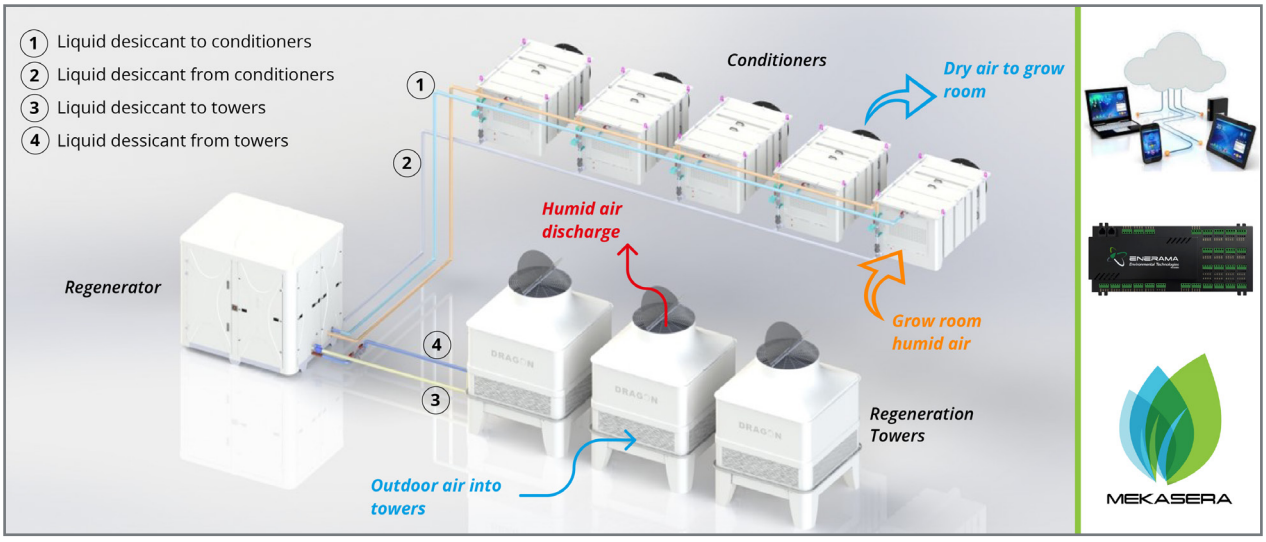
ENERAMA
Environmental Technologies

DRAGON
WORLD'S MOST EFFICIENT & POWERFUL CLIMATE CONTROL SYSTEM

GENERAL CHARACTERISTICS

Dragon is a unique dehumidification system that utilizes patented liquid-desiccant technology to provide the most efficient and economically viable greenhouse and grow room dehumidification solution that exists in the market today. Liquid desiccant can efficiently remove moisture at a range of conditions, including at low temperature and humidity, allowing for cold, dry room conditions. Dragon also eliminates the need to sub-cool and reheat the grow room air to remove the moisture output from the plants, improving efficiency. As an added benefit, liquid desiccant continually sanitizes the air, reducing the risk of microbial proliferation. Dragon can be integrated with additional cooling, heating and CO2 supplementation from other manufacturers and is managed by MekaSera, a web based remote management and monitoring system, which provides multi-zone control of temperature, humidity, and CO2 concentration.



HOW DRAGON WORKS

The Dragon circulates a liquid desiccant between Conditioners in the grow room and Regeneration Towers outside. The liquid desiccant is a brine water solution that attracts moisture from air due to its low vapor pressure. Inside the Conditioners, grow room air blows through a spray of liquid desiccant, and moisture is transferred from the air to the desiccant. To be regenerated, the desiccant is heated in the Regenerator before being sprayed downward into an upward draft of outside air in the Regeneration Tower. As water evaporates from the desiccant in the Regeneration Tower, the desiccant is cooled. The desiccant can further be cooled in the Regenerator before being pumped back to the Conditioners.

WHY LIQUID DESICCANT

At 0.25 kWh/L of water removed, Dragon is an extremely efficient dehumidification system. Because Dragon uses a liquid desiccant, it maintains high moisture removal at lower temperature and humidity than refrigerant-based systems, as seen in Figure 2 below.

In addition, the Dragon does not create additional heat generation in the room like standalone dehumidifiers, reducing the load on the cooling system. Figure 3 presents reduction in load on the primary cooling system using Dragon, as compared to either standalone dehumidifiers or an integrated cooling and dehumidification system.

Furthermore, since Dragon removes the latent load, a higher chilled water temperature can be used, increasing the efficiency of the chilled water system. During cold weather, heat from the desiccant regeneration process can be used to help heat a greenhouse.

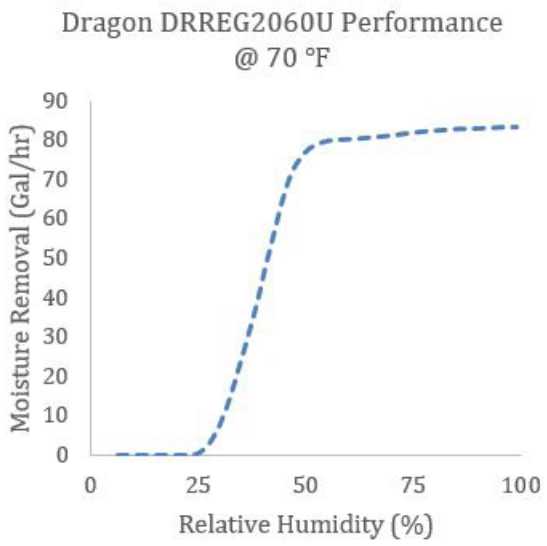


Figure 2. The Dragon maintains high moisture removal even at low temperature and humidity. The Dragon maintains its rated moisture removal capacity at 70 °F and 50% RH, whereas most refrigerant-based dehumidifiers are tested at 80 °F/60% RH but lose significant capacity at lower temperature and humidity.

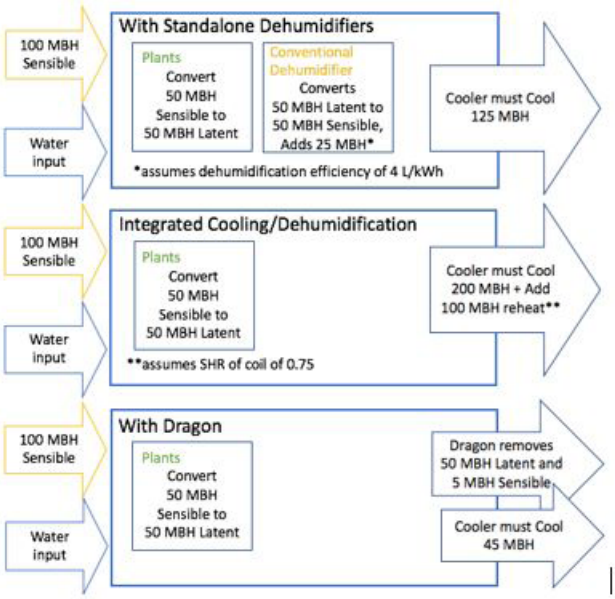


Figure 3. Standalone-dehumidifiers reject additional heat into the grow room and integrated cooling and dehumidification systems are often oversized to remove the latent load, requiring overcooling of the grow room to remove the moisture and reheating it so the room doesn't get too cold. Dragon improves efficiency with advanced liquid-desiccant technology.

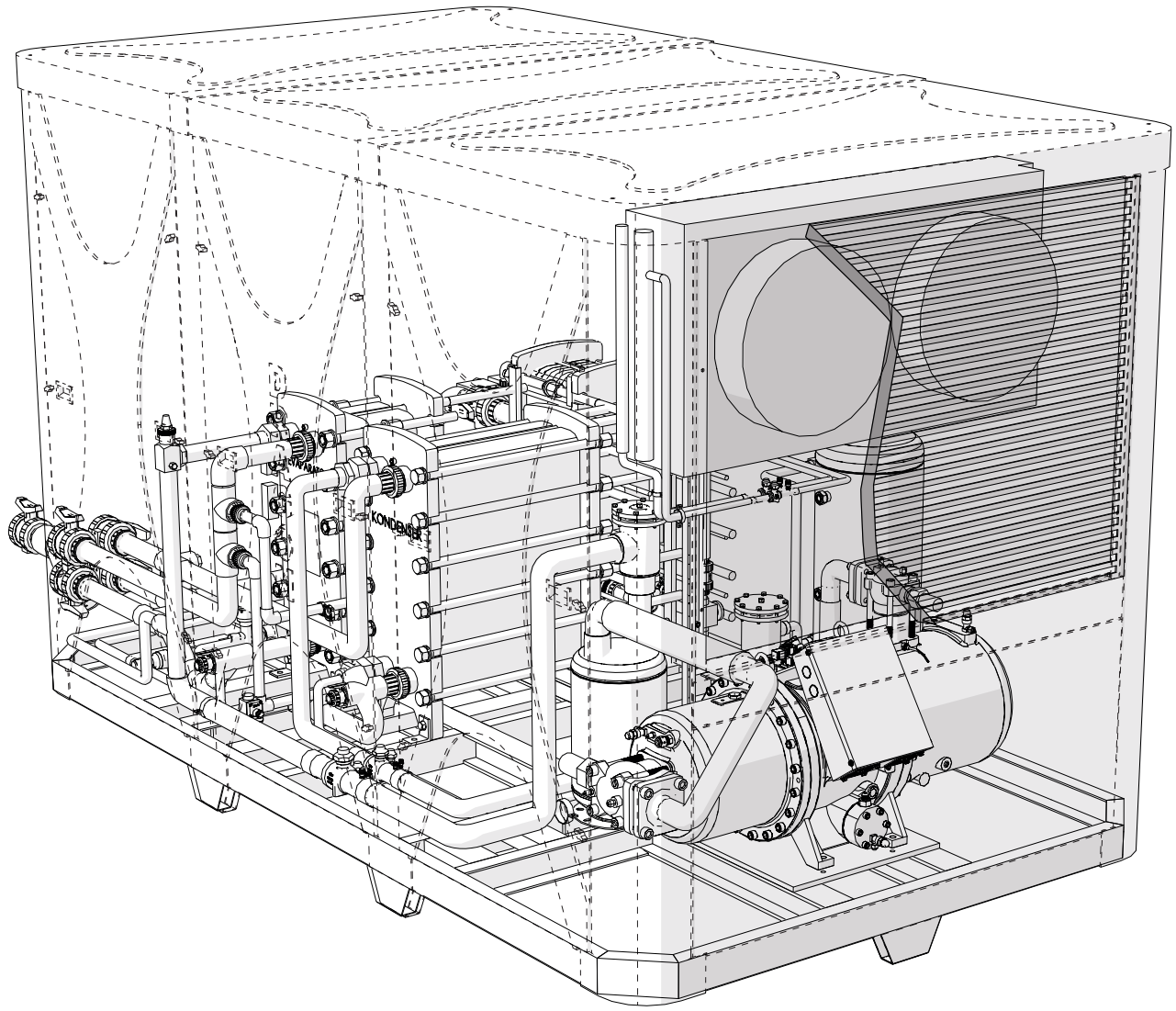
SYSTEM CONTROL AND REMOTE MONITORING

The Dragon Control System is the standard control system software for Dragon which can be conveniently managed through MekaSera, which is fully integrated web-based monitoring and management system. Control of desiccant temperature maintains constant temperature and humidity in the growing area as heating, cooling, and moisture loads change throughout the day and year. The Dragon Control System is also able to communicate to other greenhouse management systems through Modbus.

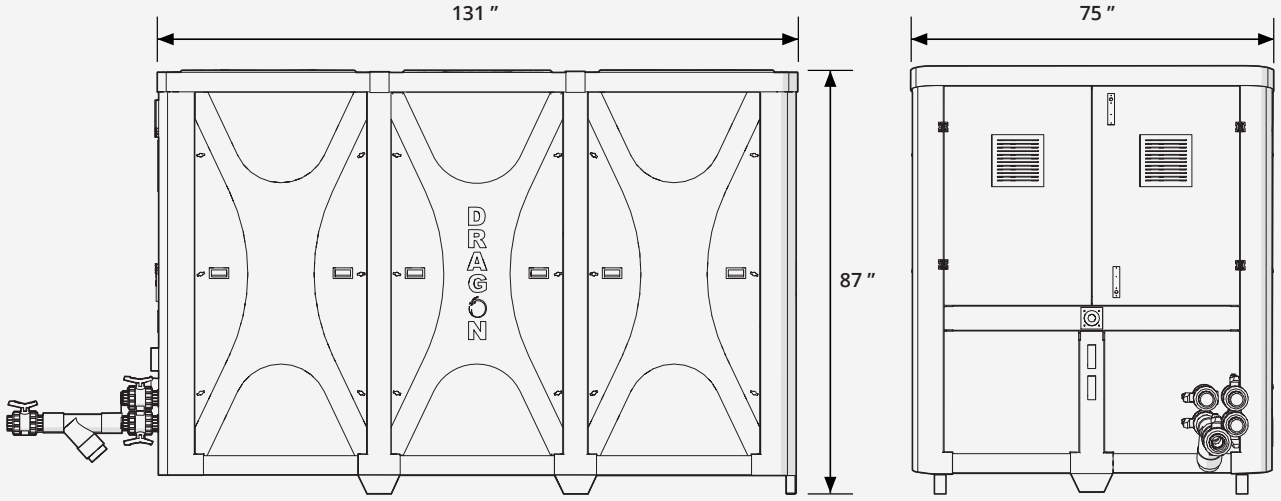
REGENERATOR

Model	DRREG2010U	DRREG2020U	DRREG2030U	DRREG2040U	DRREG2060U	DRREG2070U	DRREG2080U	DRREG2120U
Casing	FRP							
Refrigerant	R407C							
Cooling capacity	10 RT	20 RT	30 RT	40 RT	60 RT	70 RT	80 RT	120 RT
Dehumidification capacity	13 gal/h	26 gal/h	39 gal/h	52 gal/h	79 gal/h	92 gal/h	105 gal/h	158 gal/h
Compressor type	Scroll	Scroll	Screw	Screw	Screw	Screw	Screw	Screw
Condenser type	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
Evaporator type	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
Rated compressor power	10 kW	20 kW	30 kW	40 kW	60 kW	70 kW	80 kW	120 kW
Regenerator pump power	1.5 kW	3 kW	4 kW	4 kW	7.5 kW	7.5 kW	15 kW	15 kW
Conditioner pump power (*)	2.2 kW	4 kW	7.5 kW	7.5 kW	7.5 kW	7.5 kW	15 kW	15 kW
COP	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Power circuit voltage	480 V/3 Ph/60 Hz							
"RLA (including regeneration tower' power requirement)"	28 A	50 A	75 A	90 A	127 A	137 A	183 A	262 A
LRA/MCA/MOP	175 / 35 / 63 A	300 / 63 / 112 A	290 / 93 / 168 A	390 / 112 / 202 A	630 / 158 / 285 A	680 / 169 / 307 A	910 / 227 / 410 A	1300 / 326 / 587 A
Length	91 in	91 in	131 in	131 in	131 in	131 in	171 in	171 in
Width	75 in	75 in	75 in	75 in	75 in	75 in	75 in	75 in
Height	87 in	87 in	87 in	87 in	87 in	87 in	87 in	87 in
Weight	1750 lb	2200 lb	8000 lb	8100 lb	8600 lb	8700 lb	8900 lb	9200 lb

*** Conditioner pump might be replaced according to the facility plan.**



Model DRREG 2030U – 2070U
Outdoor Regenerator

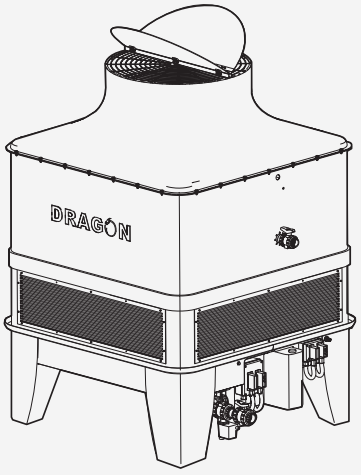


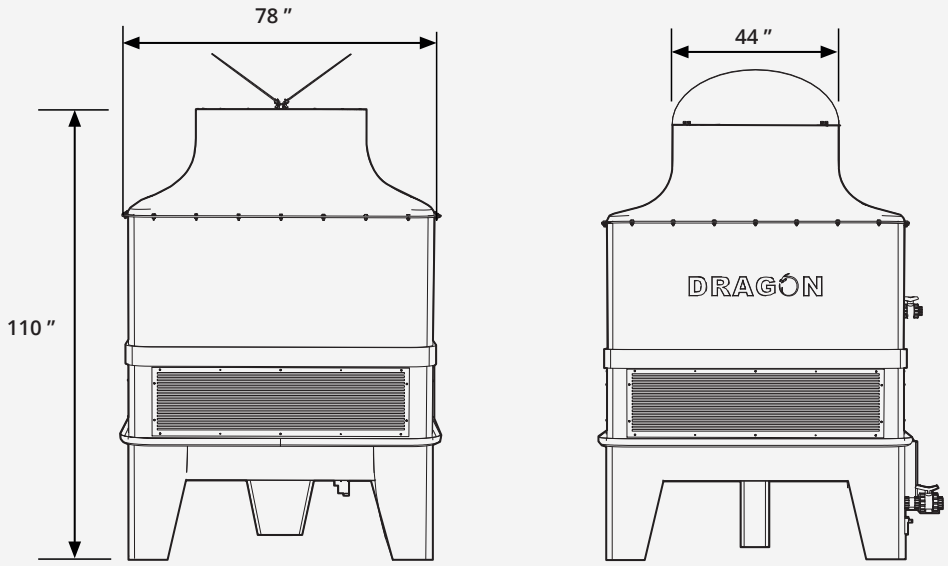
REGENERATOR TOWER

Model	DRRTW1030	DRRTW2030
Casing	FRP	
Fan power	4 kW	
Air flow rate	17,500 cfm	
Noise pressure level (*)	90 dB(A)	
Spacing	78 in	
Length	78 in	78 in
Width	78 in	78 in
Height	113 in	113 in
Weight	1014 lb	1367 lb

* Power demand is supplied by regenerator. Regenerator power information includes the required power of Towers.

Model DRRTW1015, DRRTW2015
Outdoor Regeneration Tower

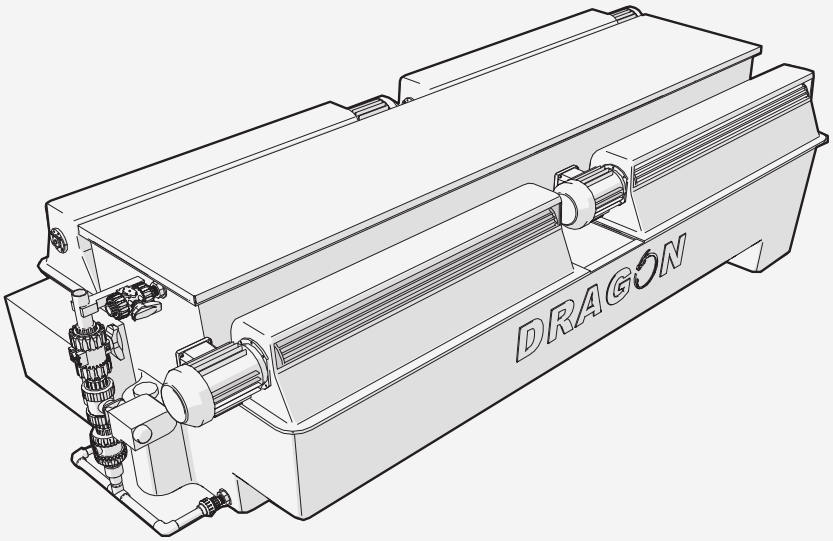


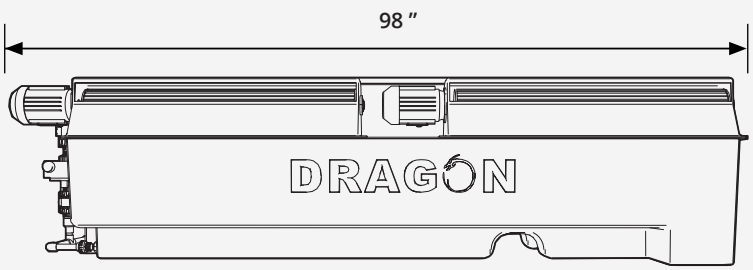


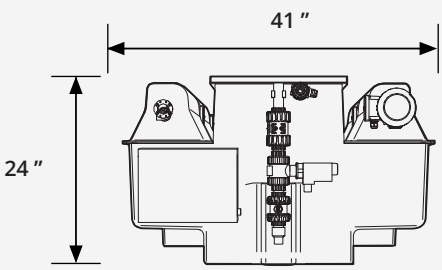
CONDITIONER

Model	DRCND1007U	DRCND1015U	DRCND1030U
High Ceiling Ready	No	Yes	No
Casing	FRP		
Fan drive type	VFD	DOL	DOL
Fan power	1.7 kW	2.2 kW	5.5 kW
Air flow rate	4100 cfm	8800 cfm	17500 cfm
Power circuit voltage	220 V/1 Ph/60 Hz	480 V/3 Ph/60 Hz	480 V/3 Ph/60 Hz
RLA	9.6 A	3.3 A	8.2 A
LRA/MCA/MOP	25.0 / 12.0 / 21.0 A	19.0 / 4.0 / 7.4 A	50.0 / 12.0 / 22.5 A
Length	98 in	92 in	88 in
Width	41 in	57 in	75 in
Height	24 in	44 in	73 in
Weight	450 lb	705 lb	1014 lb

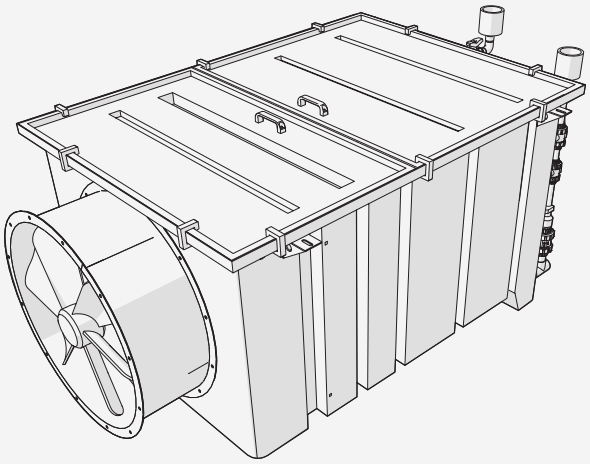
Model DRCND1007
Indoor under bench conditioner

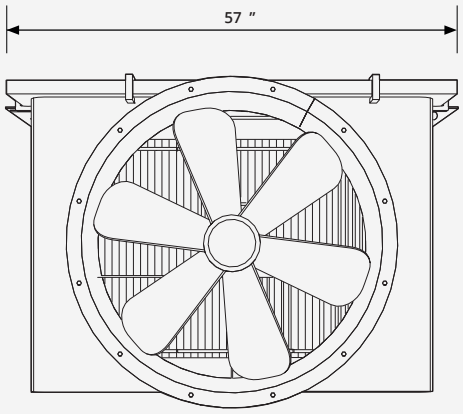


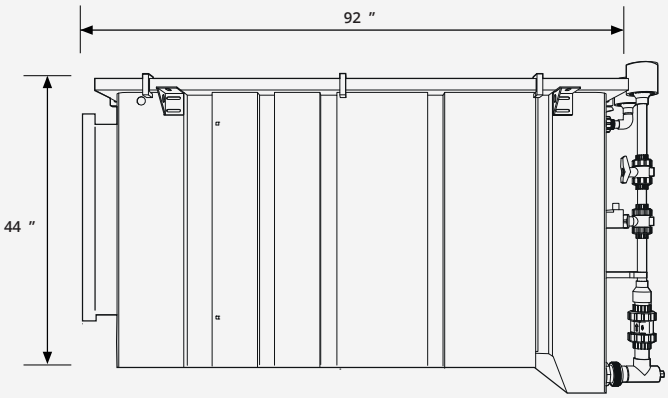




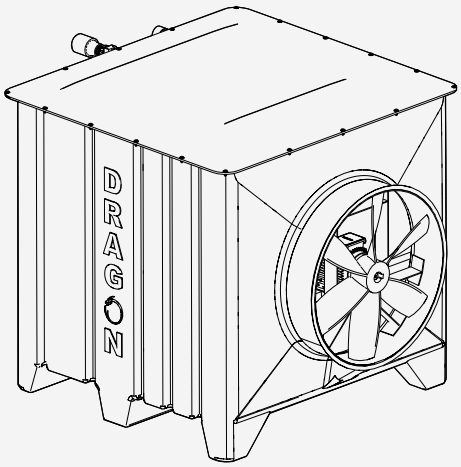
Model DRCND1015
Indoor high ceiling conditioner

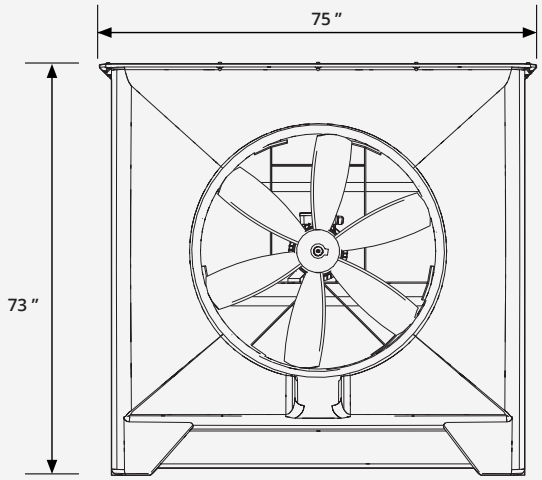


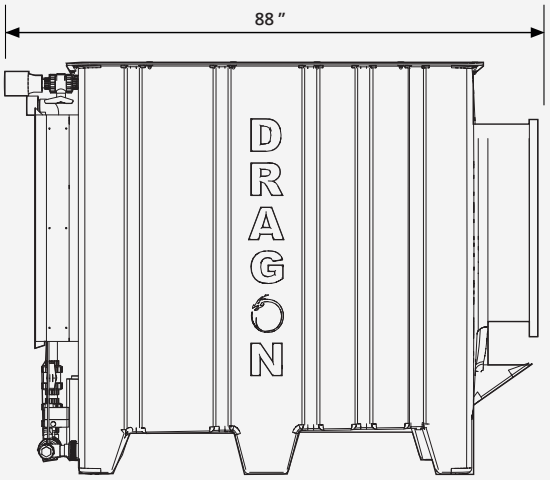




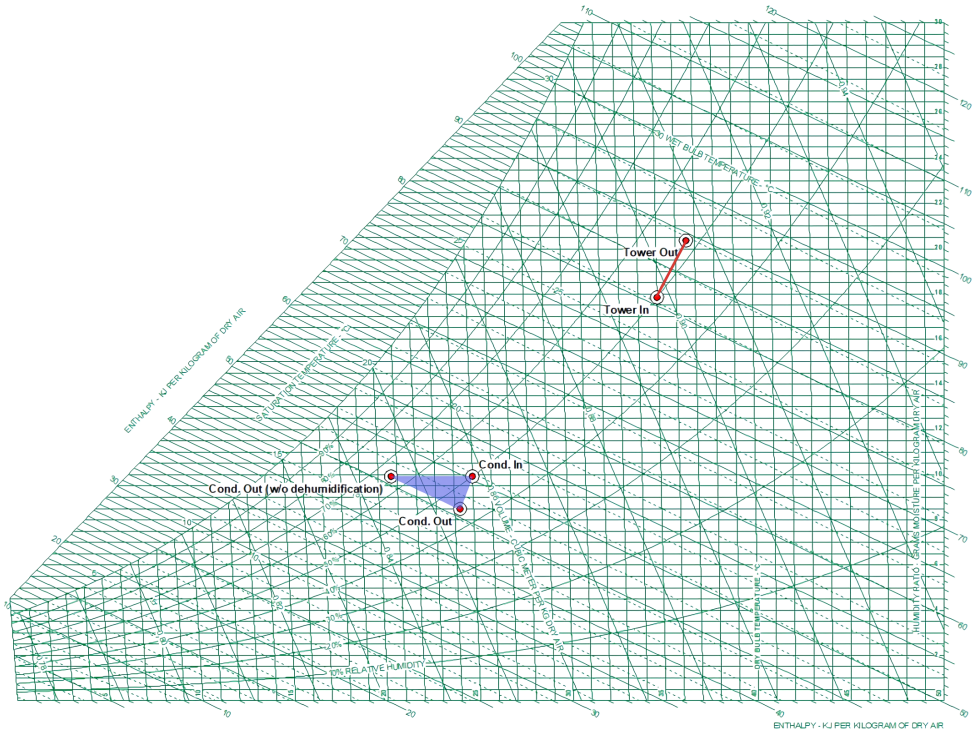
Model DRCND2030
Indoor / Outdoor conditioner



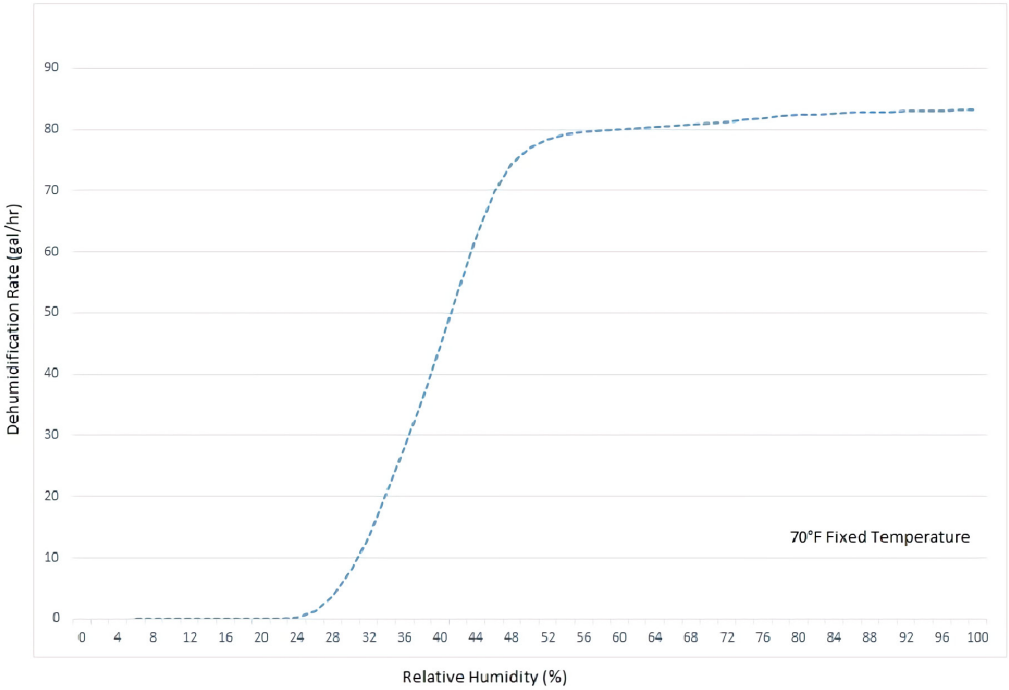




Psychrometric Chart



Dehumidification Rate



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