



# The Humidity Control Solution

Precise Control with Modulating Hot Gas Reheat



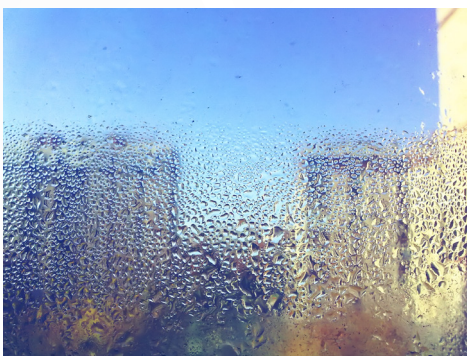
# ◆ Humidity Problems?

**T**he study of indoor air quality has pointed to moisture as one of the main causes of poor indoor air quality. High humidity can cause many problems including mold growth, condensation, wood rot, paper deterioration, increase in sickness and allergic reactions, and a variety of other indoor air quality and physically damaging issues.

In many geographic locations and building applications, the standard moisture removal ability of the cooling system cannot match the humidity control demand since the system has been designed to satisfy a dry bulb space temperature setpoint. When this setpoint has been satisfied, the supply fan continues to provide fresh air while the cooling system is shut off until the temperature rises to some level above the setpoint. During that off time all moisture removal capability is lost. Moisture on the cooling coil also evaporates back into the supply air stream, increasing the relative humidity.

A simple way to address this situation is adding an on/off 3-way solenoid valve to bypass hot refrigerant gas from the compressor discharge to a reheat coil placed after the cooling coil in the supply air stream. The valve is controlled by a dehumidistat in the space that allows the unit to continue the moisture removal process after the dry bulb setpoint has been satisfied. This solves most moisture related problems in a return air only system, but in systems conditioning ventilation air, the following problems continue:

- ◆ Poor control of the amount of reheating, which wastes energy.
- ◆ Uncomfortable supply air temperature swings during operation.
- ◆ Unacceptable supply air temperature and poor temperature control in makeup air applications, especially with 100% outside air.



Window Condensation with High Indoor Humidity

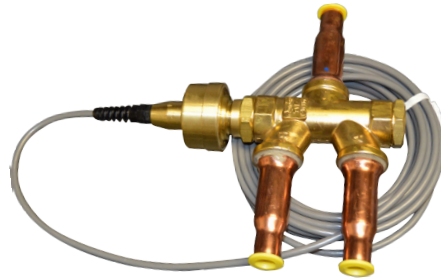


Mold and Microbial Growth with High Humidity

# The Solution: Modulating Hot Gas Reheat

AAON has addressed all of these humidity control problems with a unique design incorporating a reheat coil, a modulating 3-way hot gas reheat valve, supply air temperature sensor, and a simple controller. The advantages of the design are many:

- Occupant comfort is uniform and consistent because there are no drastic swings in the supply air temperature that are inherent with on/off solenoid valve control systems.
- If the dry bulb thermostat is satisfied and the dehumidistat is still calling for moisture removal, the system will continue to cool and the reheat control valve will modulate the amount of hot refrigerant gas passing through the reheat coil to maintain a supply air temperature.
- Since the amount of hot refrigerant gas passing through the reheat coil is modulated, the system delivers only the amount of reheating that is required for space comfort. This minimizes energy use while still offering precise temperature and humidity control.
- The factory provided supply air temperature sensor field mounted in the supply air ductwork provides input to the controller for reheat supply air temperature control.
- The valve position is controlled to provide a specific supply air temperature or a reset supply air temperature. The reset temperature setpoint used is determined by a field provided 0-10 VDC reset signal or from the unit controller. Typically reset is based on space temperature.



3-Way Modulating Hot Gas Reheat Control Valve



Horizontal Configuration RN Series Packaged Rooftop Unit with Modulating Hot Gas Reheat



CF Series Condensing Unit

CF Series and V3 Series Split System with Modulating Hot Gas Reheat



V3 Series Air Handling Unit





# Minimum Work, **Maximum Performance**

## ◆ **Packaged Unit**

Packaged unit includes factory installed refrigerant piping, 3-way modulating hot gas reheat valve, reheat coil, liquid line receiver, and the modulating hot gas reheat controller. Supply air temperature sensor is factory provided for field installation in the supply air ductwork.

## ◆ **Split System**

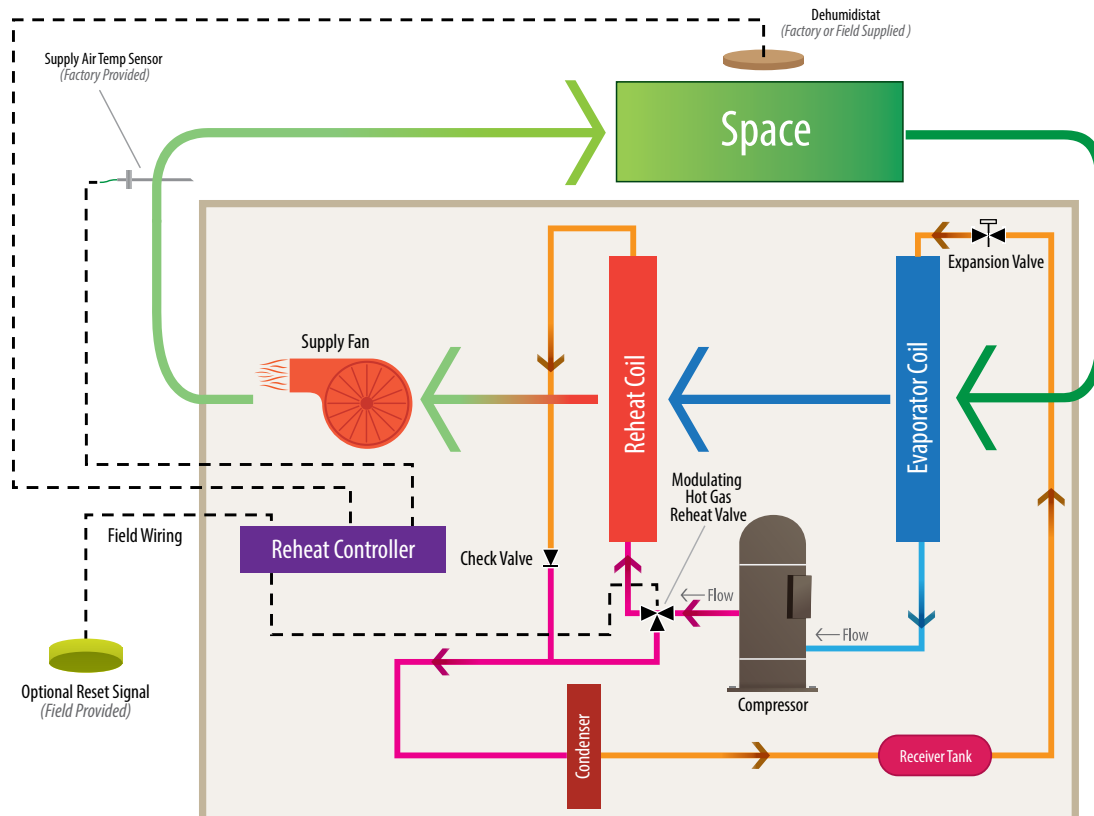
Air handling unit includes factory installed reheat coil and check valves on the liquid and hot gas reheat lines. Supply air temperature sensor is factory provided for field installation in the supply air ductwork.

Condensing unit includes factory installed 3-way modulating hot gas reheat valve, liquid line receiver, and the modulating hot gas reheat controller.

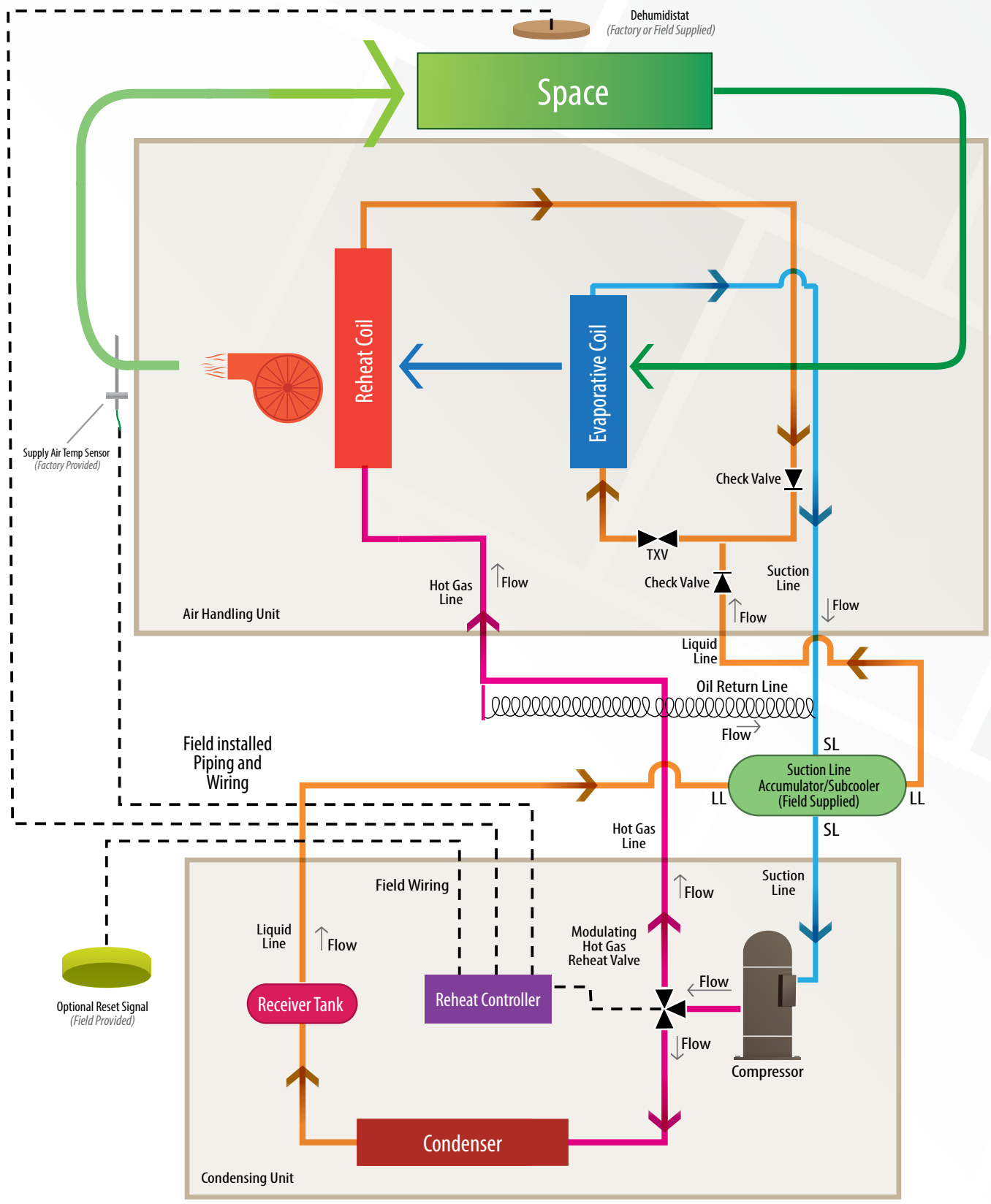
Field connection of suction line, liquid line, and a single hot gas reheat line between the condensing unit and the air handling unit is required. Field supplied and installed suction line accumulator/subcooler is recommended, especially for VAV and makeup air systems.

## ◆ **Controls**

Modulating hot gas reheat controller is factory configured and ready to accept inputs from the field mounted, factory provided supply air temperature sensor in the ductwork, and field mounted dehumidistat. Controller has a built-in logic to ensure positive oil return to the compressors. Controller also has an LCD display for status display, setpoint changes, and forced control of the valve for startup and maintenance.



Packaged Unit Space Controlled Modulating Hot Gas Reheat Schematic



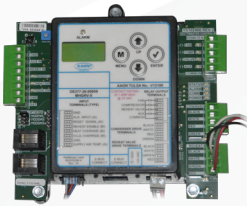
Split System Space Controlled Modulating Hot Gas Reheat Schematic

# Modulating Hot Gas Reheat System **Control**

Modulating hot gas reheat can either be controlled using a standalone controller with thermostat and dehumidistat, or with a factory provided AAON unit controller.

## **Standalone Control**

A 24VAC dehumidification input from the dehumidistat or customer provided controller initiates the dehumidification sequence when using standalone control.



Standalone Modulating Hot Gas Reheat Controller for Dehumidistat Control



Factory Provided AAON Touchscreen Controller

## **Factory Provided Unit Controller**

Dehumidification can either be set as a priority, meaning that modulating hot gas reheat will be active anytime the humidity is above the dehumidification enable setpoint, or non-priority, meaning it will only be active when the cooling and heating demands are satisfied. When the dry bulb temperature is satisfied but humidity setpoint is not satisfied, the compressors will continue to operate. The supply air temperature will be controlled to the user selected setpoint.

The AAON Touchscreen Controller has built-in space temperature and humidity sensors. The user can select the desired control temperature and humidity sensors (space, return, outside) for occupied mode and for unoccupied mode. The temperature control sensor will dictate when the unit goes into cooling or heating, while the humidity control sensor will dictate when the unit goes into dehumidification mode of operation.

# Modulating Hot Gas Reheat **Applications**

The AAON modulating hot gas reheat system is the perfect dehumidification solution for many different applications. During dehumidification, the modulating hot gas reheat system condenses water out of the air stream at the unit's evaporator coil, and then, to avoid overcooling the supply air, reheats the air to a desired supply air temperature. Therefore, this system can be used in Underfloor Air Distribution (UFAD) and Variable Air Volume (VAV) applications where dehumidification and tight supply air temperature control are needed.

It can also be used for ventilation air with chilled beam applications to prevent condensation on the chilled beams, by controlling the space dew point. Another application for the precise control of modulating hot gas reheat is supermarkets. They present unique challenges for HVAC systems because the stores include a variety of spaces that each have different temperature and humidity control requirements.



Supermarket Humidity Control

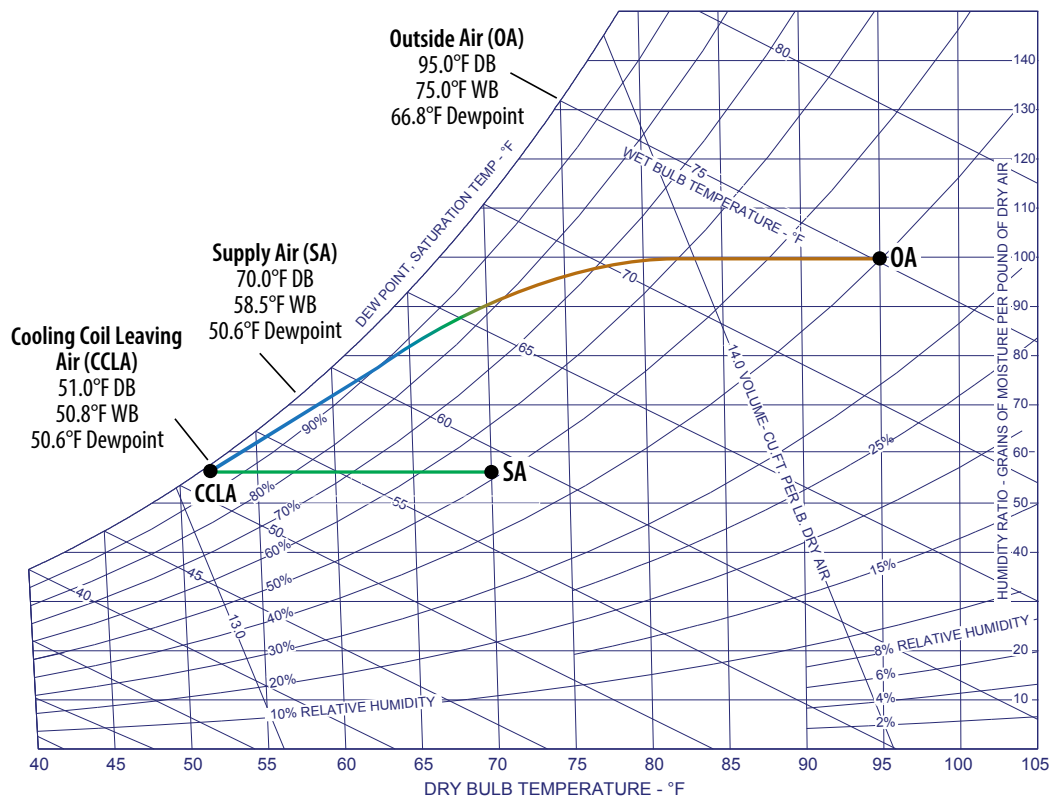
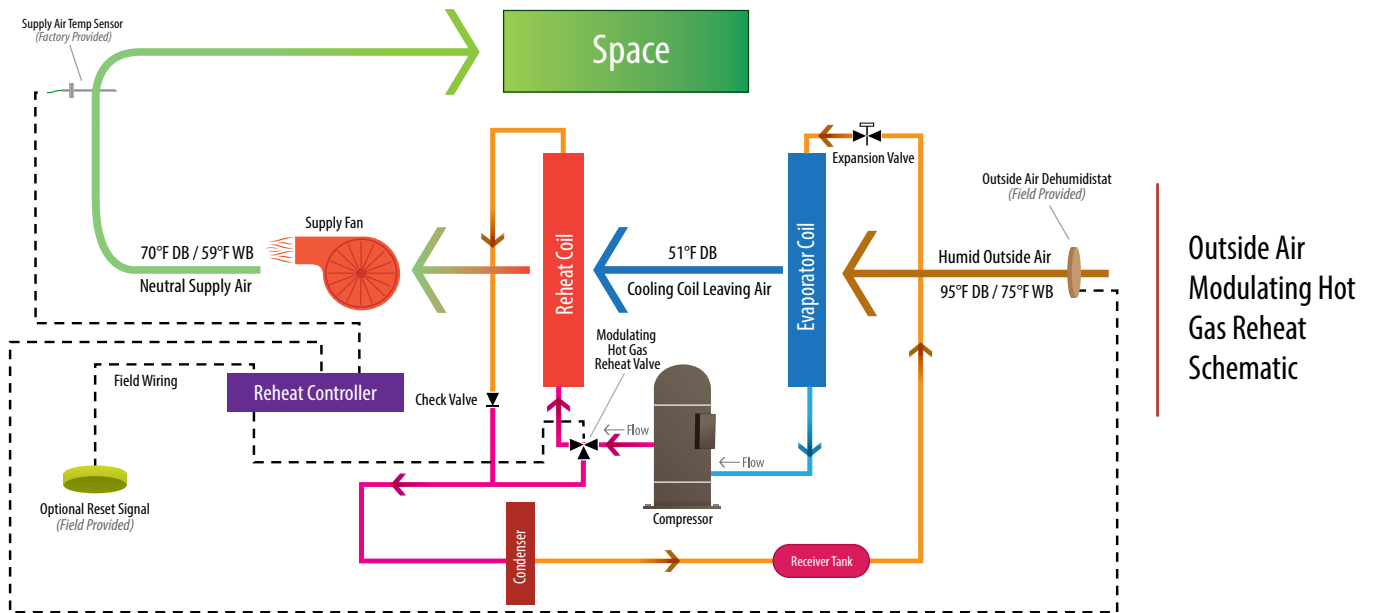
Supermarkets include a produce area, dairy & frozen foods area, bakery, deli, pharmacy, check-out stands, and office spaces. Lack of humidity control can cause moisture buildup on the windows and glass refrigeration cases. Precise space temperature control is also important to keep customers comfortable. Modulating hot gas reheat humidity control is ideal for this application because the humidity can be controlled without sacrificing temperature control.

# Outside Air? High Humidity? **No Problem.**

To meet today's standards for ventilation air, HVAC units must be designed to condition large amounts of outside air. With its enhanced latent capacity, the modulating hot gas reheat option can condition and dehumidify large amounts (up to 100%) of outside air and still maintain a neutral supply air temperature. Space temperature reset can be used to prevent unnecessary reheat when space cooling is required.

## High Capacity Evaporator Coil

A high capacity 6-row evaporator coil increases latent heat transfer. The additional rows provide more surface area, allowing the coil to condense more water out of the air. This provides superior dehumidification capabilities for outside air systems, especially when paired with modulating hot gas reheat.



## Dehumidification Strategies Comparison

	Modulating Hot Gas Reheat Control	On/Off Hot Gas Reheat Control	On/Off Sub-Cooling Reheat	Modulating Auxiliary Reheat Control
Design Approach	Modulating solenoid valve diverts only the required amount of hot refrigerant gas	On/Off solenoid valve diverts hot refrigerant gas	On/Off solenoid valve diverts warm refrigerant liquid	Modulating auxiliary electric or gas reheat
Supply Air Temperature Control Precision	Precise	Swinging	Not enough reheat to control supply air temperature	Precise
Energy Used	Low	Medium	Low	High - Typically Against Energy Codes
Can be used in 100% Makeup Air Application	Yes	No - Return Air Application Only	No	Yes



**Contact your local AAON representative to find out more about humidity control solutions from AAON.**

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