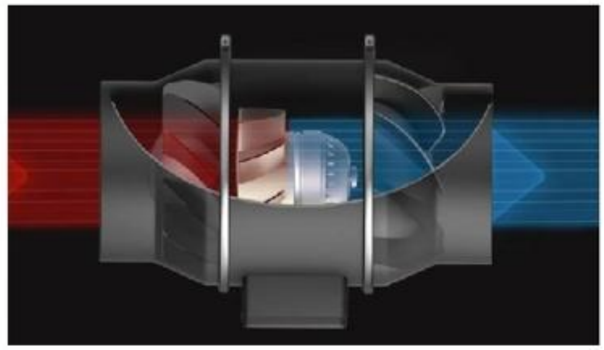
INNOTEK AIR **HumidiFlex System** **(IAHS)**

A Revolutionary leap in dehumidification system & control technology

Dehumidification Mixed Air Controller (DMAC) Inverter Control Feature when combined with a communicating type thermostat



The **Dehumidification Mixed Air Controller (DMAC**) is a core component of the **HumidiFlex System,** a smart add-on that brings powerful dehumidification to any existing air conditioning or heating system. It seamlessly integrates with your indoor unit's thermostat, actively monitoring for heating, cooling, or fan operation.

The Inverter Control Advantage

The **HumidiFlex System** truly shines when paired with an inverter-type condenser and compressor. While inverter units are great for energy efficiency, their slow ramp-down speed can be a drawback for effective dehumidification. They often don't reduce the indoor unit's air delivery quickly enough to remove moisture.

This is where the **DMAC's** **specialized inverter control feature comes in**. Through a dedicated electronic board and a specific parameter setting, the **DMAC** takes charge To understand how the DMAC handles the invert type system the staring point is going through how it initially works Using A communicating thermostat unlocks the inverter system's full potential for dehumidification because it enables a coordinated, continuous strategy.

- **Precise Control & Data:** The communicating thermostat has a **built-in humidity sensor** and **two-way digital communication** with both the indoor air handler and the outdoor inverter unit. It knows the exact relative humidity (RH) and can actively target a humidity setpoint (e.g., 50%).
- **Coordinated Low-Speed Operation:** For effective dehumidification, the system needs to run for **longer cycles** with a **colder coil** and a **slower indoor fan speed**.
    - The thermostat commands the **inverter compressor** to run at a very low capacity e.g.,30% or 40% to keep the coil running cold for a long time.
    - Simultaneously, it commands the **variable-speed indoor fan** to run at a **reduced CFM per ton** (e.g., 300-350 CFM instead of the standard 400 CFM.
    - An inverter (variable-speed) heat pump maintains a **minimum delivery CFM (Cubic Feet per Minute)** that is coordinated with the compressor's lowest capacity. This minimum is an essential restriction.

      For optimization it uses a energy-efficient blower motor called a **Constant Torque ECM** (Electronically Commutated Motor).

      Think of the motor as an older car set to use a **fixed amount of engine power (torque)**, regardless of the road conditions.

      What it Does

1. **Fixed Force:** When you set your furnace or air conditioner to a specific speed (like "Medium" or "Low"), the motor applies a **specific, constant amount of turning force (torque)** to the fan wheel. This force is always the same for that setting.
2. **Airflow Fluctuates:** Because the turning force is constant, the actual amount of air delivered (CFM) will change if it hits resistance.
    - **Clean System:** If the air filter is new and the ductwork is clear, the fan moves a lot of air.

    - **Dirty System:** If the air filter gets dirty or a vent is closed (resistance increases), the constant torque struggles against the blockage, and the **airflow (CFM) drops** . The motor can't automatically increase its force to push through the dirt.

The Conflict: Latent Cooling vs. Air Distribution

1. The Ideal for Dehumidification (Latent Cooling)

To maximize moisture removal (latent cooling), the system needs two things:

- **Cold Coil:** The inverter must run at its absolute minimum capacity to achieve the coldest coil temperature possible.
- **Slow Air:** The variable-speed blower fan must run at its slowest speed to keep the air in contact with the cold coil for the longest time, which maximizes the amount of moisture that can condense out.

2. The Constraint of Air Distribution (Ductwork)

This is where the problem arises. A ducted system requires a certain **minimum Cubic Feet per Minute (CFM)** of airflow to function correctly:

- **Duct Design:** Residential duct systems are designed to handle air within a specific range of velocity and pressure. If the blower speed drops too low, the air velocity in the ducts can become **insufficient** to overcome the static pressure of the ductwork, register grilles, and filters.
- **Inadequate Mixing and Comfort:** If the CFM is too low, the air barely makes it out of the supply registers, especially those farthest from the air handler. This leads to:
    - **Poor Air Mixing:** The conditioned (dry) air doesn't mix properly with the air in the rest of the house.

- **Hot/Humid Spots:** Far-flung rooms may develop temperature and humidity imbalances, creating uncomfortable "hot spots."
- **Air Stratification:** The dry, cooled air may drop to the floor before fully circulating, leaving the upper part of the room humid.

The Minimum System CFM Floor

Because of the physical limitations of the ductwork, manufacturers set an electronic **minimum CFM floor** for the variable-speed blower. This minimum speed, while often very low (e.g., around 250-300 CFM per ton of capacity, or lower on some units), is the slowest the fan can run while still ensuring **sufficient airflow** to all parts of the home.

How the DMAC works in this situation is that the DMAC on a call for dehumidification it then through is set parameter attempt to maintain a suction line temperature by bypassing air around the evaporator indoor coil.

Since this technology uses Fixed Force: When you set your furnace or air conditioner to a specific speed (like "Medium" or "Low"), the motor applies a **specific, constant amount of turning force (torque)** to the fan wheel. This force is always the same for that setting.

Airflow Fluctuates: Because the turning force is constant, the actual amount of air delivered (CFM) will change if it hits resistance.

Optimized Dehumidification Through Airflow Management

The system achieves enhanced dehumidification by precisely controlling the indoor fan and utilizing an internal bypass mechanism.

1. Ensuring Proper Air Distribution (CFM)

The combined fan assembly (which often includes the main blower and related housing) is designed to minimize the restriction of airflow (static pressure) back to the indoor blower. This efficiency ensures that, even when operating

at a low speed for dehumidification, the system can maintain the minimum necessary Cubic Feet per Minute (CFM). This guaranteed low-end CFM prevents air distribution problems, ensuring that conditioned air reaches all parts of the home adequately.

2. Augmenting Dehumidification Capacity

When the system enters dehumidification mode, the controlled airflow and a specialized air bypass feature work together to maximize moisture removal:

- *Bypass Effect on Refrigerant: The air bypass mechanism reduces the volume of air passing directly over the main evaporator coil. This targeted airflow causes the refrigerant process to drop the suction pressure within the system.*
- *Significantly Lower Dew Point: A lower suction pressure leads to a much colder evaporator coil. The colder coil aggressively chills the remaining air, causing more moisture to condense out. This effectively lowers the delivery air dew point, significantly boosting the unit's ability to remove humidity (latent capacity).*

3. Achieving Continuous Comfort

By prioritizing latent energy removal (moisture) and deliberately reducing sensible cooling capacity (temperature drop), the system is fine-tuned for high-humidity conditions. The unit can run almost continuously at a low, modulating speed. This extended run time:

- *Sustains Dehumidification: Ensures moisture is being removed constantly, preventing humidity from building up.*
- *Prevents Short-Cycling: Eliminates the inefficient on/off cycling that occurs when a system cools the air too quickly, maintaining a stable temperature and humidity level.*