

# FAIL-SAFE, DEPENDABLE OPERATION

## Challenge

Environmental control is critical; dependable operation is required all day, every day throughout the year. Control failure can result in catastrophic degradation of operational capacity and potential crop loss. In typical comfort applications, a mechanical failure causing a drastic temperature change in the occupied space would result in occupant discomfort and perhaps a temporary decrease in productivity. However, an equivalent mechanical failure in the indoor horticultural environment (IHE) could result in damage or loss of the entire crop.

The IHE requires 24 hour operation, 365 days per year. These conditions can require cooling and dehumidification even on the coldest days, or reheat on the warmest days, resulting in increased component stress when compared to traditional HVAC.

The complexity of providing constant, precision control and varying operating modes increases the likelihood of failure. Unscheduled maintenance results in difficulty locating qualified, knowledgeable service personnel and parts in an emergency that can ultimately result in crop damage or loss.

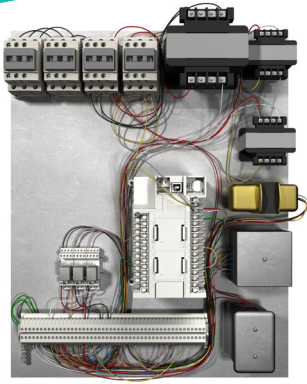
## Solution

*SolutionAir has designed the GRW to minimize the likelihood of failure through specific design elements.*

1. High temperature rated condenser motors:
  - + The condenser motors are rated for 150 °F (66 °C), higher than the typical 125 °F (52 °C) rating. By having a motor that is designed to significantly exceed the discharge temperature the motor will be less likely to fail.
2. Premium efficiency motors designed for North American power:
  - + The GRW uses three-phase induction motors that are designed for 60 HZ North American power and provide premium operating efficiencies. A motor designed for the power it is using is less likely to fail.
3. Direct drive blower motors:
  - + The elimination of the belts and drives not only reduces a common failure point; it also increases efficiency and reduces energy and maintenance costs.
4. Electronic expansion valves:
  - + Electronic expansion valves more accurately meter refrigerant, ultimately protecting the compressor from the damages of excessive and insufficient refrigeration charge. This is particularly important with the constantly changing operation requirements of the IHE.
5. Rigid Cabinet Construction:
  - + The GRW's cabinet is designed to maintain its structural integrity over time. Redundant fastening methods without the use of screws reduce the risk of the cabinet shifting and separating. The marine grade aluminum cabinet reduces the effects of corrosion, allowing it to retain its strength and form.



## Compensating Controls



**The GRW includes our Detect + Protect™ advanced monitoring system to identify potential issues before they can become emergencies.**

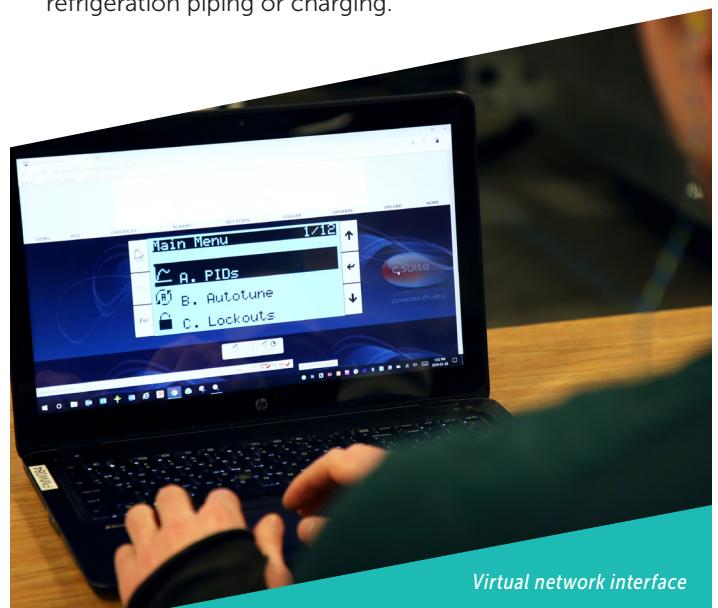
1. Refrigeration charge monitoring:
  - + Monitoring the refrigeration circuit's charges will detect an issue before a reduction in capacity.
2. Motor temperature monitoring:
  - + An increase in temperature in a mechanical device is usually a red flag. The GRW monitors the operating temperatures of the compressors, blower motor(s) and condenser motors.
3. Variable capacity condenser fan control monitoring:
  - + The required condenser fan speed is relative to load and outdoor temperatures. If this value rises it can indicate plugged condenser coils, or condenser fan assembly issues.

**In the event of a failed component, the SolutionAir GRW is designed to continue to operate and control the space:**

1. Multiple independent variable capacity refrigeration circuits:
  - + A failure of a single compressor will not result in an increase in room temperature or space absolute humidity.
2. Multiple independent evaporators with multiple independent electronic expansion valves.
  - + The loss of a single electronic expansion valve although unlikely will have virtually no effect on performance.
3. Compensating controls:
  - + In the event of a loss of capacity the GRW unit will automatically adjust set points to maintain relative humidity levels at higher temperatures, to prevent problems associated with high humidity.
4. Redundant blowers:
  - + Every blower motor is equipped with an individual VFD and backdraft dampers. If a VFD or motor becomes inoperable, the remaining blowers, each capable of handling the minimum airflow, will increase their speed to make up the lost airflow.

**The SolutionAir GRW is designed to make repairs efficient, because despite the best design, any mechanical equipment will inevitably require repairs over the unit's lifetime.**

1. Advanced control monitoring:
  - + Advanced computer controls monitor components and sensors through network connections and can identify failed components to reduce diagnostic time.
  - + A virtual network interface provides a live view of unit performance and logged unit history data can be viewed remotely.
    - Eliminates the use of service gauges when evaluating system performance speeding up diagnostic time.
    - Units can be connected to the VNI via LAN or cellular connection.
    - Our factory service team can remotely connect to units in the field to aid in diagnosing any issues.
2. DIN rail mounting:
  - + Controllers are din rail mounted with plug in connectors for quick replacement.
3. Simplified serviceability:
  - + Evaporator, condenser, and reheat coils are designed for quick replacement without cabinet disassembly.
  - + Blower components can be changed in the blower compartment.
  - + Condenser fan assemblies can be quickly replaced and are connected by plugs.
  - + Standard parts can be kept onsite for quick replacement.
  - + Evaporator, condenser, and reheat coils are kept as standard stock items at SolutionAir.
  - + Cabinet is designed for quick installation, without any on site refrigeration piping or charging.



Virtual network interface