

Technical Guide TG2016.10

Born in the USA,
refined in Cambridge, UK

Invisible.AC is the 21st century incarnation of the high-velocity air heating system first invented in the USA after the second world war by jet propulsion engineer Calvin McCracken. McCracken recognised the way the thrust of a jet engine creates a swirling mixing in the surrounding air and he thought of applying the same principle to cooling and heating systems. He called the principle **aspiration** and demonstrated its ability to create much more uniform air temperature distribution than conventional low-velocity systems.

Originally commercialized in the USA by Jet-Heat and since further developed by others in North America, high velocity systems grew to satisfy many domestic requirements, but have failed significantly to penetrate UK and European markets. Among the reasons for this failure to cross the Atlantic are:

- High noise levels unacceptable to the more sophisticated European customer.
- High energy consumption.
- Problems in the transition from 60Hz to 50Hz mains supply.
- Relatively unsophisticated control systems.
- Questionable reliability in service.

Now Invisible.AC, working from the world-renowned St John's Innovation Centre in Cambridge, has taken McCracken's original **aspiration** principle and has developed a full product range for European markets. Invisible.AC has applied its own experience in international requirements and standards to build systems which fully satisfy the cooling, ventilation and heating requirements of European markets. Invisible.AC products carry the CE mark, confirming that they meet all relevant EC Directives, some of the strictest technical specifications in the world.

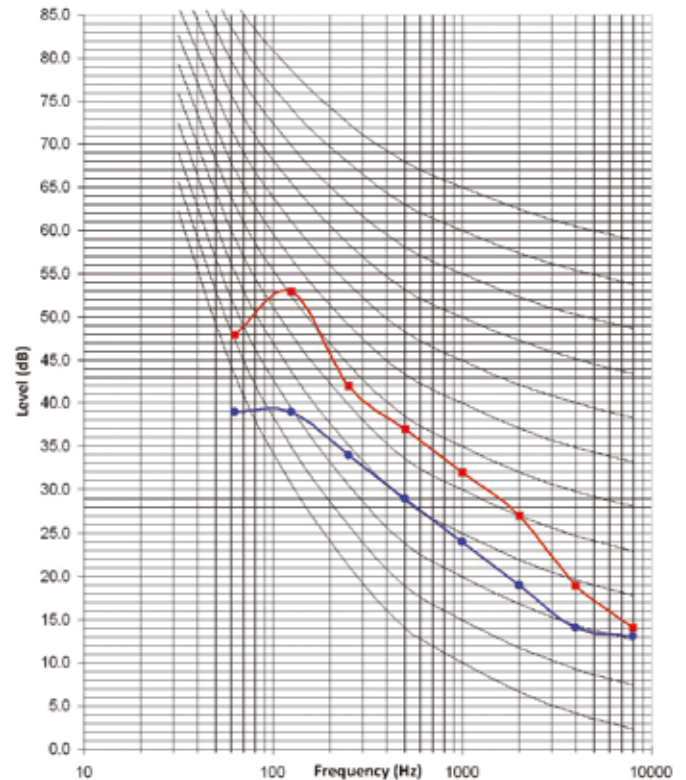
Design features which overcome the limitations of North American systems include the application of:

- The latest European electronically-commutated (EC) blower motors for:
 - *Inherently low noise and vibration.*
 - *Low power consumption.*
 - *Total controllability for optimum blower duty under all conditions.*
 - *Electromagnetic Compatibility (EMC) meeting stringent European Directives and fully CE marked.*
- High-efficiency aerodynamic backward-curved blower rotors.
- Energy-efficient proven leak-free UK-manufactured heating/cooling coils with extralarge surface area for responsive thermal transfer.
- Thorough and effective handling of condensate with reliable large-bore low maintenance drainage system.
- Zoned temperature control modulating airflow not only via dampers but also via blower speed for maximum system energy efficiency and low noise.
- Bottom-up acoustic design for comprehensive noise attenuation.

The new Invisible.AC system provides energy-efficient heating/cooling for both commercial and residential buildings, designed for simplified installation and quiet efficient operation. The system incorporates a high static pressure blower/heat exchanger unit, a modular plenum duct, and a kit of ready-insulated sound-attenuating flexible mini air ducts which together create a unique system to distribute the warmed/cooled air throughout the building. It is unlike any conventional air distribution system in design and principle, requiring only around one tenth the space for duct runs. For example, Invisible.AC is proving very successful for the heating/cooling and dehumidification of historic buildings which were never originally intended to have duct systems installed.

Invisible.AC offers a range of compact high pressure low noise air handlers as well as several options to make up the core of the system. These range from 3 kW to 36kW rating, each being matched with the heating/cooling coil of appropriate output. Coils are available for both heated/chilled water and direct refrigerant, making the systems ideal companions for the new generation of efficient (high COP) heat pumps. The lower power units are also available as integrated (fancoil) assemblies. All coil units have specially designed primary and secondary condensate trays with reliable condensate drain connections. Units are designed for both horizontal and vertical orientation in installation and handle condensate drainage reliably in both positions.

All units feature fully corrosion resistant internally insulated cabinets with vibration damping and acoustic absorption. All air handlers are compatible with the standard Invisible.AC distribution system components, typically using 2 outlets per kW of heating/cooling. Each outlet delivers approximately 450-750W at an air volume flow of 15-30 l/s depending on coil delta-T.



Red curve: Octave-band noise spectrum:
Typical North American 10kW system:

Noise Rating 36.

Blue curve: Octave band noise spectrum:
Invisible.AC 10kW system in exactly the same
circumstances showing its much improved noise level:

Noise rating 25.

The Invisible.AC system operates at typical air pressure of 370 Pa (1.5 in WG) in the plenum as compared to a conventional ventilation system's 20-40 Pa (0.1 to 0.15" WG). This high pressure technology facilitates the remarkably compact duct sizes and air velocity to create air **aspiration** in living and working spaces. There is no complicated duct sizing required because the system is designed around Invisible.AC pre-manufactured parts. All air distribution components are pre-insulated and pre-assembled.

Quietness—designed in from the start

Low noise and vibration are designed into Invisible.AC systems from the Engineering Laboratory right through the production process. Smooth-running electronically-commutated blower motors minimise noise at source, whilst facilitating precise speed control. Counter-intuitive it may be for high-velocity air transmission, but Invisible.AC's acoustic technology, with its sound-attenuating ducts and low-turbulence 66mm circular and 25mm linear ceiling and floor slot outlets, makes these the quietest air conditioning systems around.

Invisible.AC—the European mini-duct central heating & air conditioning system

Invisible.AC makes a home, office or restaurant a comfortable place in all weathers. It's the central heating and air conditioning solution of choice – particularly for buildings that are not constructed for conventional ducts. So it's the system for most European applications.

Invisible.AC is the way to exploit a Heat Pump's energy efficiency and transfer its heating and cooling output into your building to achieve today's COP requirements.

You can count on Invisible.AC's **aspiration** principle to provide uniform cooling and heating from floor to ceiling with no hot or cold spots, along with quiet, low-energy operation.

Invisible.AC—The system that lives up to its name

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