

Application Note Series

Clean Air for Safe Environments of Care – Measure and Monitor Airflow for Infection Prevention and Control in Healthcare Settings

Product Platforms: Air Velocity Sensors, Multi-Point Airflow Sensing, Airflow Alarms & Monitors, Visualization

Purpose: Modernizing airflow measurement and monitoring for safe care environments

Testing Range: 0.15 m/s to 20 m/s [30 fpm to 4000 fpm]

ABSTRACT:

Ventilation systems provide environmental control for comfort, asepsis, and odor in healthcare and other facilities. Indoor air management protects people and processes. Our medical professionals and healthcare workers work tirelessly to create, maintain, and improve safe care environments for all. There's a lot done behind the scenes, which we don't see, and modernizing airflow monitoring is one of those things. Measuring and monitoring flushing air changes, room pressurization levels, and filter integrity are just a few of the ways ventilation is controlled, air is kept clean, and airborne contamination is prevented.

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Part 1: Monitor Air Change Rate for Infection Prevention and Control



Airflow Sensing & Monitoring for Airborne-Contaminant Removal:

Infection prevention and control (IPC) measures to protect patients, personnel and visitors are well-established by hospitals, rehabilitation facilities, healthcare centers and multitudes of other public and private entities. In light of the COVID-19 pandemic and [supplemental guidance from the CDC](#), many are upgrading engineering controls for their facilities and implementing strategies to remove hazards through air ventilation.

Many hospitals are currently retrofitting patient rooms with airflow monitors, in support of their sanitation processes:

- The air change rate for a space is known, and monitored,
- the number of air changes per hour needed to clear a room of potentially infectious particles has been considered by facilities, and
- the time required for [airborne contaminant removal by efficiency](#) has been determined.

Once a patient vacates a room, a countdown timer is initiated. Healthcare personnel and patients are then prohibited from entering the room until the countdown timer finishes, signifying that the predetermined time period for enough air changes to remove potentially infectious airborne contaminants has elapsed.

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Figure 1 Airborne Precautions Signage

Know the Air Change Rate for Your Space:

Knowing and monitoring air change rates for your spaces helps maintain safe and healthy environments and prevent the spread of infectious diseases. Air changes per hour (ACH) is essentially the volume of air the HVAC system can provide in an hour, divided by the volume of the room. Typically, CFM is converted to CFH and then divided by room volume to determine ACH.

To determine air changes per hour for a space, measure air velocity using a DegreeC [probe style air velocity and temperature sensor](#) mounted in duct, and then use the air changes formula.

Alternatively, use DegreeC's [Rooster™ Monitor200](#) with duct mounted air velocity sensor to measure and display the air volume added to, or removed from, a space. The Monitor200 is BACNet® MS/TP capable which allows for easy integration into building management systems as well as remote monitoring of ACH and other critical airflow parameters.

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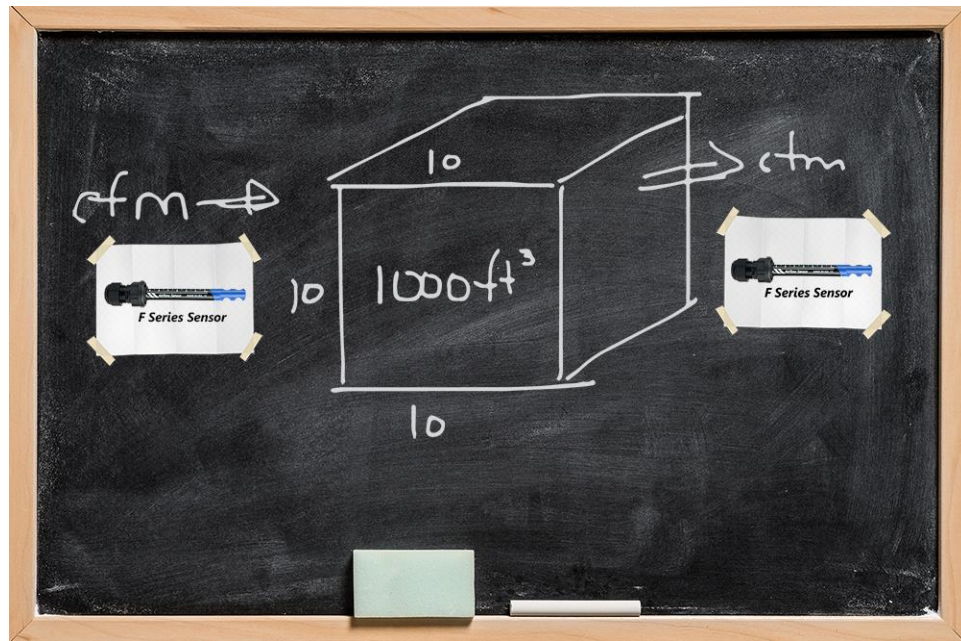


Figure 2 Measure Air Velocity to Determine ACH for Your Space

As you work to review and revise your systems, please don't hesitate to contact Degree Controls with questions about our airflow sensing and control products. Take good care, and thank you for all that you do.

Part 2 of our series, *Clean Air for Safe Environments of Care– Measure and Monitor Airflow for Infection Prevention and Control in Healthcare Settings*, presents the [Rooster™ Pressure 100](#) to continuously monitor room pressure differentials for contamination control.

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Part 2: Monitor Pressurized Spaces to Maintain Safe Environments of Care

Note: Part 1 of our series, *Clean Air for Safe Environments of Care – Measure and Monitor Airflow for Infection Prevention and Control in Healthcare Settings*, presents airflow sensing and measurement for monitoring air change rates to ensure room air is clean.



Monitor Room Pressure for Safe Environments of Care:

Hospitals and healthcare facilities recognize the importance of protecting patients, workers, and patrons from hazards. They evaluate their ventilation systems on an ongoing basis, and continuously work to make both systems and engineering controls better, for improved health and safety.

Healthcare organizations are installing room-based pressure monitors in all types of functional areas to further strategies for infection control and ensure their pressurization process is compliant. Reference [ANSI/ASHRAE/ASHE Standard 170-2017](#), Ventilation of Health Care Facilities, for ventilation recommendations for spaces directly affecting patient care. Table 7.1 shows what the pressure relationship to adjacent areas should be for spaces within healthcare facilities.

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Figure 3 Monitor Room Air Pressure for Safe Environments of Care

Know the Pressurization Level for Your Space:

To continuously measure and monitor positive or negative pressure differentials in order to maintain proper pressurization for functional spaces, use a [Rooster™ Pressure100](#) from Degree Controls. The Pressure100 is efficient, easy to use, and air pressure trip points can be set by the user via color touch screen display. The Pressure100:

- *Alarms* audibly and visually when pressure is at an unsafe level, and can be easily integrated into laboratory or building management systems (BMS).
- Continually *displays actual air pressure* measurements, as well as air temperature and relative humidity.
- *Links pressure data to functional areas* with customizable room names.
- Features *data logging* with convenient USB export for compliance record keeping, demonstrating that required levels have been achieved.

See the Degree Controls website for additional benefits and [Rooster™ Pressure100](#) information.

Outdated Instruments Don't Show Actual Pressure:

Upgrade outdated ball in tube devices. Know what pressure differentials are, alert staff when user set thresholds are exceeded, and store data to identify problems early. Proper pressurization of space is critical to safety, and continuous monitoring of pressure levels is just as important. When actual pressure differentials are available, rather than only the existence of "a differential", a higher level of



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safety can be achieved. Contamination may still occur if pressure differentials are too small.

Contact Degree Controls to purchase your Rooster™ Pressure100 today, maintain proper pressurization levels, support infection control, and meet compliance standards. Even facilities with limited budgets are taking steps to implement facility-wide pressure monitoring. They're first introducing room pressure controllers to areas most in need, and then using a phased approach to expand deployment.

Our sincere thanks to all in the healthcare community.

Part 3 of our series, *Clean Air for Safe Environments of Care – Measure and Monitor Airflow for Infection Prevention and Control in Healthcare Settings*, discusses regular testing of installed filters using airflow measurement tools to ensure filtration systems work as designed.

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Part 3: Test Filter Integrity for Safe Indoor Air

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Air Filtration Promotes Safer Indoor Air:

Ventilation and filtration provided by HVAC (heating, ventilating, and air-conditioning) systems can remove contaminants from the air, and thus lower the risk of airborne transmission of diseases. HEPA (high efficiency particulate air) filters are air filters designed to stop or capture very small particulates from an air stream at a highly effective rate. According to the U.S. Department of Energy, to qualify as HEPA, a filter must remove at least 99.97% of particles when tested with an aerosol with a size of 0.3 microns. HEPA filtration is widely applied in healthcare environments, as well as in HVAC systems in commercial and industrial facilities.

Test Filter Integrity to Keep Indoor Air Clean:

The air filtration system is only as good as the filter. Qualification testing of HEPA filters is performed upon installation, and periodic in situ testing is done to ensure that filters are in good operating condition, satisfying the required level of efficiency without any leaks.

Use single or [multipoint](#) air velocity sensors to verify proper flow rates through filters and to measure face velocity across filters to ensure spatial uniformity. Use [airflow visualization](#) foggers to verify unidirectional airflow through filters, as well as to identify any leaks or turbulence which could compromise clean areas. Airflow test methods for characterizing the performance of

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cleanrooms and clean zones are specified in [ISO 14644-3](#). Installed filter system leakage is just one of the named airflow test methods.

HEPA Certification with DegreeC Foggers:

[FlowMarker™](#) and [°C Breeze](#) fog generators for airflow pattern testing represent a small subset of airflow measurement and monitoring tools and instruments from Degree Controls that are used by HEPA certification teams:

- Handheld foggers are portable, easy to use, and show real-world airflow patterns immediately.
- Safe, sanitary, FDA-GRAS fog generators provide excellent flow visibility.
- A wide selection of nozzle types and extensions are available to meet distinct application needs.



Figure 4 Degree Controls FlowMarker™ and °C Breeze Foggers

Contact Degree Controls to advance your in-house airflow testing and monitoring capabilities, and identify potential problems before systems and safe environments of care become compromised.

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CONTACT:

To find out more about Degree Controls' sensor products and solutions, contact us at 1-877-degreeC, or visit our website at www.degreeC.com. Email sales inquiries to sales@degrec.com.

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