

Application Note Series

Side-Wall Sensors: Designing for Pressurized Laboratory Cabinets and Fume Hoods.

Degree Controls endorses side-wall (also known as side flow) sensing as the better velocity sensing technology in critical containment cabinets for several reasons, which include:

- (i) Many containment cabinets exhaust airflow laden with corrosive chemicals. Over time, these chemicals can erode probe-style sensors which are exposed to these compounds.
- (ii) Many containment cabinets exhaust airflow laden with depositing particles. Over time, these particles can build-up and compromise probe-style sensor performance.
- (iii) In cabinets with a movable sash and local fan, the correlation of duct velocity to face velocity is more difficult to establish in this turbulent environment.



The sidewall sensor overcomes these issues by acting as a flow-through velocity device, using laboratory air, not contaminated exhaust air.

Using patented sensor technology, degreeC builds high performance air velocity sensors for the Laboratory Equipment market. The Side-Wall sensor head is available on Degree Controls' F350, F450 and F550 series of air velocity and air temperature sensors.

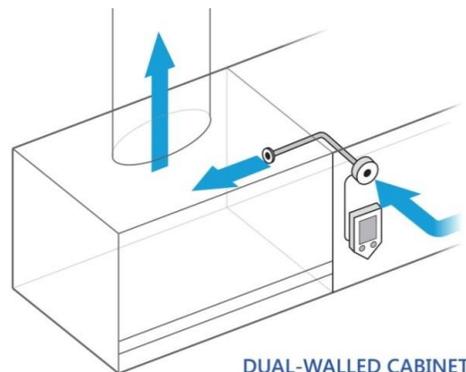
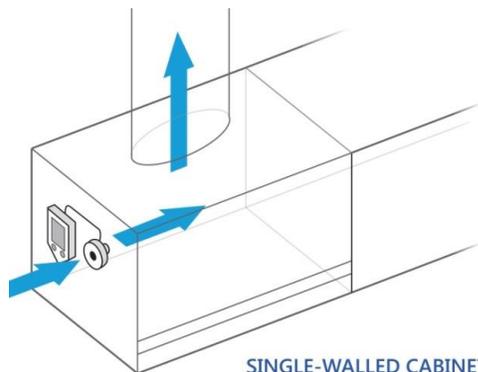
Principal of operation:

The actual velocity measured through a side-wall sensor is a function of the cabinet's negative pressure, which is created by the airflow exhaust system. The negative pressure changes when a sash is opened, or the overhead exhaust system adjusts its speed, and this will manifest itself as a pressure change, which is measured by the side-wall sensor as a velocity change. The side-wall sensor's measured velocity exhibits excellent correlation to these changes in pressure, and their corresponding effect on face velocity.

Different methods of installing a side-wall sensor:

In single wall cabinets, the side-wall sensor is a one-piece assembly, installed through a hole cut into the sheet metal cabinet. DegreeC offers an optional air screen, which acts to protect the sensitive element, laminarize flow, and in some cases act as a pre-filter for larger particulate, such as lint.

In systems with a dual wall, the side-wall sensor can be mounted and used in conjunction with flexible tubing, in order to create an airflow path from inside the cabinet, through the side-wall sensor, and into laboratory air. The principal of operation is the same; the velocity measured in the side-wall sensor is a function of the negative pressure of the cabinet, and therefore a function of face velocity.



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Correlation to face velocity:

By its very nature, a side-wall sensor is an indirect measurement of face velocity. The air velocity through the sensor and the actual measured face velocity shall never be the same, because the impedance of these airflow paths is different. In fact, the air velocity through the sidewall sensor shall always be less than the actual measured face velocity. This is not a sensor problem; it is a system reality, which then requires correlation, sometimes called calibration, to remedy. Correlation is required in all cases, so that the relationship between the side-wall sensor's measured velocity, and the real face velocity is established. This only needs to be done once in a given system, and is part of normal commissioning and certification processes. The correlation is typically accomplished using a hand-held instrument. It is used to measure face velocity, while taking side-wall sensor readings, and then inputting these readings directly into an airflow alarm monitor to make the correlation.

When I order a side-wall sensor, what velocity calibration range do I ask for then?

In industry, all air velocity sensors are ordered with a specified velocity range, to which the sensor's accuracy performance is guaranteed. In the critical containment/fume hood market, a client normally knows what the safe face velocity requirement is, but cannot know in advance what the side-wall sensor's velocity range will be, without first installing one and taking some readings. For this reason, we suggest that a client start with a side-wall sensor calibration range of 30 – 100 fpm (0.15 – 0.5 m/s) for chemical fume hood applications, when they know their desired face velocity is approximately 60 – 150 fpm (0.3 – 0.8 m/s).

How do I validate that my calibration range is correct?

After receiving your side-wall sensor, first install the sensor as it would be in your production environment, and assert known good flow. Known good flow is the industry term for your normal operating air velocity. Start monitoring your readings from the side-wall sensor, and you should find that you are in the middle of the output range.

For example, if you have ordered a 0-10V output side-wall sensor, during known good flow it is desirable to have the sensor output be in the middle of this range, approximately 4-6 V. This allows good headroom for lower and higher face velocity conditions the cabinet may encounter.

Should you find that the output voltage is not close to the middle of the output range, call degreeC and share your findings, and we will adjust the calibration range for future orders. Ideally, we would make the adjustment, and you would re-test to verify.

Using the side-wall sensor with a face velocity monitor:

Using the vendor manual for the face velocity monitor you are employing, follow their correlation (sometimes called calibration) procedures. Normally this involves a hand held air velocity meter, real-time adjustment the sash position to set one or two face velocities, and then inputting the measured face velocity reading directly into the monitor, thereby establishing the correlation of side-wall sensor's output to actual face velocity.

CONTACT:

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

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