Nailor® Industries Inc. ENGINEERING BULLETIN

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PRODUCT AIRFLOW SWITCHES
SUBJECT: Fun Facts About Airflow Switches on Electric Duct Heaters and Single Duct Air Terminal Units with Electric Reheat (Part 1)
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The airflow proving switch is considered a safety device; its purpose is to lock out electric heat if there is no airflow across the heater. It does **NOT** measure airflow nor prove a minimum flow. Presence of airflow and pressure is critical because of the temperatures at which electric element wires operate. In normal operation, the element wires have a surface temperature of about 600o to 800o F. Under inadequate airflow conditions, this can increase to temperatures above 2,000° F.

The airflow switches used on Electric Duct Heaters and Single Duct Air Terminal Units with Electric Reheat by nearly all electric heater manufacturers are the most sensitive switches available for this type of application. They operate at a differential pressure of 0.05” w.g. This value has a tolerance and hysteresis of 0.02” w.g. That means that the maximum signal where the switch might activate is between 0.03 and 0.07” w.g. Most of them operate on the low end, but occasionally one will operate closer to the high end.

It is important to note that the pressure signal picked up at the probe is a **total** pressure signal, **not a static** pressure signal. Static pressure alone in most of these applications is not adequate to operate the switch. For Duct Heaters, there is usually adequate total pressure in the duct system, but the static pressure may be quite low since there are few adjustable devices downstream of the heaters in the duct system. For Duct Heaters mounted on the inlet of the fans in air handlers, the probe may actually measure a negative pressure in the duct. There is a negative side to the air pressure switch that can be attached to the probe in this case. In these negative pressure conditions, turning the probe so that it faces downstream can improve the total signal when attached to the low pressure port on the switch.

For single duct Terminal Units, the area in the downstream section of the unit is much larger than that of the round inlet, or the cross sectional open area around the damper blade especially when the airflow is adjusted to minimum values for heating. The probe is usually located in that downstream section; consequently, the static pressure will be very low in this area. Since the terminal unit is also set to minimum flow in the heating condition, the velocity pressure will also be low. This is problematic in that neither sufficient pressure not volumetric flow may be present to fill the bellows in the airflow switch moving the diaphragm to make the switch. If the pressure and flow are barely adequate, the diaphragm may flutter causing chattering in the contactors and/or relays in the heater control box. This chattering damages the contacts in the chattering relays.

When balancing and commissioning these heaters, there are three minimum flows that must be considered: inlet static at the terminal unit, minimum airflow across the heating elements and the minimum pressure and volumetric flow to make the airflow switch.

Part 2 will cover options to fix the switch operation.