

DATE: November 1, 2018
PRODUCT AIRFLOW SWITCHES
SUBJECT: Fun Facts About Airflow Switches on Electric Duct Heaters and Single Duct Air Terminal Units with Electric Reheat (Part 2)
ISSUED BY: GUS FARIS

This paper covers methods to fix problems with airflow fan interlock switches when the pressures or volumetric airflow is too low to make the switch. **See Fun Facts About Airflow Switches on Electric Duct Heaters and Single Duct Air Terminal Units With Electric Reheat (Part 1) in whatever reference to HAR is required.**

Electric Heaters on Air Handlers, Blower Coils and Fan Coils

When there is one heater related to one fan or one fan wall, a single safety relay may be used to interlock the heater operation with the fan operation in the air moving device. This satisfies the requirement for a fan interlock relay in UL 1996 and provides an electric relay that is not dependent on airflow as that fan interlock. This also eliminates the problems with the negative pressure condition described in part 1 of this paper.

For systems where there are multiple duct heaters downstream of a single air handler the electric relay will not satisfy the problem. See below for possible fixes.

Electric Heaters on Single Duct Air Terminal Units and Systems with a Single Fan and Multiple Electric Duct Heaters

Fixing the low airflow condition causing the airflow switch to not function on single duct terminal units or multiple duct heaters all downstream of a single air handler is more problematic than with a fan relay. Normally there are multiple VAV devices installed downstream of the single fan in an air handler, so an electric relay will not work as an interlock device.

As mentioned earlier, there are three minimums 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. The airflow switch does **NOT** measure airflow nor prove a minimum flow; that is the job of the VAV terminal unit controller. The minimum airflow must satisfy the minimum outdoor air requirement and the minimum airflow requirement to keep the heating elements from overheating. The minimum inlet static pressure requirement for the minimum flow must be met in order to have adequate pressure to move the air downstream of the terminal unit and into the room. These values are common to all terminal units. Those terminal units with airflow switches must also satisfy the minimum total pressure at the pitot tube to activate the airflow switch.

The easiest way to get the airflow switches to make on duct heaters or single duct terminal units is to increase the downstream static pressure. This can be done by slightly closing the balancing dampers in the duct runouts. Only a few hundredths of an inch of additional static pressure is required. While this does cause the static pressure to increase at all flows, it is normally not enough to be recognized at the power meter. It does cause the VAV damper to slightly open allowing more air and a more stable air pattern at the pitot tube.

If there is no balancing damper in the duct, any type of duct restriction will work. This would include but not be limited to using a smaller neck diffuser, adding elbows for pressure increase, or even installing an OBD in the neck of the diffuser. The ceiling tiles can be important for the switch pressure, too. If the tiles are in place, the ceiling plenum will be slightly negative. The airflow switch is measuring the differential pressure between the probe and the pressure inside of the electric controls enclosure, which should be very close to the ceiling plenum pressure. So, less pressure in the plenum on the negative side of the airflow switch requires less pressure at the probe on the high side of the switch. Remember, only a slight increase is necessary.

Last, the minimum airflow setpoint can be increased. This may cause a heating issue if the increase is large enough to provide too much cold primary air during the heating mode. The design engineer should be consulted about this.

Here is what NEBB says about this issue.

“8.8.4 COOLING UNITS WITH REHEAT”

This is a cooling terminal unit with the addition of an electric or hydronic heating coil. Units with electric heating coils are supplied with an airflow switch that shuts off the heating coil if the total pressure at the reheat coil falls below a certain value. The intent of this safety is to prevent damage to the unit or the heating coils, however, it does not assure adequate air flow as the device is currently used. Adequate backpressure on the terminal unit is required to activate the switch, which may require the installation of an additional damper in the terminal unit discharge duct.”