4GS CO2 SENSOR DUCT MOUNT CONFIGURATIONS

The 4GS CO2 sensor is available in a variety of configurations, one of which involves the direct application of the sensor to HVAC ductwork. In this configuration the 4GS is numbered as the 4GS-3, and comes complete with the 4GS sensor and the unassembled duct mount kit. The sensor itself is configured with voltage and relay outputs, and the duct mount kit includes the aspiration box assembly. The pitot tube assembly is not available from Texas Instruments, but is available through many distributors. The pitot tube and duct mount kit (aspiration box assembly) are the two preferred solutions for attaching your 4GS sensor to many duct applications. The following information will help in differentiating between the two applications in order to best meet your needs.

Pitot Tube Application

In HVAC applications, ductwork can be either positively or negatively pressurized relative to the outside environment. If a duct is positively pressurized, the installation of a pitot tube within the duct will allow air to be brought out to the attached sensor. In such instances, the response time and the final reading of the sensor will depend on the actual airflow pressure to the sensor. As one should expect, the lower the pressure differential between the duct and the environment, the lower the actual air flow to the sensor. Fig.1 shows the typical airflow through the pitot tube for various duct total pressures, and Fig.2 shows the response of the 4GS-CO2 sensor under various flows of 800-PPM CO2 gas.

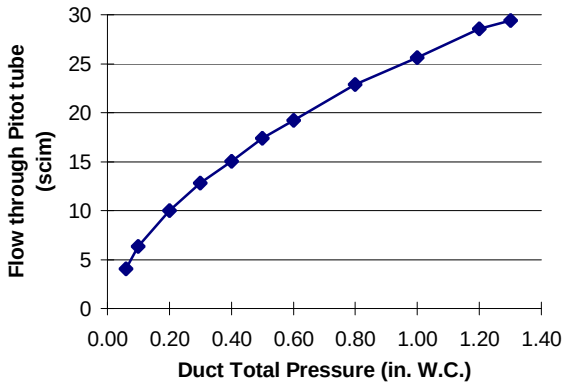

Fig.1

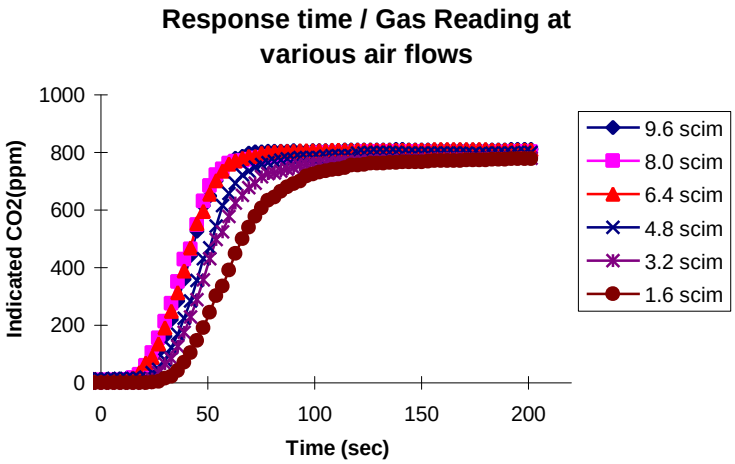

Fig.2

The preceding results indicate that the sensor response time, and subsequent final sensor reading, will reach an optimum point when the flow rate is 6.4scim or better (or an equivalent 0.10 in W.C. total duct pressure). It should be noted that at lower duct pressures the sensor will respond, but more slowly and with a slightly lower final reading.

Aspiration Box Application (Duct Mount Kit)

Under those circumstances where duct pressure is maintained at a lower level than the environment, a pitot tube is considered ineffective. Under such circumstances the aspiration box, or duct mount kit, should be used instead. The aspiration box application is very effective when the air speed within the duct is sufficiently high, regardless of the differential pressure. This is true because the level of airflow through the aspiration box primarily depends on the air speed within the duct, and not the differential pressure.

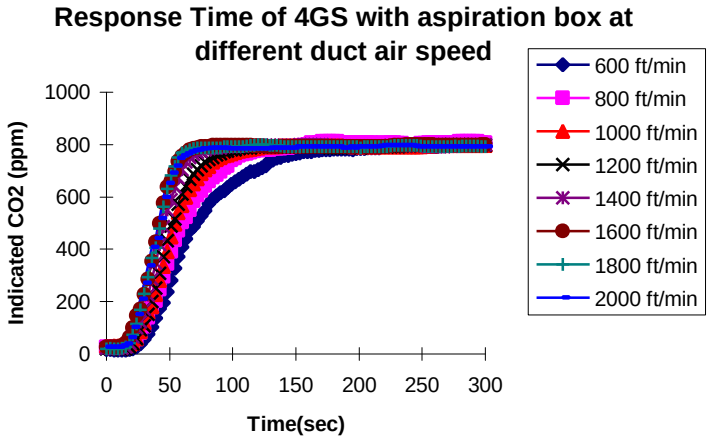

Fig.3

Figure 3 illustrates the response level of the 4GS sensor within the aspiration box configuration for various duct air speeds. As expected, lower air speeds increase the response time of the sensor. While the response time is better for air speeds greater than 1200ft/min, the aspiration box can be effectively used in ducts where the air speed is as low as 800ft/min, as long as response time is not a critical issue. Regardless of air speed, once the optimum reading level is obtained, the reading is very stable.

As can be readily seen, the 4GS CO2 sensor is a very versatile instrument in providing for a multitude of monitoring solutions. The use of a pitot tube, or the addition of the aspiration box assembly, merely extends the proven utility of the sensor to virtually all duct-monitoring applications.