

In-Situ Tips

For flue gas applications: -

1) Location

On coal-fired boilers the best mounting position for a 1231 probe is vertically downwards. The probe can be used without filters but the purge facility should still be utilised.

Locate the probe where the process temperature is between 300°C and 700°C. Below 200°C the inner sheath, outer sheath and heater can be corroded by concentrated acids condensing on the S/S and inconel. Above 800°C, the heavy metals and many compounds are hostile to the electrode material used on the surface of the zirconia sensor. Silica will also attack the grain boundary layer of the sensor.

The probe should be located at least five flue / duct diameters downstream of any bends and three diameters upstream of any bends.

2) Gas Velocity

The gas velocity passing the end of the probe should be greater than 5 metres per second. Low gas velocities result in slow refresh times of the process gas around the sensor causing a gradual depletion of the oxygen reading; any hydrocarbons in the gas will accelerate the oxygen depletion rate at the sensor's surface.

3) Dust

If the particulate loading is less than 500 mg/Nm³ then filters are not required. Use the sintered filters for particulate loadings in the range of 0.5 to 10 g/Nm³. 30 micron filters are used on most applications but 15 micron filters are available if required. Remember that the response time to changes in oxygen levels dramatically increase with the finer pored filters.

For dust levels up to 200 g/m³ on coal fired boilers the fly-ash can be abrasive. A protection shield may be required to prevent the probe from being prematurely destroyed.

In higher dust levels than 200 g/m³ do not use filters but the probe must be mounted vertically downwards and purged frequently.

4) Process Pressure

Novatech's in-situ oxygen probes can operate over the process pressure range of -60kPa to 250kPa. The analyser can compensate for a fixed process pressure or accept an analogue input signal from a pressure transducer for varying process pressures.

5) Probe Length

The insertion depth required is dictated by the size of the flue or duct and the velocity of the process gas. The probe should protrude almost halfway across small diameter flues and about 750mm into large ducts. Higher flue gas flow rates reduce the depth of tramp air ingress at the boundary of the duct and can therefore use a shorter probe.

In high temperature processes with high velocities the appropriate insertion depth can be determined by inserting an inconel (or 253MA) tube into the gas stream longer than the estimated (or guessed) insertion depth. Leave the tube in the process for a week and then remove it. The affect of heat and available oxygen will discolour the sheath proportional to the amount of heat and oxygen. The correct insertion depth is the length required to reach the point where the discoloration or oxidation of the tube is uniform.