

CEMS NEWSLETTER

Monitoring Solutions

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CEMS FROM A-Z: A MULTI-PART SERIES

This issue continues our presentation of a comprehensive look at CEMS from beginning to end, with descriptions and details on a variety of components including the probe, umbilical, sample conditioning system, analyzers and more - including maintenance and trouble-shooting topics.

This issue covers:

EXTRACTIVE CEMS PROBES:

The probe is the initial contact with the sample being drawn for monitoring. It is also the separation point of the sample gas, purge air and cal gas. Its primary function is to provide a heated environment to maintain sample gas temperatures above the stack dewpoint and remove particulate material from the gas sample.

CONSTRUCTION

The probe is constructed to serve three primary purposes:

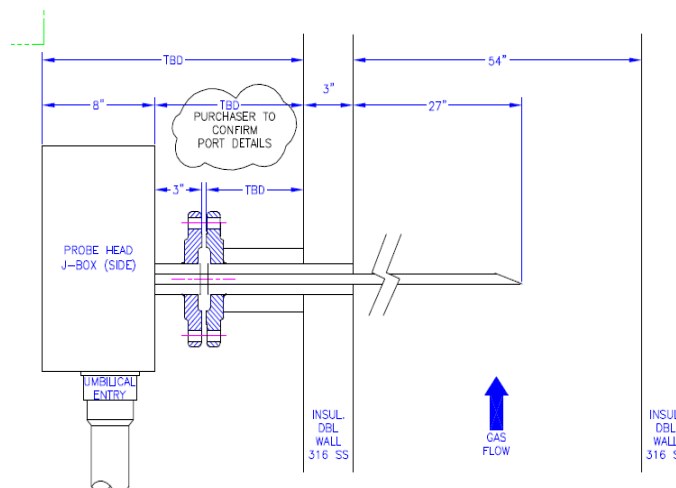
1. Keep outside air from being introduced into the sample (i.e. keep the sample air-tight).
2. Keep the sample at a temperature high enough to prevent condensation (the formation of water droplets in the system).

3. Allow for a point of cal gas introduction into the CEMS system.

The probe is housed in a NEMA 4 box. *(Type 4 enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose directed water; and to be undamaged by the formation of ice on the enclosure.)*

The main components and purposes are as follows:

Stinger - The stinger is a pipe made of either stainless steel or hastelloy

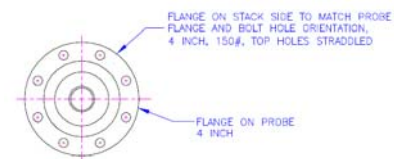


INSTALLATION NOTE:
(material selected based on application and existence of corrosive gases) that extends into the stack where the sample will be collected from.

The Stinger has an angled end which is oriented in the stack facing up so as to prevent moisture and dirt particles from direct impingement (see drawing).

The length of the stinger is determined by regulations which require that it must protrude into the midpoint of the stack or 1 meter minimum (PS-2).

Port/Flange: The probe is attached to the stack via a port with a flange on it. The flange is typically a 4" 150lb. as a standard but in existing situations, a 2" through 6" flange can also be used.



PROBE/STACK FLANGE DETAIL

There is a mating flange on the probe that matches the flange on the stack port. A gasket is typically used between the two for the best seal. Gasket material is selected based on stack conditions - high temperature stacks may need special gasket material.

The port location is determined by EPA regulations. The regs state: *It is suggested that the measurement location be (1) at least two equivalent diameters downstream from the nearest control device, the point of pollutant generation, or other point at which a change in the pollutant concentration or emission rate may occur and (2) at least a half equivalent diameter upstream from the effluent exhaust or control device.*

Internal Components

1. **Filter Housing:** The probe filter is used to keep stack contaminants from entering the sample stream. Filter options include ceramic (2 & 5 microns), stainless steel (5, 10, 20 microns) or glass – the most commonly used being ceramic.

On each side of the filter are graphoil washers to maintain an air-tight seal. The sample draws through the filter and into the sample line at a flow rate of approximately 5 lpm.

2. **Purge System:** The purge system is used to blast compressed air through the probe at predetermined intervals to clean out any accumulated dust and stack contaminants.

The compressed air is brought up the umbilical and fills a purge tank (40-60 psig) where it then travels to a solenoid. The solenoid has a plunger which is triggered through a signal from the CEMS. When the solenoid opens, the compressed air is blasted into the filter housing through the filter and out into the stack - cleaning the filter and stinger.

The frequency of probe purging is determined by application. A gas boiler system for instance would be purged much less often than a coal boiler system. Frequency can run anywhere from once a day to once an hour. The length of purge is also programmed in the CEMS and typically lasts 5-30 seconds.

Besides being used for cleaning the probe, purge cycles are typically run between each cal gas during

calibrations to clean out the line before the next cal gas is run.

3. **Cal Gas Port:** Cal gas in a CEMS is introduced at the probe. Regulations state that the entire CEMS is calibrated – not just the analyzers. By introducing the cal gas at the beginning of the probe, the gas travels the same path as the sample.

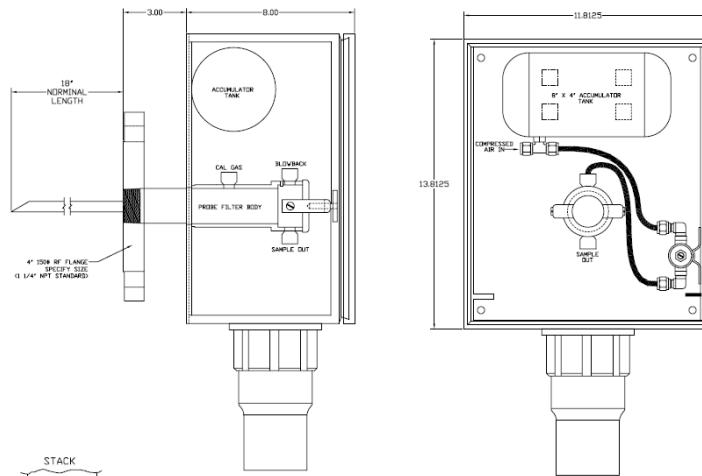
Calibration gas comes up a separate line through the umbilical. It is introduced at a flow rate higher than the sample (at least 1½ times the sum of the analyzer flow rates; typically 8-10 lpm). This allows only the cal gas to be drawn through the sample line down to the CEMS.

The cal gas line from the umbilical

The temperature is normally set between 350°-400° F to prevent condensation of the sample in the probe.

UTILITIES AND CONNECTIONS

- A. Power is supplied to the probe through wires in the umbilical thereby eliminating the need for a separate power source on the stack. 115V is the typical voltage that powers the thermocouple and heater and 24V powers the solenoid.
- B. The umbilical is connected to the probe using a heat shrink boot which is a 7" length, 2.75" min expanded I.D. nose. This is another step taken to ensure an air tight seal and protect from water infiltration at the probe box.



connects to a port on the filter housing.

4. **Heater** – The extraction probe utilizes a heater to keep the sample hot and to prevent condensation. The **heater jackets** are band type heaters attached to each side of the filter housing. A **thermocouple** is used to measure temperature. The temperature is controlled by a controller typically mounted in the CEMS cabinet.

MAINTENANCE

The probe does not require routine maintenance for the filter head or the temperature controller. The filter element requires periodic replacement, depending upon application and dust loading. This is typically done during quarterly PM's.

Some customers prefer to use the stainless steel

elements which can be cleaned and reused. They are cleaned in an ultrasonic cleaner with acid and flushed with a 50/50 solution of isopropyl alcohol and water to clean out the microscopic holes. Stainless Steel filters still need to be replaced every 1-2 years (dependent on application) because the microscopic holes eventually get clogged despite the cleaning (IPA does not dissolve the salts that build up). The system will typically need a few hours to condition/stabilize after this is done.

Monitoring Solutions is pleased to announce a
“National Service Partnership “

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Monitoring Solutions is adding the following products to our offering:

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<p>Extractive Probes</p>  A probe mounted on a large white cylindrical tank.	<p>Thermo-Electric Coolers</p>  A white and blue unit labeled 'BALDWIN' and 'COOL 5000'.	<p>Dilution Probes</p>  A probe housed in an orange protective case.

Along with all these products, we offer complete technical support, engineering and application assistance, start-up support, and parts and repair services to our customers.

Keep Monitoring Solutions in mind for any of your sample conditioning needs.

For more information or to request a complete Perma Pure Products and Applications Brochure
Contact:

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better understand CEMS"**

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THE COMPLETE SOURCE FOR ALL YOUR CONTINUOUS EMISSIONS MONITORING SYSTEM (CEMS) NEEDS:

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