How Often to Calibrate Gas Detectors

Calibration Frequency

mPower recommends calibrating gas monitors the first time they are used and then at regular intervals not to exceed 6 months, depending on use and exposure to particulates, contaminants and sensor poisons. For personal monitors, a daily bump test should be performed to ensure a functional response of all sensors and alarms.

Regulatory Requirements

Many countries have safety agencies like OSHA and ATEX that give written standards on the frequency of calibration of portable gas detectors used for protection of workers. Sensor response invariably decreases gradually with time and exposure, and therefore a functional test of the instrument is important before the user enters any potentially hazardous environment. Although calibration standards are mostly written for confined space entry monitors with LEL/O_2/CO/H_2S sensors, we recommend the same procedures for all mPower instruments including those using other electrochemical sensors, PIDs and NDIR sensors.

Causes for Sensitivity Loss

One of the most common causes for sensitivity loss is plugging or dirtiness of an inlet filter, or leaks in the sample train, so that the sample gas does not effectively reach the sensor. Pellistor-type LEL sensors can be poisoned, or their response suppressed, by silicone lubricants, acids, sulfur compounds and chlorinated compounds. Electrochemical sensors can be affected by loss of catalyst activity, drying of the electrolyte, or overexposure to corrosive gases, VOCs, or even the target gas. PIDs can lose sensitivity when the lamp ages or is coated by high-boiling compounds like heavy organic amines, or other deposits, particularly from phosphine or silazanes. A functional test applying detectable gas is the best way to check for any such issues.

- **Caution**: To test for sample train problems, it is important to set up the bump test or calibration check in a way that allows the instrument to sample the same way as in a live measurement. Thus, for diffusion instruments, the gas should be passed over the sensor and not forced through it. For a pumped instrument, the probe should be inserted into an open cup or open tube into which gas is supplied, or use a demand-flow regulator, to allow the pump to draw in the sample without being forced into the unit.

Tiered Calibration Checks

mPower strongly recommends following the guidelines of ATEX and the ISEA (International Safety Equipment Association) on instrument calibration frequency:

- Perform a daily test, either a *Bump Test* or *Calibration Check*, before entering a potentially hazardous environment. In both cases the applied gas concentration should exceed the alarm limit and ensure that the sensor and audio/visual alarms are working. A *Bump Test* need not use a define concentration gas and could be just a few seconds' exposure to cylinder gas or even a bottle of rubbing alcohol. A *Calibration Check* runs for full equilibration time and tests whether the instrument still responds within defined limits set by company policy, typically ±10-20% of the standard gas concentration.
- Perform a *Full Calibration* if either the Bump Test or Calibration Check fail, and at regular intervals defined by company policy, the instrument manufacturer, or a regulatory guideline. Full Calibrations usually have tighter specifications than Calibration Checks, such as ±5-10%. If the unit fails the Full Calibration, it must be taken out of use and sent for maintenance.

mPower suggests no more than a 1-month interval between calibrations for instruments that can be calibrated by the user. If company policy allows, this interval can be extended for up to 6 months. The best way to establish a calibration frequency is to start with daily Calibration Checks and then still

perform a Bump every day, but gradually increase the number of days between Calibration Checks until experience in the environment used establishes the longest allowable interval.

UNI 321 Monitors

The UNI 321 Series single-gas monitors are classified as “Maintenance-Free” and, under ideal conditions, do not require calibration over their entire working life of up to 3 years. However, under real working conditions it is not possible to rule out factors that can reduce sensitivity, such as dust plugging the filters, exposure to sensor poisons, or use in extremes of temperature, pressure or humidity. Therefore, where workers’ health depends on a properly functioning monitor, the UNI 321 should be bump tested before use. If a monitor fails a bump test it must be taken out of use until it can be serviced. Simple user service such as replacing the onboard filter may allow passing a bump test. If not, the unit should be calibrated. UNI 321s can be zeroed manually, but span calibration requires a UNI Docking Box or CaliCase 4-Bay Docking Station. If neither of these are available, the unit can no longer be used until serviced. In summary, we recommend the following policy:

- For optimum safety, perform a bump test before every use.
- If such bump testing is not feasible, perform a bump test at intervals guided by company Standard Operating Procedures, which we recommend not to exceed one month.
- If the bump test passes, the monitor is ready for use.
- If the bump test fails, replace the internal filter if the monitor has been used in dusty or highly humid or contaminated environments.
- Perform another bump test, and if the monitor still fails it should be calibrated before putting it into service, sent to a Service Center for repair, or discarded. As noted above, calibration requires a docking station.

UNI Lite Monitors (MP110 and MP112)

Because UNI Lite monitors utilize only H_2S and CO sensors, which are very stable, they typically require calibration only every 3 to 6 months when used under good environmental conditions. However, it is prudent to follow the cautions for more frequent calibration as described above for UNI 321 monitors. As always, company policy may call for shorter intervals.

- MP110 allows both Zero and Span calibration manually (directly on the instrument)
- MP112 allows only Zero calibration manually when in Time-Remaining-Display Mode and both Zero and Span manual calibration when in Concentration-Display Mode.
- MP100 can use an MP300T1 or MP310 CaliCase, while MP112 can use an MP311 CaliCase, for Bump tests and Zero & Span calibrations.