

Maintenance and Calibration of Continuous Oxygen Monitors Located Inside Structures and Isolated From Normal Outside Fresh Air

INTRODUCTION:

Oxygen monitors are widely used in the safety industry as portable devices to establish safe levels of oxygen in such operations as confined space entry, inert gas welding, and CO₂ fire suppression. The portable instrument is sometimes equipped with sensors for flammable gas and certain toxic gases as well as oxygen. The oxygen sensor in such a portable device (O₂ only or multiple sensors) is based on an electrochemical sensor of either the "polarographic" type or the more recently developed "capillary diffusion barrier" type. The latter version is relatively immune to altitude effects (even up to 12,000 ft. elevation), whereas the "polarographic" type sensor responds to the partial pressure of oxygen in an air sample and thus shows lower readings at elevations significantly above sea level (2,000 ft. or more), if the instrument had last been calibrated at, for example, sea level. However, the polarographic device is immune to a phenomena associated with small molecular diameter interferent gases (such as Hydrogen and Helium). The capillary diffusion barrier oxygen cell has been shown to have significant "non-fail safe" behavior around elevated levels of hydrogen or helium. For this reason, the U.S. Department of Energy and most designers of MRI's use only the polarographic oxygen sensor due to the wide use of cryogens for cooling of magnets for research accelerators or MRI chambers.

INSTRUMENT FRESH AIR/20.9% O₂ SETTINGS:

Portable gas detectors which contain an electrochemical oxygen sensor of either type discussed above should be set to 20.9% by volume in outside fresh air prior to the use inside tunnels, confined spaces, or buildings. This function is frequently called "auto set" or "zeroing" of the oxygen sensor and is really the process of using outside fresh air as a 20.9% by volume oxygen calibration gas standard (in atmospheres up to 14,000 ft. elevation).

Unfortunately, stationary (or fixed) oxygen monitors often are hard-wired into power systems, PLC's, controllers, or building alarm systems, and thus cannot be taken to the outside fresh air for the process of setting the instrument to read 20.9% O₂. Makers of the stationary oxygen monitors offer their customers calibration gas apparatus to resolve this dilemma. Such "cal gas kits" usually have a sensor calibration cover and a cylinder of gas such as 20.9% by volume oxygen (balance nitrogen) which is certified to National Institute of Standards and Technology (N.I.S.T.). The calibration gas cylinder will frequently show a date of preparation and a recommended expiration date. Instrument manuals usually cover this calibration procedure in a maintenance section of the owner's manual and may indicate one or more oxygen gas bottles of different concentration are necessary to set calibration "window" for the device.

Alternately, and as a field expediency, it is possible on some oxygen monitoring instruments such as the ENMET AM-5175, ISA-40, ISA-42M, ISA-50M, and ISA-60M to use the ambient air in which the instrument and the sensor are located to set the oxygen reading to 20.9% as shown on the LCD display of the device. To do this safely, a field portable device with an oxygen sensor can be taken to an outside fresh air location, where the reading can be verified or set to "20.9% by Vol. O₂" and brought inside a structure where a stationary O₂ monitor is on power. If the field portable device shows a comparable "20.9 by Vol." oxygen level at that location, then the "fresh air" setting of the stationary monitor can be

actuated using the verified inside air level of 20.9% oxygen shown on the portable device. Such calibration of the stationary unit could be conveniently done in minutes on a weekly basis as described above to insure accurate readings from the stationary monitor. ENMET Corporation recommends quarterly recalibration of its portable and stationary gas monitors using N.I.S.T Certified gas cylinders.

If a customer is using an ENMET Portable Recon/O₂ (oxygen version-P/N 02541-1100) and an ISA-42M or ISA-60M as the oxygen MRI stationary monitor, the calibration sections of the applicable instruments manual should be followed as listed below.

- Recon/O₂ manual #80006-018
- ISA-42M manual #80015-301
- ISA-60M manual #80003-500

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