



# White Paper

Title: Pre-conditioning the Oxygen Sensor for Low Oxygen Testing

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## **Low Oxygen Testing Overview:**

Current Bridge MAP analyzers provide extremely low oxygen resolution using a chemical sensor – to 0.001% (10 ppm). This is a very low oxygen value when compared to normal oxygen levels in room air, which are 20.600% - so some care has to be taken to fully remove any remaining room air effects from the analyzer before testing levels below 0.100%.

## **Chemical Oxygen Sensor Characteristics:**

The chemical sensors used in Bridge MAP analyzers are non-destructive, zero stable and very specific to oxygen – and so are insensitive to other gases in the headspace gas mix and superior to other methods of low oxygen measurement. However, as they are somewhat slower response time than other methods, and are particularly sensitive to remaining oxygen ions that may be present in the chemical sensor electrolyte. While they respond rapidly (seconds) to changes in the 1.00% range, they may initially need a few minutes to reach the 0.010% range after long-term exposure to room air. This is due to the diffusion speed of remaining oxygen ions in the chemical sensor electrolyte, which have to be removed at the electrodes. Due to this effect, it is recommended that the oxygen sensor be pre-conditioned by with oxygen free gas for 5 minutes before testing oxygen levels below 0.100% to remove remaining offset errors. This is a relatively simple process, as outlined below, and only needs to be done initially after long-term exposure to room air.

## **Preconditioning on Oxygen Free Gas:**

The concept is to replace the ambient air in the analyzer with oxygen-free gas – and hold it for 5 minutes to allow natural diffusion to remove oxygen ions from the sensor. The way this is done is as follows:

1. Power on the analyzer and perform the first Zero. The analyzer will complete the zero and be in continuous measurement mode.
2. Run a TEST on room air. The analyzer will test room air and turn the pump off.

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3. Wait for the first (5 minute) Zero Request. The analyzer will begin to flash dashes on the display.
4. Put the sample needle in oxygen free gas – either using the Bridge Gas Test Stand (recommended) or a sample bag containing known oxygen free gas.
5. Zero the analyzer on this oxygen free gas mix. The analyzer will Zero normally – and then run a TEST on the oxygen-free gas – replacing the ambient air in the analyzer with oxygen free gas. (NOTE: The oxygen reading will still be high – about 0.400% at the end of the test – but will continue to reduce while the pump is off.)
6. Wait 5 minutes for the oxygen to diffuse from the sensor.
7. TEST the oxygen free source again. Observe the oxygen reading – which should now be substantially below 0.100%. If it is still considered too high for use – simply wait another few minutes for oxygen diffusion to occur and repeat the process.
8. When the residual oxygen level is low enough for valid testing, you may proceed with the normal test protocol.

This pre-conditioning process only has to be performed at the beginning of a test series – or if the analyzer has had ambient air in it for more than 15 minutes – and is only necessary for oxygen measurements below 0.100%.

In the production environment – long term exposure to low oxygen gas is common, so this effect is not normally seen except at the beginning of the day of testing – and quickly disappears with subsequent testing of Lo-Ox packages. It is only apparent during the first 5 minutes of use – and disappears quickly with normal use.

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