



# Technical Support Note

Title: Testing Protocol for Hi-Ox (80% O<sub>2</sub> / 20% CO<sub>2</sub>) gas mixes

TSN Number: 25

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25\_Test\_Protocol\_Hi-Ox.docx

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## Testing Overview:

Testing Hi-Ox gas means that the analyzer is measuring relatively high gas values of both oxygen and carbon dioxide simultaneously. Because the oxygen channel is calibrated on ambient oxygen as part of the Zero process, care has to be taken that adequate time is allowed for the gas in the analyzer to fully exchange between the package headspace gas – which contains very high levels of oxygen to the ambient air used for Zero calibration – which contains about 21% oxygen.

As analyzer stability is established by the quality of the Zero calibration process, the process of gas transition between package testing and room air Zeroing will be the primary focus of attention for this TSN.

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## Initial Power Up and Zero:

When the analyzer is initially powered up, the first thing required is a Zero to begin operation – at the end of which the analyzer will be in the ‘Continuous Measurement Mode’. The analyzer should be left in this state measuring room air until it is used for the first package test.

### First Zero:

3-5 minutes after power on, the analyzer will ‘ask for a Zero’ by alternating the numbers on the display with dashes. Service this Zero when it is convenient. After the Zero is complete, run a test on room air. Leave the needle exposed to room air and push the Test Button (or UP Arrow on analyzers without a Test button). At the end of the test, the pump will turn off and the room air gas readings will be displayed.

Note: 30 minutes after a Zero is performed the analyzer will ask for another Zero in order to maintain analyzer stability. This means that performing a Zero will provide 30 minutes of uninterrupted test time.

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## Zero Before Testing:

Before a test sequence is begun, Zero the analyzer. This process makes sure the gas readings are as accurate as possible, and stabilizes them for the next 30 minutes.

## Test Air - Put the analyzer in Sample/Hold Measurement Mode

If this has not been done at startup, run a test on room air. Leave the needle out of the package and exposed to room air and push the Test Button (or UP Arrow on analyzers without a Test button). At the end of the test, the pump will turn off, the room air gas readings will be displayed, and the analyzer will be ready for package testing.

Note: Because the analyzer will be used to measure process Hi-Ox gas containing high levels of oxygen, multiple testing of the first package after an ambient air Zero may be required to obtain stable high oxygen readings. The operator should expect to test the first package after a Zero multiple times until high and stable oxygen readings are obtained.

## Test the First Package – Test 1:

Insert the needle into the package headspace, and push the Test Button (UP Arrow). The analyzer will flash the displays once each second of the test sequence while it is drawing package headspace gas into the analyzer. You will be able to see the CO<sub>2</sub> and O<sub>2</sub> readings change during this process – first CO<sub>2</sub>, and then O<sub>2</sub>. At the end of the sampling period, the pump will turn off and the readings will be frozen on the displays.

## Test the First Package – Test 2:

Do not remove the needle from the first package. Test the package again – and look for the readings to be stable during the last few seconds of the test. Because you are transitioning from room air and 80/20 headspace gas, you should expect the O<sub>2</sub> readings to be getting close to the final value, but not quite reaching a stable reading when the first test ends. It is wise to ‘Test Again’ on the first package after the Zero to provide enough test time for the analyzer to reach a stable reading.

Note: This multiple testing process to get the O<sub>2</sub> readings high and stable only has to be done on the first package after a Zero. Subsequent packages can be tested once, as the transition from ambient air to high oxygen headspace gas only occurs on the first package tested after a Zero. Package-to-package testing will not cause this transition.

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## Test the Next Package:

Once you have a stable reading on the first package, remove the needle from the first package and move to the next package. (The pump will be off at this time, so no room air will be drawn in during the move.)

Test the next package – noting that the readings are now quite stable at the end of the test.

## Testing Continues:

At this point, you should be able to move from package to package, testing only once on each package.

## **Servicing a Zero Request During Testing:**

When the analyzer requests a Zero (or if the operator performs a Zero without a request) – first remove the needle from the package.

### Test Air Before Zeroing: (Optional)

Remember that the analyzer has Hi-Ox headspace gas in it from the last test. Replace this with ambient air prior to the Zero by testing room air. You should see the CO<sub>2</sub> and O<sub>2</sub> readings change to very close to room air values at the end of the test.

### Zero the analyzer:

Press the Zero button. The Zero sequence will begin – and the analyzer will switch gas input from the sample needle to the ambient air Zero port and commence the Zero process - alternating between dashes and blanks for the 30 seconds the Zero process takes. At the end of the Zero process, the analyzer will switch gas input to the sample needle and run an automatic test on ambient air – allowing confirmation that the O<sub>2</sub> reading is close to that obtained during the ambient air Zero before testing began.

Note: If a discrepancy in oxygen readings is obtained, simply Zero the analyzer again leaving the needle exposed to room air to assure that the oxygen readings that are correct.

### Test the First Package – Test 1 After Zero:

Insert the needle into the Hi-Ox package and push the Test Button (UP Arrow). The analyzer will flash the displays once each second of the test sequence while it is drawing package headspace gas into the analyzer. You will be able to see the CO<sub>2</sub> and O<sub>2</sub>

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readings change during this process – first CO<sub>2</sub>, and then O<sub>2</sub>. At the end of the sampling period, the pump will turn off and the readings will be frozen on the displays.

## Test the First Package – Test 2 After Zero:

Do not remove the needle from the first package. Test the package again – and look for the readings to be stable during the last few seconds of the test. You should see the O<sub>2</sub> readings converging on a high value at this point. When you are satisfied with the stability of the O<sub>2</sub> reading, you may proceed to the next package.

## Test the Next Package:

Once you have a stable reading on the first package, remove the needle from the first package and move to the next package. (The pump will be off at this time, so no room air will be drawn in during the move.)

Test the next package – noting that the readings are now quite stable at the end of the test.

## Testing Continues:

At this point, you should be able to move from package to package, testing only once on each package.

## **Other Tests:**

### Running Multiple Tests on the Same Package:

The analyzer takes a relatively small gas sample from the package – so multiple tests can generally be run on any package. Because the package headspace volume varies considerably from product to product, it is wise to test a typical package several times to determine how many tests can be run on a package without mitigating the test results. The indication that ambient air is being drawn into the package is that both the CO<sub>2</sub> and O<sub>2</sub> readings will go down together as ambient air is drawn into the package headspace and the headspace gas is diluted.

Note: During this test make sure that the sample needle does not inadvertently contact the product as the headspace gas is drawn from the package. Doing so may cause needle and/or filter blockage.

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This is a simple exercise that should be done to determine the ability to perform multiple tests on a package in case of measurement instability or uncertainty. We have found that typical packages will allow up to 6 tests to be run before room air intrusion affects the headspace gas measurement, and it is wise to know how much overhead is available so that second or even third test sequences can be run on the same package if measurement uncertainty is encountered in use.

Running multiple sequential tests on a single package until the O<sub>2</sub> and CO<sub>2</sub> readings reduce due to ambient air intrusion will allow an easy determination of how many tests can be run safely on a single package during use.

## Testing Certified Process Gas:

The analyzer is shipped calibrated from the factory using certified test gases – and the analyzer accuracy is periodically stabilized in use by the (ambient air) Zero process. However, the accuracy of the analyzer can only be known at the customer site by testing certified process gas.

To establish the best accuracy in the application, the customer should have his own certified process gas as a working standard, and have the capability of testing certified process gas at his facility in order to remove any bias from the gas measurement process.

See Bridge Analyzers' White Paper #28 for guidance in the acquisition and installation of this local gas test capability.

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