



Technical Support Note

Title: Testing Protocol for Lo-Ox Case-Ready Meat Packaging Gas Mixes

TSN Number: 26

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Testing Overview:

Testing Lo-Ox gas means that the analyzer is intended primarily to measure residual oxygen in headspace gas with a process gas containing CO, CO₂, and Nitrogen. The analyzer will simultaneously measure relatively high gas values of carbon monoxide and carbon dioxide in a low residual oxygen environment – and the most critical measurement is residual oxygen. Because of the criticality of the residual oxygen measurement, care has to be taken that adequate time is allowed for the gas in the analyzer to fully exchange from the ambient air used for Zero calibration – which contains almost 21% oxygen, to the package headspace gas – which contains very low levels of oxygen.

Because of this sensitivity, the process of gas transition between package testing and room air Zeroing will be the primary focus of attention for this TSN.

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’. It can either be left in this mode, or a TEST can be run as below to place the analyzer in Sample/Hold mode. Wait until the 5-minute Zero procedure below before testing a product package.

5-Minute Zero:

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, and after the Zero is complete, run a TEST on room air. Leave the needle out of the package and exposed to room air and push the 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. Leave the analyzer in this Sample/Hold mode (display values frozen, with the pump off) between test series.

NOTE: The analyzer uses thermal methods for measuring CO and CO₂, and for best accuracy should be left ON when idle between test series to maintain thermal stability. If

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it is repeatedly powered OFF and then ON before a test series, there will be thermal instability introduced which will effect analyzer accuracy until it warms up on each power cycle, and the warmup sequence above.

NOTE: The 5-Minute and subsequent Zeros reset the 30 minute Zero timer, which means that the analyzer will not ask for another Zero for 30 minutes after the last Zero was performed, providing 30 minutes of uninterrupted test time.. The 30 minute Zero request does not have to be serviced immediately when the prompt appears unless the analyzer is being used. If it is not being used, leave the unit idling and wait until the next test sequence is about to start – then perform a Zero. Doing this will assure the most accurate test readings, and will provide 30 minutes of uninterrupted test time.

Testing the First Package:

NOTE: Insert the needle into the Lo-Ox package headspace before continuing with the steps below. The pump should be off, so no gas will be extracted.

Zero Before Testing:

With the needle inserted into the first package to be tested, Zero the analyzer with the needle in the test package. This process makes sure the gas readings are as accurate as possible for the test series, and stabilizes them for the next 30 minutes.

During the Zero process, the analyzer will switch gas input to pull ambient air in from the Zero port. At the end of the Zero process, the analyzer will switch gas input to the sample needle and run an automatic TEST from the needle – now in the package headspace gas – aiding in speeding the transition from room air to Lo-Ox gas. At the end of the TEST, the pump will turn off and display the gas readings.

NOTE: Because the analyzer has been flooded with room air with high levels of oxygen during the Zero process, it may take some time to remove this oxygen from the analyzer so that true low oxygen readings of package headspace gas can be obtained.

Testing the First Package – Manual Test 1:

With the needle still in the package headspace, push the Test button. 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, CO₂ and O₂ readings change during this process – first CO and CO₂, and then O₂. At the end of the sampling period, the pump will turn off and the readings will be frozen on the displays.

Testing the First Package – Manual Test 2:

Do not remove the needle from the first package. Test the package again – and look for the CO and CO₂ readings to be stable during the last few seconds of the test. Because you are transitioning from room air and Lo-Ox headspace gas, you should expect the O₂

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readings to be going down during these test processes and getting close to the final value. It is wise to 'Test Twice' on the first package after the analyzer is Zeroed to provide enough test time for the analyzer to reach a stable and low O₂ reading within your test specifications.

NOTE: This multiple testing process to get the O₂ readings low and stable only has to be done on the first package after a Zero. Subsequent packages can be tested once, as the transition from high oxygen room air to low oxygen headspace gas only occurs on the first package tested after a Zero. Package-to-package testing will not cause this transition.

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

The analyzer Zero timer starts at the end of the Zero process – and times out after 30 minutes. When it times out, the analyzer displays will alternate between numbers and dashes, indicating that it is time to Zero the analyzer again to maintain accurate gas readings. This request does not have to be serviced immediately when the prompt appears unless the analyzer is being used. If it is not being used, wait until the next test sequence is about to start – then perform a Zero as above with the needle in the first test package. Doing this will assure the most accurate test readings, and will provide 30 minutes of uninterrupted test time.

When a Zero is initiated during use, the above procedure for the first package tested should be used. In this case, the analyzer will more rapidly reach low levels of oxygen, as it has been exposed to Lo-Ox for most of the time.

NOTE: Insert or leave the needle into the Lo-Ox package headspace before continuing with the Zero in the steps above. The pump should be off, so no gas will be extracted.

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Supporting 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. Determining how many legitimate tests can be run on a package provides the operators with information on backup procedures for questionable test results. 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 test results. Tests may be run until a vacuum is drawn on the product package and draws in ambient air - indicated by a sudden increase in the O₂ reading as ambient air is drawn into the package headspace.

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.

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 test gas 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 O₂ readings increase 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 **White Paper #28** for guidance in the acquisition and installation of this local gas test capability.

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