



# Technical Support Note

Title: 900131 Operating Protocol for Lo-Ox Case Ready Meat Packaging Gas Mixes

TSN Number: 40

File:S:\Bridge\_Analyzers\Customer\_Service\_Documentation\Technical\_Support\_Notes\  
40\_900131\_Operating\_Protocol.docx

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Last Revision Date: 16-Oct-15

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## Testing Overview:

Testing Lo-Ox process gas is critical, due not only to the complex mixture of gases, but the need to obtain low levels of residual oxygen in the packaging process. The Bridge 900131 Series analyzer has been designed to assist this process by using infrared measurement technology for both the CO and CO<sub>2</sub> measurement, and a special Oxygen sensor designed to operate at very low oxygen levels in a mix of CO and CO<sub>2</sub>. Because of the criticality of the gas measurements, care has to be taken that adequate time is allowed for the analyzer to reach and maintain thermal stability for the infrared measurement, and for the Oxygen measurement to reach low levels – both during calibration checking and product testing.

The focus of this technical support note is to establish a strict conditioning and testing protocol in order to achieve gas measurement stability in the Lo-Ox testing environment.

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## Overnight Storage and Initial Power-up:

Overnight Storage: The thermal stability of the analyzer is optimized by leaving it powered off in the cold environment overnight with the battery charger plugged into the unit. This will ensure that the on-board battery is fully charged before use, and allow the analyzer to ‘cold-soak’ in the working environment before it is powered up in the morning.

Morning Warm-up: Power up the analyzer and let it go through self-test – indicated by all 8’s on the display, and then going into an idle state with dashes on the display. Zero the analyzer and leave it with the pump on (Continuous Test Mode), testing room air in the cold environment for a minimum of one hour. (During this warm-up period, periodic Zero requests can be ignored – just leave it running.) At the end of the warm-up period, the analyzer should be thermally stabilized and ready for calibration checking.

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## Start-of Day Calibration Check:

Leave the analyzer in the continuous measurement mode, and move it to the calibration test stand location. Turn the calibration gas cylinder on, and verify that there is 10-20 PSI gas output pressure from the calibration tank regulator. Set the gas flow on the

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output flowmeter to 350-400 ml/min (3.5 to 4.0 on the gage). ZERO the analyzer, connect the analyzer sample needle to the test stand output, and observe that CO and CO<sub>2</sub> gas readings are typical, and that the Oxygen begins to reduce from room, air levels (20.90%) towards Zero.

Wait until the oxygen reading becomes stable – which will take from 5 to 10 minutes – as the analyzer has been fully saturated with 20.90% oxygen from room air during the warm-up procedure. NOTE: Patience must be maintained during this critical phase to get all the oxygen out of the analyzer internal plumbing as well as the oxygen sensor itself before accuracy tolerance testing. The oxygen sensor and measurement circuitry is designed to be very sensitive to oxygen levels below 2.000%, and it typically can take over 5 minutes for this initial oxygen stabilization to occur, and to reach the very low levels of oxygen required for proper calibration checking. You should wait until the oxygen readings are both low and stable – generally less than 0.050% for a well calibrated analyzer, and changing less than 0.005% per minute.

When oxygen readings are low and stable, ZERO the analyzer again. Doing so will further stabilize the CO and CO<sub>2</sub> infrared gas measurements, but it will also expose the oxygen sensor to room air and cause the oxygen readings to be elevated once more, but because of the short time of exposure (30 seconds during the ZERO), they will reach the previous low levels in a much shorter time.

Once the gas readings are stable, note the readings, and if they are out of tolerance, enter the CAL mode and trim them to match the Calibration Gas Tank Certificate values.

### Calibration Tolerances:

**CO:** +/- 4% Relative to the certificate CO value.

For Example: If the calibration gas is 0.400%, the gas should read 0.384% to 0.416%.

**CO<sub>2</sub>:** +/- 4% Relative to the certificate CO<sub>2</sub> value.

For Example: If the calibration gas is 30.00%, the gas should read 29.08% to 31.20%.

**O<sub>2</sub>:** +/- 0.040 Absolute Offset from the certificate O<sub>2</sub> value.

For Example: If the calibration gas is 0.00%, the gas should read 0.040% to -0.040%.

**NOTE:** Because the Oxygen readings normally continue to go down during use – it is normal practice to calibrate them higher than nominal to +0.020% or so.

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## **Gas Calibration:**

### Calibrate CO<sub>2</sub> First:

Enter the CAL mode (CAL and ZERO) buttons together, and push the CAL button until CAL is displayed on CO and O<sub>2</sub>, and numbers on the CO<sub>2</sub> display. Adjust the values up or down using the yellow arrow keys until they match the calibration gas certificate value within the tolerance above.

### Calibrate CO:

When CO<sub>2</sub> is completed, press the CAL button until numbers are displayed on the CO display and adjust CO values up or down using the yellow arrow keys until they match the calibration gas certificate value within the tolerance above.

### Calibrate Low O<sub>2</sub>:

When done with CO, press the CAL button until 'Lo' is displayed for low oxygen calibration, and adjust the oxygen values to 0.020%.

When all gas readings are calibrated, cycle through the gas readings one more time to make sure they are within tolerance and adjust them again if necessary.

When you are satisfied with the gas readings, push the CAL and ZERO buttons together again to set the calibrated gas values in the analyzer.

### Change to the Sample/Hold test mode - Run a TEST on Calibration Gas:

Leave the analyzer attached to the calibration gas, and run a TEST on it. The analyzer should continue to sample and measure the calibration gas, and then freeze the final values on the display, and stop the pump after 15 seconds.

### Wait 5 Minutes with the Pump Off:

Let the analyzer thermally stabilize with the pump off for 5 minutes – still connected to the calibration gas. The pump will be off, so the analyzer will not be sampling calibration gas, but this idle time will allow the analyzer to thermally stabilize to the Sample/Hold test condition with the pump off.

### ZERO the Analyzer in Sample/Hold Mode:

ZERO-ing the analyzer after 5 minutes with the pump off will start the pump, draw in ambient air, and reset the reference values into the analyzer to compensate for the

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operating mode change from calibration to normal testing. At the end of the 30 second ZERO, the analyzer will automatically run a TEST on the calibration gas. The readings from the first test will be very close to the calibrated values, except for Oxygen, which will be high due to its exposure to room air oxygen levels (20.90%) during the ZERO.

### Repeat the TESTs on Calibration Gas to obtain Oxygen Measurement Stability:

Run another TEST on calibration gas, observing the ending oxygen value – which will be substantially lower than the previous (automatic) TEST.

TEST again (3-5 times) until the final oxygen readings are within tolerance and stable.

NOTE: This may take 3-5 TEST's to achieve, but only needs to be done after a ZERO when in the Sample/Hold mode.

If the readings stay within tolerance, remove the analyzer from Calibration gas, and turn off the calibration gas flow and tank valve. The analyzer can now be used to test actual product packages – and will stay in calibration until the next ZERO prompt – usually 60 to 90 minutes, depending on the time it was allowed to warm-up.

### Trimming Gas Readings from Sample/Hold Mode:

If the gas readings are not within tolerance at the end of the Sample/Hold TESTs above, they can be further trimmed by reverting to the continuous measurement mode and trimming calibration as follows:

Note the gas reading error magnitude. For example: if the CO is still 0.15 too high after repeated TESTs.

Set the unit into Continuous Measurement Mode. (DOWN Arrow)

Go into CAL mode (CAL+ZERO)

Select and adjust the gases that are out of tolerance.

Save the calibration (CAL+ZERO)

Select Sample//Hold Mode (TEST)

Repeat TEST if necessary to confirm readings are correct.

Repeat the sequence above until the TEST readings are within tolerance.

When the readings stay within tolerance, remove the analyzer from calibration gas, and turn off the calibration gas flow and tank valve. The analyzer can now be used to test actual product packages – and will stay in calibration until the next ZERO prompt – usually 60 to 90 minutes, depending on the time it was allowed to warm-up.

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## Operating Protocol During Testing:

The analyzer usually sits idle after a test series – with the displayed values frozen, and the pump off. During this idle time, the analyzer ZERO Timer is still operating, measuring the time since it was last ZEROed. Before the analyzer is used for the next test series, the display should be observed first.

### Numbers Constant:

This is the normal Sample/Hold idle mode, and the analyzer can be used for further package testing.

Place the needle into the next package to be tested and press the TEST button. If the numbers seem to be moving at the end of the TEST – press the TEST button a second time.

NOTE: Usually the gas readings will be stable during the last 3-5 seconds of the TEST, but you should TEST a product package until readings are stable if the readings are moving at the end of the test. You may easily run several TESTs on a single package – as the tests are only 15 seconds long and do not consume much gas. There is typically enough headspace gas in the package to run many tests – so don't be concerned about running out of gas. TEST until you are confident that the readings are stable and accurate.

### Display Alternating between Numbers and Dashes:

This is the 'ZERO Prompt' mode, and the analyzer should be ZEROed before the next test series. Before tests are run, do the following:

1. First place the needle into the next package to be tested:

The pump will be off, so no gas will be drawn from the package until the end of the next ZERO. You are just preparing for that event – so that the analyzer will remove the ambient air used for the ZERO procedure as rapidly as possible after the ZERO.

2. ZERO the Analyzer:

The analyzer will set new correction values into the analyzer to compensate for any ensuing thermal drift since its last use, and recalibrate the oxygen sensor. At the end of the 30 second ZERO, the analyzer will automatically run a TEST on the package into which you have pre-inserted the sample needle. The readings from the first test will show high oxygen (typically about 1.000% above what is in the package) due to residual oxygen from the ZERO process.

3. Repeat the TESTs on Package Gas to obtain Oxygen Measurement Stability:

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Run additional TESTs on the package until the oxygen readings stabilize. This may take 3-5 TEST's total, but only needs to be done immediately after a Zero.

NOTE: Package-to-Package testing with low oxygen values between packages do not saturate the oxygen readings the way a ZERO does, so it should not be necessary to repeatedly TEST packages during normal inspection

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