Sampling with a MicroView ATEX Portable Hygrometer & Bottled Gas Dryer

1) Hygrometer Pre-Sample Validation Test on "Zero" Gas

On receiving the analyser a dry gas check should be performed to confirm the "zero" reading of the sensor prior to commencement of testing.

a) Connect a regulated low flow of nitrogen or (oil-free) instrument air to the inlet port of the MCM Bottled Gas Dryer (BGD) and establish a continuous flow from the BGD of approximately 500 cc / minute. NB:- the BGD is shipped from MCM in a ready to use condition and, if properly sealed between uses, should not require regeneration for a period of several weeks or months. If in doubt then follow the recommended procedure for regenerating the BGD (refer to the BGD Operating Manual for detailed instructions).

b) Switch the hygrometer on.

c) Wait for one minute whilst the instrument completes its self-check routine.

d) With the desiccant seals in place on the inlet and outlet ports, press button 1 (MONITOR) and observe the first numerical moisture value that is displayed on the screen (this should ideally be <10 ppmV).

e) Wait for the instrument to start its automated Push Purge® routine. Observe the indicated sensor temperature ("SenT") increasing from 45ºC (normal operating temperature) to 135ºC (Push Purge® temperature).

f) Observe that the displayed moisture value drops to UNDER RANGE and the graphical trace drops to zero.

g) When the Push Purge® routine has ended observe the "SenT" value return to and stabilise at 45ºC.

h) Observe that the graph and displayed moisture value both rise slightly and stabilise at a suitable level that is consistent with the data observed in step 1.d).

i) Look for signs of sensor contamination; for example, the reading being unable to drop below 1 ppmV (i.e. UNDER RANGE) during Push Purge®. If the reading drops below 1 ppmV during Push Purge® and recovers to low value then continue to Section 2.

If the display does not drop below 1 ppmV during Push Purge® or reads too high following recovery, then:

j) Loosen the desiccant seal on the instrument vent port but do not remove completely (if the inlet and vent ports are not indicated on your instrument then you may choose to vent through either port). Loosen and remove the desiccant seal from the inlet port and connect the purging dry nitrogen / instrument air from the BGD as quickly as possible.

k) Observe the displayed reading and, once settled, log the displayed value. Allow a settling time of about five minutes or until the graphical line on the instrument display shows a flat-line equilibrium condition.

l) Manually activate the Push Purge function by pressing button 1 and wait for the recovery of the reading to a settled value. Allow about five minutes to achieve a stable reading and log the displayed value again.

m) If the displayed reading is falling with time, then leave the instrument connected to the BGD until results are stable and within acceptable tolerances on dry gas values. If extended purging is required then the hygrometer can be switched off to conserve the service clock. Switch the instrument back on when required and follow steps 1.b) to 1.d) to re-enter the COLLECT mode.

n) If the value from the BGD exceeds 10 ppmV and cannot be lowered by continuous purging from the BGD, then check the span value of the hygrometer with an appropriate span gas (if available) to check the response speed of the sensor.

o) Additionally, failure to produce a reading of <10 ppmV could suggest that the BGD is in need of regeneration. Regenerate the BGD and attempt the test again once complete.

p) If the reading from the BGD continues to be outside acceptable tolerances (or of the response speed to span gas step changes takes longer than ten minutes), then reattach the desiccant seals and return the instrument to MCM for service inspection and calibration.

2) Site Preparation (refer to page 6 of the Operating Manual)

a) Locate a suitable connection point after the final letdown stage, before the input to the chromatograph or other gas analysers.

b) Connect 1/8" stainless steel fittings, flow control (needle) valve and pipework to the selected sample point, ensuring that there are no other components such as flow meters, filters or gauges installed between the pressure reducing valve and test point.

c) If possible, a continuous gas purge should be established, tied to a suitable vent. However, if this is not practical purge the sample loop for at least 20 minutes at a higher flow than that required for the analysis. The output flow rate and pressure of the letdown system should suffice (0.7 to 1.2 barg).

d) Check that the sample system is clean and dry, by using a clean white cloth / rag placed over the open end of the sample loop tubing, and check for any contamination.

e) Once satisfied that the sample gas is clean, adjust the flow-rate down to the test flow-rate (max 0.5 litre / minute).

3) Hygrometer Preparation

These tests can be carried out at the same time as the Site Preparation tests in Section 2.

a) Repeat Sections 1.b) to 1.h).

b) You are now ready to take your first measurement.

4) Sample Gas Moisture Measurement

a) If possible connect the outlet port of the hygrometer to the atmospheric vent line. If this is not available then loosen, but do not remove, the desiccant seal on the outlet port.

Note: Failure to loosen the desiccant seal on the outlet port whilst undertaking a moisture test will result in the sensor chamber and desiccant seal becoming pressurised, which may cause the plastic cap to blow off and the desiccant medium to blow out.

b) Once satisfied that the sample loop has been purged sufficiently, swiftly remove the desiccant seal from the inlet port and connect the sample loop tubing to the hygrometer.

Note: Ensure that the tubing fitting is finger-tight before using a spanner to tighten fully. This is to prevent any damage to the analyser fittings.

c) If the analyzer is switched off, then initiate power as per Section 1.b) to 1.d). Once in MONITOR mode, wait for the unit to go through the automatic Push Purge® routine and allow time for the moisture reading to stablise.

If the instrument was already switched on an in MONITOR mode, then press button 1 to manually activate Push Purge®. Observe the “SenT” rise above 100°C and the displayed reading drops below 1 ppmV (i.e. UNDER RANGE).

Allow the measurement about 5 minutes to reach a steady reading.

d) Manually activate the Push Purge® feature by pressing button 1 and wait for the recovery of the reading to a steady display, as per Section 4.c). Allow the measurement about 5 minutes to reach a steady reading.

e) Take a note of the reading for moisture in ppmV at this point.

f) Manually activate the Push Purge® again and repeat steps 4.d) and 4.e).

g) Take a second reading for moisture in ppmV at this point.

h) If there is close agreement between the first and second readings, this confirms that the readings for the moisture content of the sample gas are valid.

Note: A difference of 1 or 2 ppmV at low levels (i.e. <10 ppmV) is acceptable and an average between the two readings can be taken as the moisture content.

i) Quickly disconnect the sample loop tubing to the hygrometer and replace the desiccant seals.

j) Manually operate the Push Purge® feature and allow the hygrometer to complete the cycle. Record the displayed value in ppmV.

k) Power off the hygrometer.

5) Post Sample Checks

a) If available, purge the hygrometer with nitrogen at sample flow-rate. Operate the Push Purge® during this run. This allows any contaminants to be burnt off the sensor and provides a post-sample reading.

b) If nitrogen is not available, then return unit to base for a “Dry Gas Validation” or recalibration at the manufacturer.

6) Dry Gas Validation

a) On return to a safe area, set up the hygrometer with a flow of clean, dry nitrogen or air at the correct flow of 0.5 litre / minute. Use of the BGD is required for these checks.

b) Turn the hygrometer on and follow the initial procedure for achieving a stable reading of the moisture content. Activate Push Purge® and look for any signs of contamination; an indication of this is the reading not being able to drop below 1 ppmV during the Push Purge® cycle. If the reading cannot go below 1 ppmV, reads off-scale WET or is unusually slow to respond, then carry out the following:-

c) Observe and log the moisture reading in ppmV.

d) Activate the Push Purge®, wait for the reading to stabilise and log the reading again.

e) Compare the readings taken in Sections 6.c) and 6.d).

f) Repeat if necessary.

g) If the reaings are coming down with each Push Purge® cycle, then leave the unit in sample mode and purge with either nitrogen or clean, oil-free air fed through the BGD until the results are stable and within acceptable tolerance on the declared dry gas values.