Clora Extended Linear Range for Catalyst Measurement

This document describes the use of the extended linear range option for measurement of catalyst samples.

What is Extended Linear Range?

Standard Low Range corresponds to a linear range of 0 to 3300 ppm. When the extended linear range option is installed, the linear range is extended from 0 ppm to 4 wt%. This allows for measurement of chlorine in catalyst, since chlorine in catalyst responds linearly even at percent level concentrations.

This option removes the normally present upper limit of Low Range mode. It is not a separate mode. In order to switch from measurement of petroleum samples to catalyst measurements, one simply selects the catalyst calibration curve in the Configure options screen.

How Do I Know If Extended Linear Range Has Been Installed?

Because extended linear range is not a separate mode it is not readily apparent whether it is installed or not. In order to see if it has been installed, check the software versions on the Warmup screen. From the Ready To Measure screen, press STANDBY. On the Standby screen, press RESUME. The analyzer will go to the Warmup screen where the software versions can be checked.

There are three software version numbers on the Warmup screen. These include the screen software version, the PLC software version, and the C code software version. Please note these numbers and contact XOS to verify that the proper software has been installed for this application.

It is important to have the correct software versions for the extended linear range to function properly.

There is another way to determine if the extended linear range has been installed. Measure a sample having greater than 3300 ppm chlorine in Low Range. If the measurement results display 3300 ppm or *****.****, then extended linear range has not been installed. If a measurement result greater than 3300 ppm is displayed in Low Range, then extended linear range has been installed.

PPM vs. WT%

Standard Low Range and extended linear range measurement results are reported in ppm. However, catalyst chlorine concentration is usually reported in wt%. Use the following equations to convert between ppm and wt%:

ppm to wt%: ppm / 10,000 = wt%

wt% to ppm: wt% * 10,000 = ppm

Calibration and Switching Calibration Curves

Follow the instructions in the user manual for the calibration procedure. The procedure for catalyst samples is the same as for petroleum samples. When using auto calibration, make sure to enter the concentration values in ppm (rather than wt%). See conversion above.

When measuring catalyst samples, make sure that the analyzer is using the catalyst calibration curve. Follow the instructions in the System Setup section of the user manual to switch calibration curves.

Catalyst Sample Prep and Analysis

Use a grinding mill to grind catalyst samples to a fine powder. Make sure to clean mill in between samples. A coffee mill grinder (capable of grinding catalyst to <80 mesh) may be used if following UOP method 949. However better precision will be achieved if a ball grinding mill (capable of grinding catalyst to <325 mesh) is used. This is required in UOP method 979.

After grinding, screen the catalyst sample with the appropriate sized sieve. Fill a Chemplex cup at least 1 cm with the screened catalyst sample. Assemble sample cell using Etnom film. Lightly tap the sample cup prior to analysis to ensure a smooth, level sample surface on the Etnom film.

Powdered samples, even when ground very fine, are not homogenous as compared to petroleum samples such as diesel fuel. Therefore, it is recommended to make several measurements and use the average. The measurements can be made on the same sample, but the sample cup should be rotated in between measurements. Three separate measurements with a measurement time of 60-100 seconds is suggested.

Petroleum Samples and Extended Linear Range

Warning: Do not measure petroleum samples greater than 3300 ppm using extended linear range.

While the analyzer will allow measurement of any sample in extended linear range, petroleum results greater than 3300 ppm will be erroneous if measured using extended low range. This is because petroleum products do not respond linearly at high chlorine concentrations. **Use High Range for petroleum samples greater than 3300 ppm.**