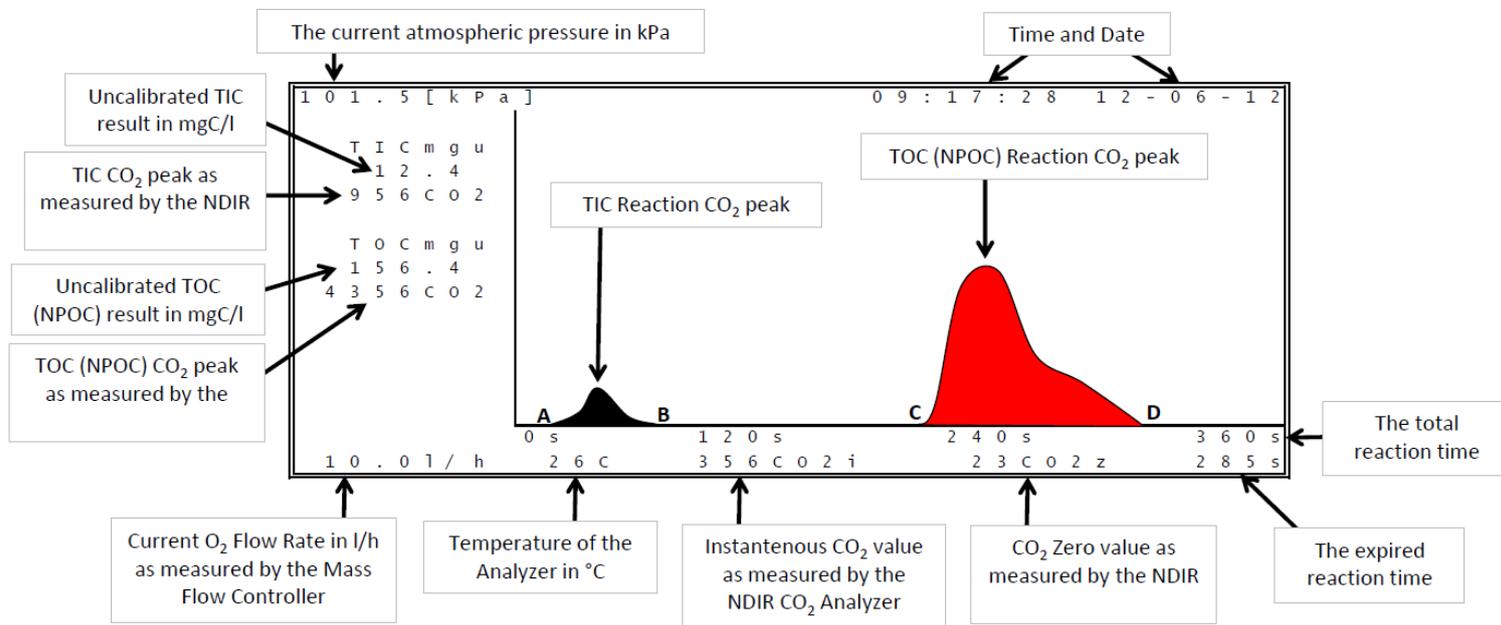


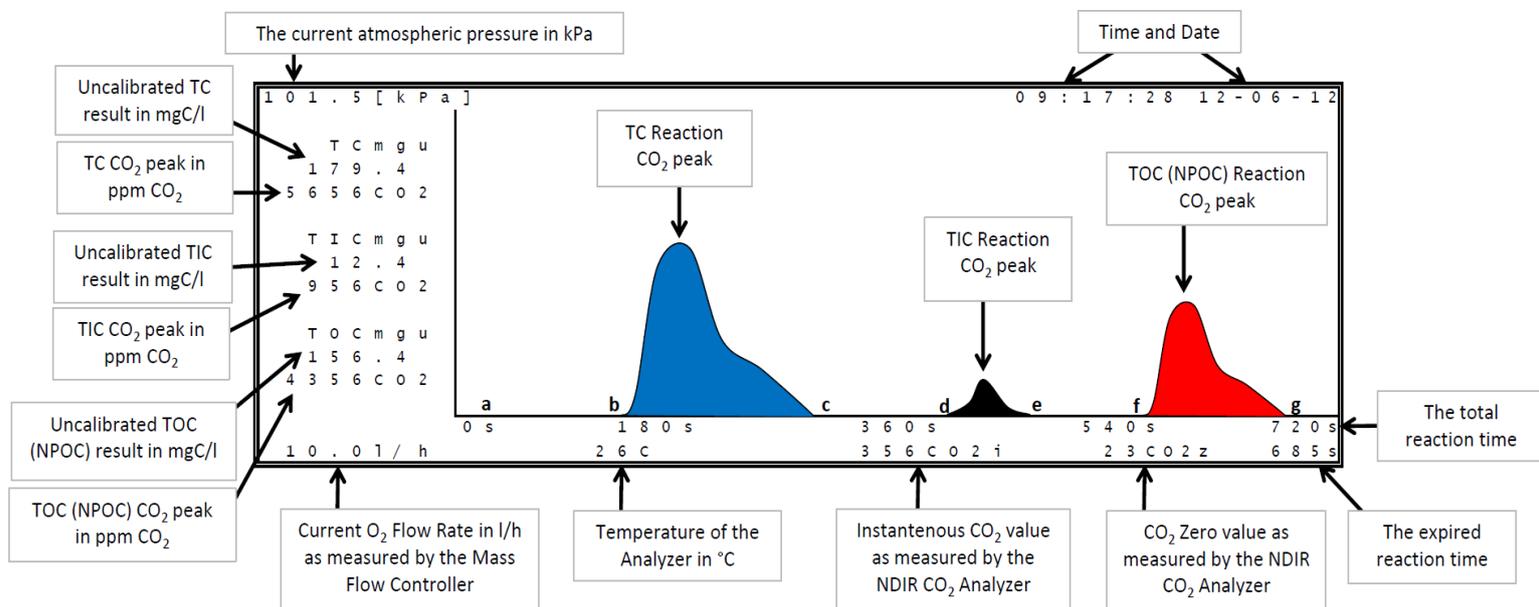
Inspection of a TIC & TOC (NPOC) Analysis Graph



In TIC & TOC (NPOC) analysis mode (which is the most common operation mode in TOC analyzers), when an analysis cycle is observed, below items should be checked and confirmed:

1. An unfiltered liquid sample is injected into the reaction chamber (reactor) of the BioTector at the beginning of the cycle.
2. Acid reagent is injected for TIC removal and the TIC is removed and measured by the NDIR CO₂ Analyzer. This indicates that sample is correctly injected and that the reactor pH is correct (pH < 2). See "TIC Reaction CO₂ peak" marked with the **black** CO₂ peak between points "A" and "B" above. This reaction phase is called the "TIC phase".
3. Base reagent is injected at point "B" above. The flat line between points "B" and "C" above, indicates that the pH is correct (pH > 12). This reaction phase is called the "Base Oxidation phase".
4. Acid reagent is injected at point "C" above for TOC (NPOC) removal. TOC is further oxidized and removed between points "C" and "D", and measured by the CO₂ analyzer. See "TOC Reaction CO₂ peak" marked with the **red** CO₂ peak above. This reaction phase is called the "TOC phase". The TOC result obtained from the TIC & TOC analysis mode represents the Non-Purgeable Organic Carbon (NPOC) because some of the Purgeable Organic Carbon (POC) may escape during the TIC phase.
5. At the end of the reaction, the oxidized sample liquid, which typically has a distinctive pink/purple color, is discharged from the reactor with increased oxygen flow.

Inspection of a TC TIC & NPOC Analysis Graph



In VOC analysis mode, which is a combination of a TC analysis followed by a TIC & TOC (NPOC) analysis, when the analysis cycles are observed, below items should be checked and confirmed:

TC Analysis:

1. Base reagent is injected into the reactor and the ozone generator is activated. This reaction phase is called the “Pre-Oxidation”.
2. An unfiltered liquid sample is injected into the reaction chamber using a small quantity of acid. While there is no carrier gas flow, the volatile organic content of the sample is oxidized. This reaction phase is called the “VOC Oxidation phase” as the oxidation of volatile matter is achieved without being sparged.
3. When the VOC Oxidation phase is complete, the remaining Non-Purgeable Organic Carbon (NPOC) content in the sample is oxidized in the Base Oxidation phase, which is marked with points a and b above. The flat line between points “a” and “b” above indicates that the pH is correct (pH > 12).
4. Acid reagent is injected at point “b” above for TC removal. TC is further oxidized and removed between points “b” and “c”, and measured by the CO₂ analyzer. See “TC Reaction CO₂ peak” marked with the **blue** CO₂ peak above. This reaction phase is called the “TC phase”. The TC result obtained the analysis represents the sum of TIC, NPOC and POC.

$$TC = TIC + NPOC + POC$$

TIC & NPOC Analysis:

5. At the end of the TC phase, the oxidized sample liquid is discharged from the reactor and a sister sample is injected into the reactor at points marked with “c” and “d” above.
6. Acid reagent is injected for TIC removal and the TIC is removed and measured by the NDIR CO₂ Analyzer during the TIC phase. This indicates that sample is correctly injected and that the reactor pH is correct (pH < 2). See “TIC Reaction CO₂ peak” marked with the **black** CO₂ peak between points “d” and “e” above.
7. Base reagent is injected at point “e” above. The flat line between points “e” and “f” above, indicates that the pH is correct (pH > 12) during the Base Oxidation phase.
8. Acid reagent is injected at point “f” above for NPOC removal. NPOC is further oxidized and removed between points “f” and “g”, and measured by the CO₂ analyzer. See “NPOC Reaction CO₂ peak” marked with the **red** CO₂ peak above.
9. At the end of the reaction, the oxidized sample liquid is discharged from the reactor.

When both TC and TIC & NPOC analysis are complete, the flowing data is available:

- TC result, as measured and displayed from the TC analysis.
- TIC result, as measured and displayed from the TIC & NPOC analysis.
- TOC result including volatiles, which is calculated from the difference between the TC and TIC:

$$\text{TOC}_v = \text{TC} - \text{TIC}$$
- VOC (POC) result, as calculated from the difference between the measured TC and the sum of measured TIC and NPOC, from the TIC & TOC analysis:

$$\text{VOC (POC)} = \text{TC} - (\text{TIC} + \text{NPOC})$$