



## // XPREP C-IC

TE Instruments introduces the world's first automated independent sample preparation system for Combustion Ion Chromatography: the Xprep C-IC. This unique configuration redefines automated combustion IC analysis through its innovative design and functionalities.

## Independent Sample Preparation System

Besides full control over sample combustion, the Xprep C-IC not only collects the oxidized gas stream, but also automatically transfers a fraction of the absorbance liquid to any renowned IC system. The ideal solution to cover the increasing demand for analysis of corrosive halogens (Fluorine, Chlorine, Bromine, Iodine) and sulfur compounds in all different industries. These analytes need to be monitored because they are corrosive, poison catalysts, damage industrial equipment, influence the characteristic of the sample, quality control or are harmful to the environment.



## New Standard in Automated C-IC Analysis

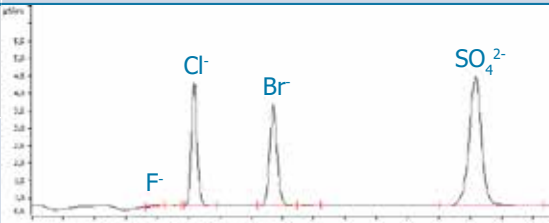
The analysis of speciated halides and sulfur in complex matrices is difficult and requires extensive sample preparation with conventional offline methods. Oxidative Microcoulometry is an alternative detection technique which provides results as a sum-parameter. Combustion IC enables the determination of individual halides and sulfur by a single analysis while eliminating the complex and time-consuming sample preparation steps of conventional offline digestion/combustion methods.

TE Instruments developed a fully automated, extremely compact sample preparation system covering the oxidative pyrohydrolytic combustion, fraction collection, and sample injection towards the IC. The Xprep C-IC can introduce samples both via direct injection (liquids module) and boat-inlet (boat module) into a horizontal furnace. This automated sample-prep solution reduces complexity of sample transfer and improves user convenience.

### Key features include:

- Small footprint (half the size compared to existing C-IC configurations).
- Fully automated sample introduction by means of robust sampling systems.
- Controlled sample introduction by direct injection- or boat inlet system.
- Oxidative pyrohydrolytic combustion of solids, liquids, gas and LPG.
- Quartz & ceramic combustion tubes available.
- Each combusted sample is collected & stored on 1 of the 65 positions of the fraction collection unit.
- Option of standalone use of the Xprep C-IC or fully integrated operation with any renowned IC.
- Injection of aqueous sample/standards directly from the Fraction collection unit into any renowned IC.

## Principle of Operation

Element of Interest	Combustion	Collection	IC Analysis
Sulfur	$\text{SO}_x$	$\text{SO}_4^{2-}$	
Halogens	H-X, $\text{X}_2$	$\text{X}^-$	

## Introduction

Sample introduction is done fully automated by means of robust sampling systems for (viscous) liquid, solid, gas and LPG samples. The autosamplers have a proven track-record for controlled and accurate sampling of all kinds of matrices.

TE Instruments offers two introduction modules: the liquids introduction module (direct-injection) and boat introduction module (boat-inlet). Switching between introduction modules and auto samplers is done within minutes, which gives the operator a high degree of flexibility in the analysis of different matrices.

The liquids module is specifically designed for the direct injection of liquid samples with a final boiling point up to 420 °C, which corresponds with the scope of e.g. ASTM D7359 and UOP 991. International test methods that focus on the analysis of Total Sulfur and Total Chloride stipulate direct injection as a viable sample introduction technique.

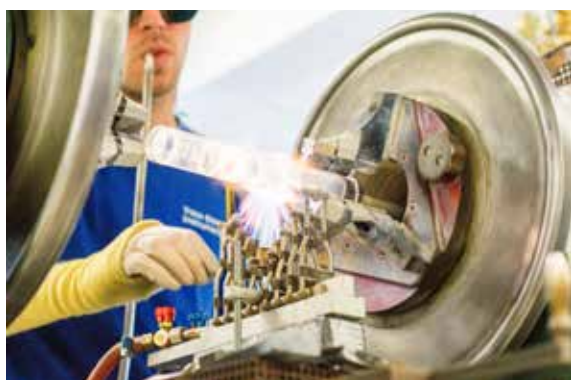
Xprep C-IC is the only combustion system capable of introducing samples for combustion both via direct injection (liquids module) and boat-inlet (boat module) into a horizontal furnace. Introduction of low boiling liquid samples by direct injection has multiple benefits compared to boat-inlet:



Features Liquids Module	Benefits
Temperature controlled (500 °C) Sample dispense up to 1 µL/s by automated syringe	<ul style="list-style-type: none"><li>• Controlled evaporation of liquid sample into the gas phase, transferred by the inert carrier gas into the combustion zone.</li><li>• Controlled sample combustion prevents soot or coke formation, a result of incomplete combustion.</li><li>• Improves the repeatability for automated C-IC analysis.</li><li>• Eliminates the need for a boat program, decreases time of analysis.</li></ul>
Enables a larger sample volume	<ul style="list-style-type: none"><li>• Improves IC-detection limit compared with boat introduction (limited sample volume).</li><li>• Multiple injections from the same sample can be introduced, combusted and absorbed for a single IC analysis.</li></ul>

## Combustion

Every sample is completely oxidized by pyrohydrolytic combustion in an oxygen-rich environment at high temperature. TE Instruments provides a 5-year warranty on the robust dual-zone furnace. All glassware, including combustion tubes and introduction modules, are designed, developed and manufactured by TE Instruments. The specially developed pyrohydrolytic combustion tube includes a single-stage capturing filter and collision flow technique.



TE Instruments offers 2 combustion tubes, a quartz version and an extremely durable ceramic version. This ceramic combustion tube is the go to combustion tube for inorganic samples (like metals) or samples containing high amounts of fluorine.

All combustion tubes for the Xprep C-IC are equipped with a "self-cleaning" filter, to catch all particles possibly formed during the combustion.

## Collection

After combustion, absorber solution is added to the output gas stream to guarantee a complete absorption of the analytes in the fraction collection unit. In this process the H-X, X<sub>2</sub> and SO<sub>x</sub> are converted to F<sup>-</sup>, Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup> and SO<sub>4</sub><sup>2-</sup>. All these negatively charged ions will be separated and analyzed in the IC.



The integrated low maintenance sampling system operates with a dual-channel needle. One channel is used for dosing of the required reagents and absorption of the combustion gas, the other transfers the sample from the collection unit to the IC. Up to 65 combusted samples can be absorbed and stored in the individual absorption vials. Continuously rinsing a single absorption tube is no longer required. The collected samples can be transferred to the IC immediately or stored for analysis at a later stage.

## Injection

Once sample preparation has been finalized, the absorbent containing the analytes can automatically be transferred from the fraction collection unit towards any renowned IC. The internal syringe pumps of the collection unit load and rinse the IC sample loop. A six-way-valve and 100 µL sample loop are by default integrated at the front of the fraction collection unit. The sample loop may be used to fill the pre-concentrator when present in the IC.

## Compliance and Regulations

Our instrument complies with, but is not limited to, the following international standards:

- ASTM D5987
- ASTM D7359
- ASTM D7994
- ASTM D8150
- ASTM D8247
- UOP 991
- UOP 1001
- NEN-EN 17813



## Typical Industries / Applications

Industries	Example Applications
• Petrochemical / Refineries	Fuels / LPG / Pure chemicals
• Renewable fuels	Sustainable aviation fuel (SAF) / Pyrolysis oil
• Plastics / Polymers	Polyethylene (PE) / Rubber / Plastic waste
• Mining	Copper concentrate / Iron ore / Coal
• Electronic components	Batteries / Soldering material
• Consumer goods	Textiles / Fire retardant material

## The Combustion Experts

TE Instruments has a rich history in the development and production of trace elemental combustion solutions. Since 1993, our home base in Delft, the Netherlands, facilitates a strong network of well-integrated departments such as Application Development, Research & Development, Glass Manufacturing and Production. This allows us to quickly respond to customer needs. TE Instruments controls the entire production process of its analyzers, starting from fundamental research up to shipment from our warehouse. We are fully dedicated to the development of targeted solutions for elemental combustion analysis with the quality you expect and the attention you deserve.

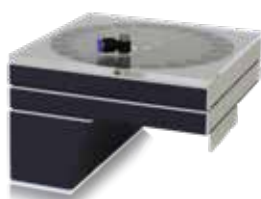
## Autosamplers



### VECTRA

#### Robotic Liquids XYZ Autosampler

Sample	Liquids
Volume	5 – 250 µL
Sample positions	up to 350
Optional	Conditioned sample tray (cooling & heating)



### NEWTON

#### Robust Solids Autosampler with Stackable Trays

Sample	Solids
Sample positions	20 (one tray), 40 (two trays), 60 (three trays)
Sample amount	5 – 250 mg
Sample cups	Quartz / Ceramic



### GLS

#### Safe & Advanced Pressurized Gas & LPG Sampler

Sample	Pressurized gas & LPG
Sample loops	10 mL gas; 50 µL liquefied gas (or customized)
Primary pressure gas sample	up to 50 bar, 725 psi (or customized)
Primary pressure LPG sample	up to 110 bar, 1450 psi (or customized)
Features	Automatic safety lock Leak sensor Sulfinert flow path



### GBS

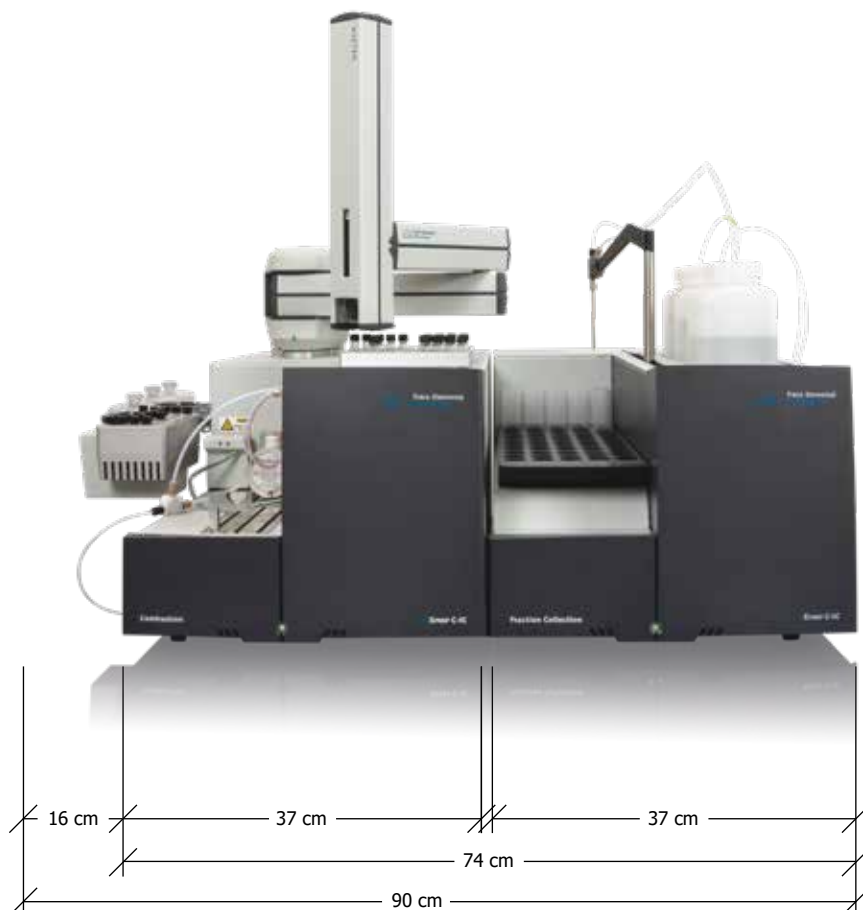
#### Flexible Non-Pressurized Gas Sampler

Sample	Non-pressurized gas
Volume	10 – 1000 mL
Sample positions	Up to 10 Tedlar® bags
Features	Leak sensor Sulfinert flow path



## Specifications

<b>Sample introduction</b>	Liquid, gas & LPG samples by heated liquids introduction module (direct injection) Solid and Liquid samples by quartz/ceramic boat introduction module (boat-inlet)
<b>Compliance</b>	Compliant with the performance standards of international test methods like ASTM, UOP, ISO, DIN, EN, JIS, KS.
<b>Sample types</b>	Solid, liquid, gas, LPG
<b>Typical sample amount</b>	10 - 250 mg (solids), 5 - 250 µL (liquids), 10 - 250 mL (gas), 50 - 500 µL (LPG)
<b>Sample pyrolysis</b>	Xprep C-IC quartz or ceramic combustion tube
<b>Furnace voltage</b>	Dual zone, low voltage
<b>Furnace temperature</b>	Max. 1150 °C, 2100 °F
<b>Gases</b>	Oxygen 99.6% (2.6), Argon 99.99% (4.0) or Helium 99.99% (4.0)
<b>Input gas pressure</b>	3-10 bar (45-150 psi)
<b>Absorbent tube</b>	23 mL - 65 positions (optional 40 mL)
<b>Injection to IC</b>	Variable, default 100 µL
<b>Flow path material</b>	PTFE, PEEK
<b>Remote control</b>	Configurable remote Start/Stop
<b>Voltage</b>	100 - 240 VAC, 50 - 60 Hz
<b>Software</b>	TEIS Software



Used images are examples of configurations which may deviate from ordered configurations.