Process Ion Chromatograph

Reliable multicomponent analysis for
online process control

Metrohm
Process Analytics

Process Analytics by Ion Chromatography

Ion chromatography (IC) allows for multicomponent analysis in a single measurement. IC offers many advantages for process monitoring with several detectors, analytical columns, and sample preparation options available from Metrohm. The Process Ion Chromatograph from Metrohm Process Analytics is a complete and flexible system for online monitoring of ionic compounds in aqueous media from ng/L to % concentrations. This online process analyzer is offered in two setups with multiple time-saving options, and can be configured to measure several sample streams for easy process monitoring around your plant.

Process IC ONE

Includes one measurement channel and detector to quantify either anions, cations, sugars, *or* organic acids in a single analysis.

Process IC TWO

Features two measurement channels and detectors for the simultaneous determination of two different types of analytes (such as anions *and* cations).

All components necessary for the analysis, including automated sample preparation, QC standards, and calibrations, are integrated into a high-quality housing that fulfills IP65, protecting the system from harsh environments. The enclosure provides a clear arrangement of components with analysis instrumentation, reagents and electronics all separately accessible.

The analyzer is controlled by a robust industrial PC, equipped with a complete process and analysis software package. An easy to read, color touchscreen monitor grants access to your analytical methods and results.

Keep an eye on trends

The continuous monitoring of control values as well as the presentation of process relevant parameters allows the identification of trends, limit exceedance and drives process optimization by early detection of events.

Automate sampling at your key process points

Your setup can be optionally connected to up to 20 process points for time-saving sequential analysis at multiple areas inside the plant.

Typical application areas

- Wastewater analysis
- Environmental ground and surface waters
- Analysis of drinking water quality
- Trace analysis of ultrapure water
- Analysis of liquid fertilizers
- Power plant cooling water circuits
- Monitoring etching and galvanic baths
- Chemical industry assay of solvents
- Pharmaceutical synthesis
- Monitoring fermentation indicators

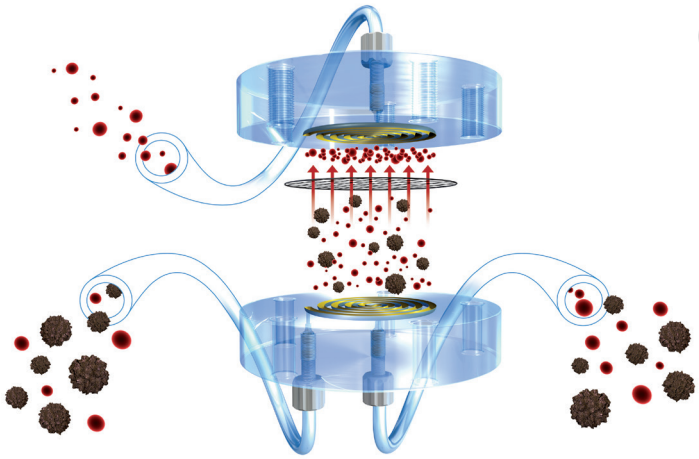
Optimized for continuous reliable operation

The built-in Metrohm ion chromatograph is at the heart of the measurement, designed for autonomous operation with **absolute reliability**, based on our decades of experience as a leader in this technique.

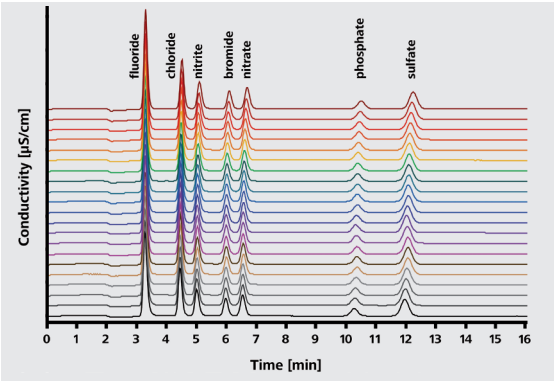
Online IC analysis has never been so simple

The modular system can be configured according to your application and matrix including sample preparation where necessary. Metrohm Inline Sample Preparation (MISP) extends the measuring range, protects the system, automates calibration and simplifies the verification of the measurement results.

Other sample preconditioning systems custom manufactured by Metrohm Process Analytics can be integrated to handle high pressures, high temperatures, and other types of sampling conditions.



Metrohm Inline Ultrafiltration, one of the many MISP options.



Overlay of anion chromatograms taken over a one month period showing long-term stability of retention times with inline eluent preparation.

Continuous eluent generation

The integrated eluent production module – which automatically monitors all reagents – guarantees smooth unattended operation and stable baselines. The reagents are diluted automatically from concentrates, easily allowing for **one to six months** of autonomy. Eluent concentrates can be purchased directly from our partner, Sigma-Aldrich®, or created with chemicals on site by the operator.

Never run dry

The Process IC requires ultrapure water to run analyses. For secure operation and convenience, ultrapure water can be continuously generated inline with the PURELAB® flex 5/6 from ELGA®. This is the only instrument on the market with a **pressureless water feed**, meaning less wear and less replacement of the purification packs, saving you money.

Optionally, ultrapure water can be stored for use in 20 L canisters with minimum level sensors inside of the reagent cabinet.

ELGA PURELAB® flex 5/6 configured in the reagent cabinet of the Process IC ONE.

Features and Benefits

- Informative process monitoring – with one injection, analyze multiple components with automated, intelligent inline sample preparation and injection techniques
- High precision analyses for a wide spectrum of analytes with multiple types of detectors
- Inline eluent preparation ensures consistent baselines, saving you time and effort
- Peltier cooling for reproducible results in different ambient temperatures, regardless of the detection technique
- Safe, rugged enclosure that is ideal for the process environment
- Integrated ultrapure water system for autonomous operation and reliable trace analysis

Elements of the Metrohm Process IC System

Front door
- 15" touch screen
- Quick Stop button
- 2 x USB ports

Analysis system
- Metrohm Professional IC Vario
- IC detector block
- Liquid handling module
- Eluent production module
- Expandable according to process application requirements

Reagents compartment
- Max. 4 x 250 mL containers, for calibration and QC standards, with level sensor
- Max. 3 x 10 L eluent containers with level sensor
- Optional 20 L container for waste with level sensor

Internal configuration may vary depending on application.

Control unit (side panel)
- Industrial PC
- I/O Controller
- Power supply

9 configurable wet part modules
- Max. 4 x Dosing units
- Max. 5 x Filtration/dialysis cells

Also available:
- Peristaltic pumps
- Mixing vessels
- Multivalves
- and more

Ultrapure water supply
- Max. 2 x 20 L containers
- or ELGA PURELAB® flex 5/6

Rugged and secure
- Peltier-cooled enclosure rated IP65
- Leak sensors for safe operation in both compartments
- Sealed reagents compartment protects light-sensitive solutions

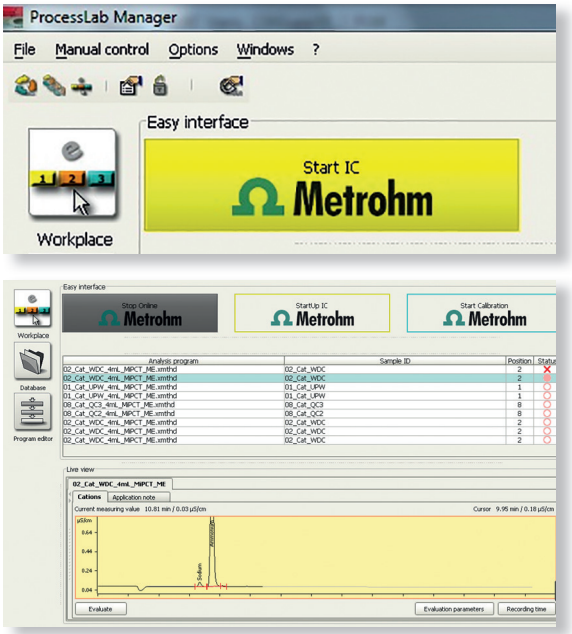
ProcessLab Manager – the interface for the process

Just press a button and go

ProcessLab Manager software with its intuitive, user-friendly interface allows you to develop applications optimized for process environments. It controls the analysis using MagIC Net software and serves as an interface for process communication. Calibration is at the press of a button, and validation is easily programmable to run daily or as required.

MagIC Net controls the IC, extension modules, and devices for liquid handling and automation. The software runs in the background and user input is only needed during commissioning and optimization of methods.

ProcessLab Manager software contains user management options, with different rights for operators and administrators to simplify workflow. Service reminders, reagent level alarms, and other notifications can be controlled by the software.

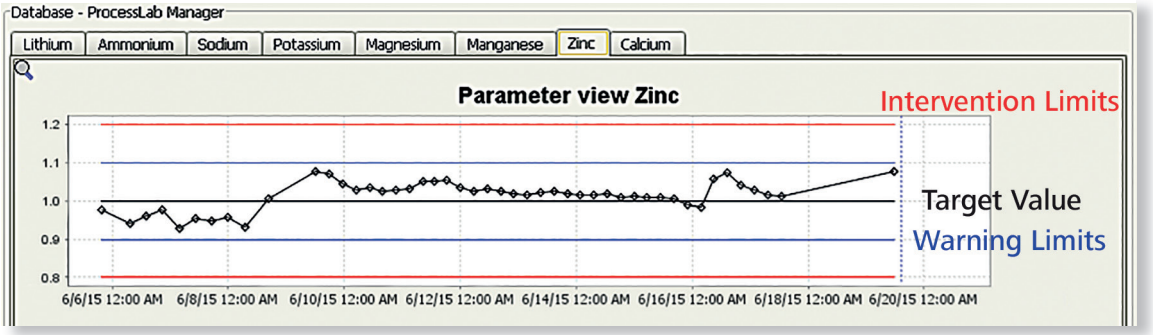


ProcessLab Manager running a cation chromatogram on the Process IC system. Analysis is simple with the intuitive software.

Results database

Analysis results are collected in a database, managed and transmitted in accordance with process specifications. The results are presented in a table view with highlighted values if pre-defined warning or intervention limits are reached. Data is able to be exported in xml, csv or xls formats.

Trend charts can be generated for any analyte measured in every sample stream, with programmable warning and intervention limits. The continuous monitoring of **control values** as well as the presentation of **relevant parameters** allows you to easily identify process optimization changes and other events.



Trend chart generated for zinc over a period of 14 days. Warning and intervention limits can be determined by the operator, immediately notifying you in the event that a limit is reached. Long term trends can be examined to better understand your process.

Communication options

- Digital and analog inputs and outputs (4–20 mA)
- Result transfer via ethernet, Modbus/TPC, or HTTP server
- Remote control and remote maintenance possible

Application adaptability

Easy transfer from lab to online

Metrohm Process Analytics as part of the worldwide Metrohm AG group has access to a large database of applications for laboratory-based measurements and instrument technologies that can be used as a foundation for online applications. The lab method can be implemented directly inside your process system. Translating and configuring a laboratory application to an online application is an almost daily routine, as we have much knowledge and experience in both fields. Furthermore, our significant history in industrial sampling and sample preconditioning plays an important role in adapting a laboratory method to an online process.

A wide range of analytical columns, detectors, and additional equipment is available from Metrohm to adapt your application to almost any process requirement.

Fully automated sample handling options

It is possible to automate sample handling processes in full and make each individual step traceable with Metrohm Inline Sample Preparation (MISP). The high precision and accuracy of liquid handling are based on the outstanding properties of the dosing units in the analyzer. MISP is the key to fully automated sample analysis by ion chromatography, saving you time and effort.

MISP options
• Inline Ultrafiltration
• Inline Dialysis
• Inline Dilution
• Intelligent Partial Loop Injection Technique
• Intelligent Pick-up Injection Technique
• Inline Extraction
• Inline Matrix Elimination
• Inline Calibration
• Inline Preconcentration
• Inline Neutralization
• Inline Cation Removal

IC Detection options

Conductivity Detector

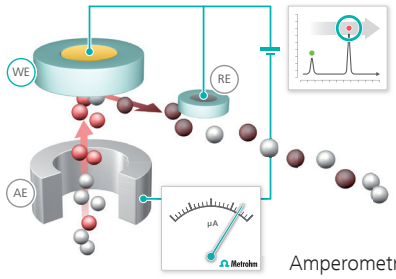
This is the most commonly applied detector, used for a wide selection of analytes ranging from anions and cations to organic acids and amines. Detection is based on changes in the electrical conductivity of the eluent exiting the column which passes through the temperature-stabilized cell block.

Amperometric Detector

Amperometric detection is an alternative method mainly used to determine electroactive, i.e., oxidizable or reducible compounds. This detector offers outstanding selectivity. The excellent signal/noise ratio and the very fast start-up guarantee the highest in measurement precision.

UV/VIS Detector

UV/VIS detection enables straightforward quantification for substances that absorb light in the ultraviolet or visible range. Detection takes place via a diode array. Combined with post-column reactions, UV/VIS detection makes it possible to detect a number of ions in very low concentrations or also in the presence of high salinity.



Amperometric detection

Need advice? Ask the experts!

We do not just offer you a process analyzer but a complete process control solution. Our chromatography specialists are always ready to tackle the most challenging application development requests and give advice about the proper instrument setup. With our experience in ion chromatography we will support you even with the most difficult application questions and give advice to ensure a long-term instrument life.

Example Process Applications

The Process Ion Chromatograph is equipped capable of performing a wide variety of applications, be it monitoring of amines during synthesis or the determination of anions and cations in water taken directly from a river. Determining oxyhalides in drinking water, corrosion indicators in a thermal power plant or even ensuring the purity of liquids in semiconductor manufacturing is no problem. Applications which are already used in the laboratory can be transferred directly to the Process Ion Chromatograph.

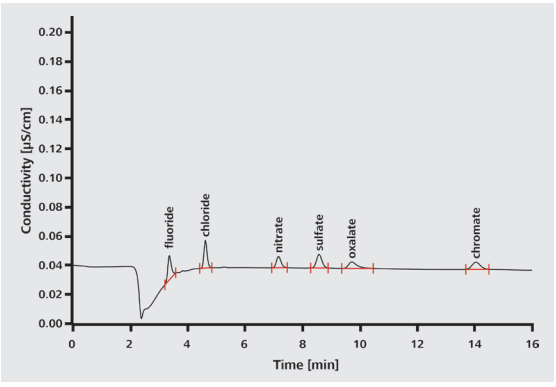
The Metrohm Intelligent Injection Techniques broaden the flexibility of the method with dilution, preconcentration, and even matrix elimination options, allowing a large working range of concentrations to be determined in a single run.

Expansive ranges

- Concentrations can range from ppt to %
- Sample injection volumes from 250 nL to 10 mL

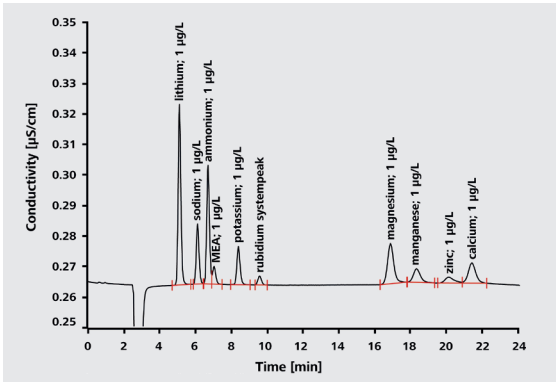
Corrosion in Energy/Power Industry

Measuring corrosion indicators or the presence of the corroding ions themselves can save a plant significant costs with early warning and mitigation to solve the issue before a shutdown is necessary. A spiked anion sample from the water-steam circuit of a boiling water reactor is shown below.



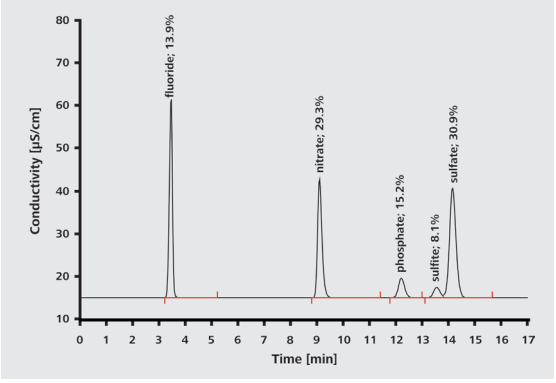
Quality of Ion Exchangers

Measuring low concentrations of cations in a process stream as in the example below and monitoring the resulting trend graphs can indicate if there has been a breakthrough of the ion exchanger upstream in the process. An alarm can be programmed to alert the operator immediately if warning or intervention limits are reached.



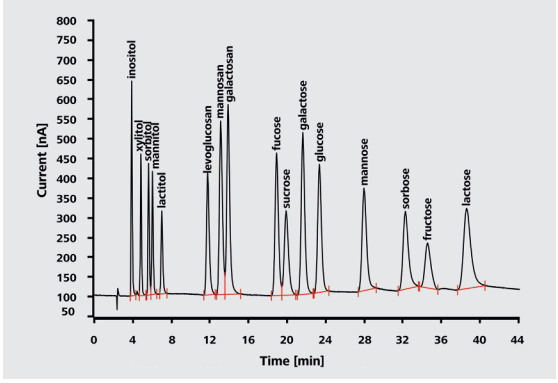
Surface Finishing Analysis

The coating and finishing of surfaces using electroplating techniques is a highly sophisticated process. Rising costs of raw materials and energy make it absolutely essential to drive production as efficiently as possible. Frequent monitoring of the baths ensures a quality etch without waste. Below is a high concentration anion analysis of an etching solution.



Food and Beverages

It is important to monitor and verify the amount of different sugars and other components in food and drinks to ensure the correct amounts of ingredients are present as well as for compliance with federal regulations. Here, an isocratic separation of 16 sugar compounds is acheived within 40 minutes using the amperometric detector.



Technical information

Number of analysis channels	Single, Process IC ONE Double, Process IC TWO
Dimensions (H x W x D)	1900 x 600 x 700 mm
Weight	≈ 225 kg (without reagents)
Power supply	100–120 / 200–240 V
Power consumption	50...60 Hz / 600 W (max. 1400 W with cooling)
IP protection	Designed for IP65
Ambient temperature	15–45 °C
Humidity	Max. 80 % non-condensing
Languages (PLM)	Chinese, English, German
Languages (MagIC Net 3.1)	Bulgarian, Chinese, Traditional Chinese, Czech, English, French, Italian, Japanese, Korean, Polish, Portuguese, Russian, Slovak, Spanish

Subject to modifications
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