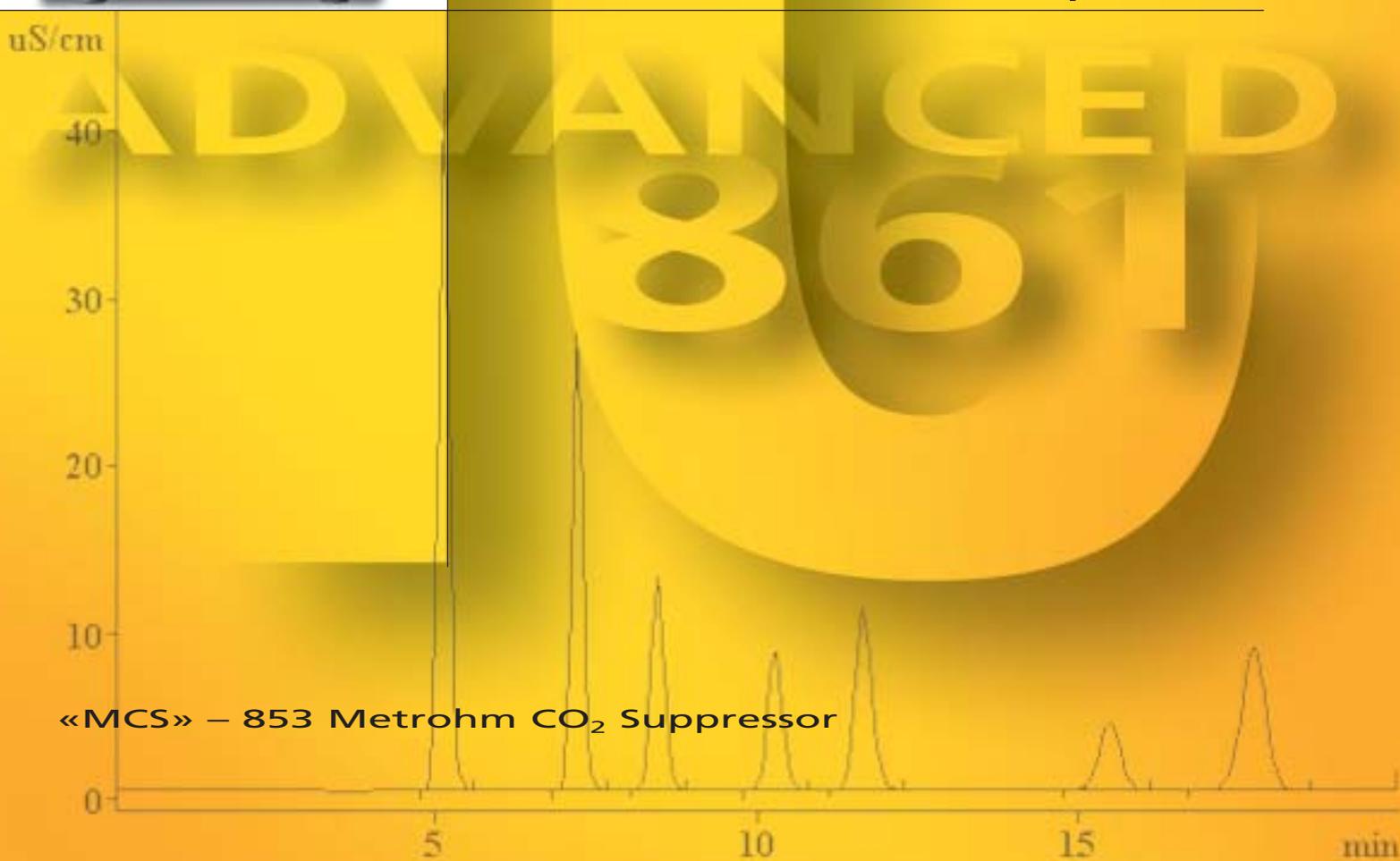




## 861 Advanced Compact IC



# New compact model

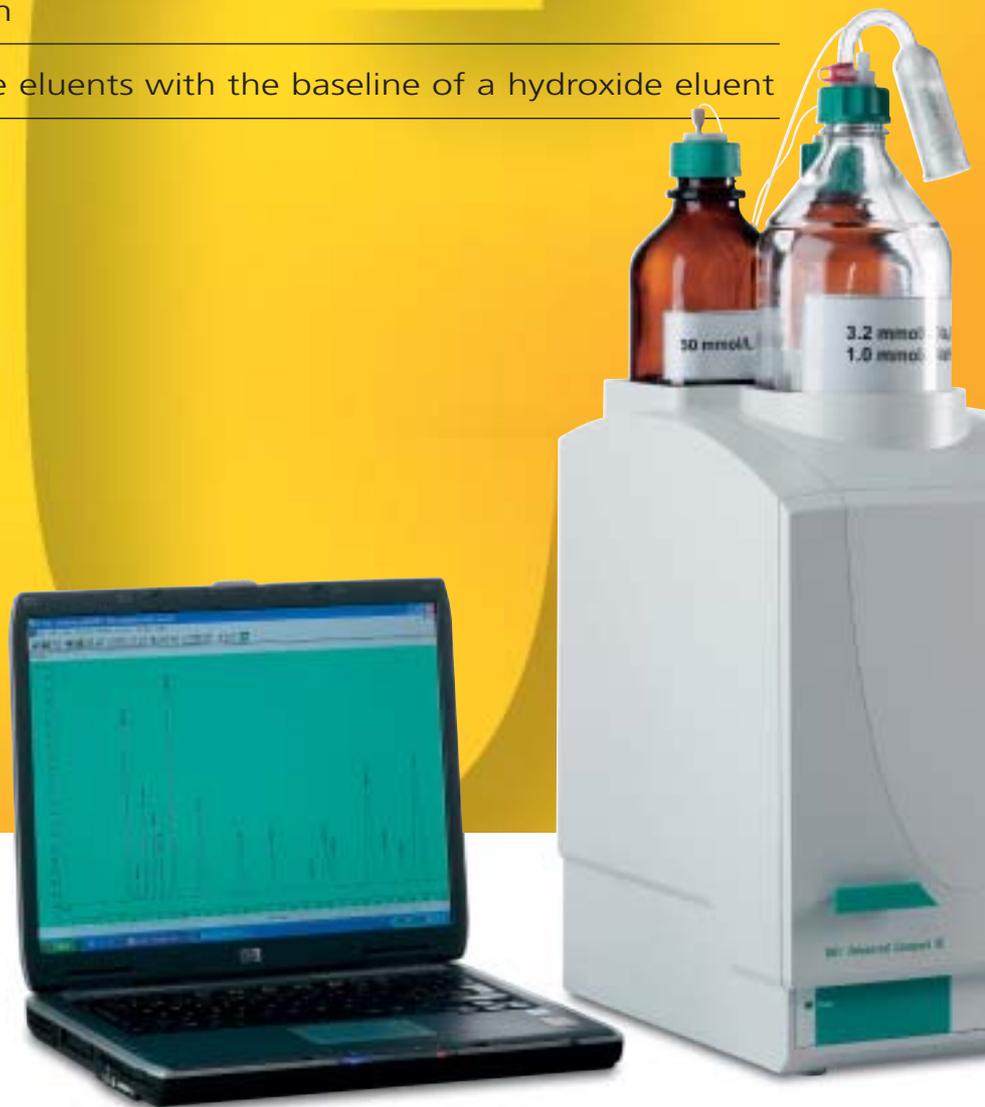
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- <2 ppb detection sensitivity for standard anions
- Measuring range expanded to 5000  $\mu\text{S}/\text{cm}$
- Column heating
- 10-year «MSM II» suppressor warranty
- Extremely small footprint
- Analog and digital output
- **CLiCK** – One-Button IC – the new simple software
- Low acquisition costs
- Lowest total cost of ownership
- Suitable for «MISP» – Metrohm Inline Sample Preparation, for example by dialysis or ultrafiltration
- Highest Quality «Swiss Made»



# New chromatography

- No injection peak
- No system peak
- No interference from carbonate
- Previously unachieved precision for rapidly eluting anions
- Significantly improved detection limits
- Sequential suppression
- Flexibility of carbonate eluents with the baseline of a hydroxide eluent



# The next generation

The 861 Advanced Compact IC represents a further extension to the range of compact Metrohm IC instruments. Since their introduction in 1999, this new instrument class has become firmly established. Extremely compact design, high sensitivity, low detection limits, comprehensive automation possibilities – all combined with very easy handling – form the basis for the outstanding performance and success of these IC systems. In addition, excellent price-performance ratio and low running costs have opened up completely new application areas for ion chromatography.

An innovative step forward in the compact instruments sector: Metrohm introduces the 861 Advanced Compact IC with sequential suppression. With values below  $1 \mu\text{S}/\text{cm}$  after suppression, the background conductivity approaches the theoretical limit of  $0.05 \mu\text{S}/\text{cm}$ . When running anions, low background conductivity directly relates to very low detection limits, which means the compact ion chromatograph now covers the single-figure ppb range.

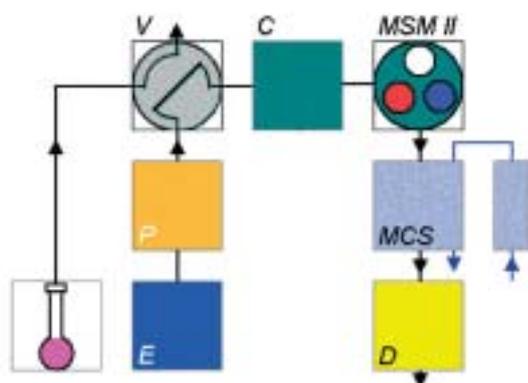
With the 861 Advanced Compact IC you are experiencing a new type of chromatography: larger peak areas, no injection peak, no carbonate peak, and baseline stability better than anything you have seen up until now.

The 861 Advanced Compact IC combines the two most effective suppression techniques sequentially into a single instrument: namely, the second generation of the Metrohm Suppressor Module «MSM II» for chemical suppression, which coincides with a completely new development – «MCS», the 853 Metrohm  $\text{CO}_2$  Suppressor. This combination guarantees an accurate and reproducible analysis while representing an entirely new type of ion chromatography.

The removal of  $\text{CO}_2$  keeps the carbonate equilibrium from affecting the peak areas: With sample concentration and sample volume being the same, up to 50% larger peak areas and markedly lower detection limits are obtained.

No carbonate peak – this means no bothersome interferences during the quantification of certain analyte anions. For example, on many polystyrene/divinylbenzene columns, chloride and carbonate coelute. The use of the  $\text{CO}_2$  suppressor eliminates this problem.

The virtual absence of an injection peak improves the determination of rapidly eluting anions such as fluoride. Although excellent separation between the injection peak and fluoride peak is achieved on polyalcohol columns, the use of the  $\text{CO}_2$  suppressor improves the detection limit even further. As the injection peak is negligibly small, considerably larger sample volumes can be injected.



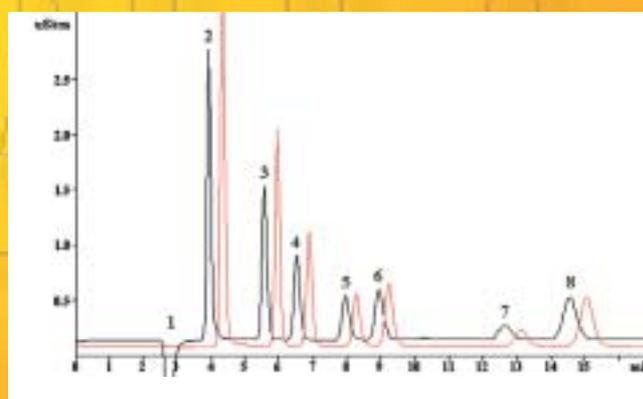
System flow sheet of 861 Advanced Compact IC

| Acronym | Meaning                          |
|---------|----------------------------------|
| E       | Eluent                           |
| P       | Serial dual-piston pump          |
| V       | Injection valve                  |
| C       | Separation column                |
| MSM II  | Metrohm Suppressor Module II     |
| MCS     | Metrohm $\text{CO}_2$ Suppressor |
| D       | Conductivity detector            |



# The Compact IC system

Compact means that all instrument components can be accommodated in a small housing. Everything that is required for state-of-the-art ion chromatography is included in the 861 Advanced Compact IC. The space requirement is minimal, meaning the footprint is hardly larger than a sheet of DIN A4 paper. The 861 Advanced Compact IC needs no gas supply or computer plug-in cards, the only things required are electricity and a connection to the COM port of the PC.



Comparison of suppression with «MSM II» alone (black) and with «MSM II» plus «MCS» (red)

Metrosep A SUPP 4 – 250 (6.1006.430) + A SUPP 4/5 Guard (6.1006.500); 1.8 mmol/L  $\text{Na}_2\text{CO}_3$  / 1.7 mmol/L  $\text{NaHCO}_3$ ; 1.0 mL/min

| No. | Ion            | Conc. (mg/L) |
|-----|----------------|--------------|
| 1   | Injection peak | -            |
| 2   | Fluoride       | 1.0          |
| 3   | Chloride       | 1.0          |
| 4   | Nitrite        | 1.0          |
| 5   | Bromide        | 1.0          |
| 6   | Nitrate        | 1.0          |
| 7   | Phosphate      | 1.0          |
| 8   | Sulfate        | 1.0          |

# Applications

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The 861 Advanced Compact IC can carry out all applications in the routine IC analysis sector, while its outstanding sensitivity also allows the 861 to be used in the R&D field. Completely integrated within the Metrodata IC Net software, the 861 can be automated extensively, making the instrument available for Metrohm inline sample preparation applications such as dialysis, ultrafiltration and sample preconcentration.

## Inorganic anions

From 5 ppb bromate up to 500 ppm phosphate, whether it be with or without suppression, the 861 Advanced Compact IC determines everything that can be recorded using conductivity: standard anions in wastewater, drinking or surface water, perchlorate in soil eluates, sulfite, sulfate and thiosulfate in the paper industry, chloride, nitrite, nitrate and sulfate in the cooling water of conventional and nuclear power stations, phosphate and citrate in cola drinks, cyanate, azide and even chlorate in explosives. Numerous anion applications for the 861 Advanced Compact IC are available in more than 200 Application Notes, accessible online and free of charge on the Internet at [www.metrohm.com](http://www.metrohm.com).

With sequential suppression, the Advanced Compact IC 861 achieves detection limits ranging from 0.7 to 1.9 ppb for the standard anions – with an injection volume of merely 20 µL.

## Organic anions

The 861 Advanced Compact IC reliably determines water-soluble carboxylic acids with a chain length of up to six carbon atoms, such as short-chain fatty acids, hydroxy fatty acids, dicarboxylic acids as well as weak inorganic acids. The built-in «MSM II», when used for post-column derivatization, significantly increases the detection sensitivity. More than 25 relevant applications can be found on the Internet at [www.metrohm.com](http://www.metrohm.com).

## Cations

The 861 Advanced Compact IC covers a multitude of monovalent and divalent cationic compounds: alkali metals and alkaline earths, ammonium and biogenic amines, heavy and transition metals. This analysis is without post-column reaction, and above all, without chemical suppression. For example, the transition metals can only be determined by conductivity without suppression, that is with a simple but very effective system that can reliably determine even 20 ppb. The field is covered by an ever updated list of more than 60 Application Notes that give an overview of possible applications made readily available over the Internet at [www.metrohm.com](http://www.metrohm.com).



# The components



## Eluent Organizer

For eluents, regeneration and rinsing solutions, the Eluent Organizer is simple and functional. Alternatively, the 861 Advanced Compact IC can be conveniently operated with innovative and certified MPak solutions.

## Serial dual-piston pump

The serial dual-piston pump features extremely low pulsation with a capacity of 0.2...2.5 mL/min and a maximum pressure of 35 MPa (350 bar, 3625 psi); system pressure can also be outputted as a measured quantity. No external gas supply is required for operation.

## Six-way injection valve

The six-way injection valve is electrically operated with robust rotor and outstanding long-term stability. The system permits automatic or manual sample injection and can be optionally equipped with an «Internal Loop» having a volume of only 0.25  $\mu$ L.

## Two-channel peristaltic pump

The built-in two-channel peristaltic pump delivers 0.5...0.6 mL/min. It regenerates and rinses the «MSM II» suppressor in counterflow.

## Flow path

All parts coming into contact with the sample and eluent are made of PEEK or PTFE, making the 861 Advanced Compact IC particularly suitable for sensitive biological samples.

## Column heating

Column heating is used for separation columns that require a given working temperature. An additional advantage is that column heating improves baseline stability in the trace region. At the same time the effect of strong ambient temperature fluctuations is minimized.

## «MSM II» Suppressor

The Metrohm Suppressor Module II «MSM II» contains the unique and rugged «microcapillary packed bed» suppressor (US Patent 6,153,101). While one of the three suppressor chambers is used for the current determination, the second is regenerated while the third is being rinsed. As the suppressor rotates one position after each determination, a freshly regenerated suppressor is provided for each sample. The «MSM II» is 100% solvent-resistant and absolutely pressure-resistant. The «MSM II» has the lowest noise of all commercially available suppressors (only 0.2 nS/cm), with an unmatched warranty period of 10 years.



## «MCS» Metrohm CO<sub>2</sub> Suppressor

The «MCS» removes both carbonate from the sample as well as any CO<sub>2</sub> formed during the suppression reaction, virtually eliminating the injection peak while allowing the peak areas of the analyte ions to be considerably larger. In addition, the interfering carbonate peak is effectively removed. The principle is based on the gas permeability of Teflon AF™. The special system arrangement with built-in vacuum cell, Teflon AF™ membrane and CO<sub>2</sub> absorber is controlled from the 861 Advanced Compact IC.

## Detector block

The conductivity cell is contained in a Faraday cage. The temperature of the cell can be set between 25 and 45 °C, with temperature stability better than 0.01 °C. Pre-amplification of the analog signal takes place in the detector block. These constructive measures permit high-performance conductivity measurements with excellent sensitivity, stability and reproducibility. Four different measuring ranges are available: 0...50, 250, 1000 and 5000  $\mu$ S/cm. The measuring signal can be transferred both as an analog signal (0...1000 mV) to any evaluation system, and also digitally to the Metrodata IC Net software. The signal is digitized with the built-in 22-bit A/D converter.

# Operation and software – CLICK One-Button IC



The 861 Advanced Compact IC can be completely controlled from either a notebook or desktop PC – no additional plug-in cards are required. Communication takes place simply and reliably via a COM port (RS 232C). The IC Net software carries out both instrument control and data evaluation. The powerful and user-friendly chromatography software satisfies the highest demands while still remaining very easy to use.

With IC Cap, the operation of the 861 Advanced Compact IC becomes workforce-friendly: a single mouse-click is all that is needed to start a measurement.

Both IC Net and IC Cap are included in the standard equipment of the 861 Advanced Compact IC.



Extremely easy to operate and available in 16 languages: the IC Cap software.

# Automation and sample preparation

The 861 Advanced Compact IC can be automated with all Metrohm sample changers. Choosing the right sample changer depends on the type of application and budget:

- The 813 Compact IC Autosampler is suitable for routine tasks and accommodates a maximum of 36 samples.

The new Advanced IC Sample Processors offer many options:

- The 838 Advanced IC Sample Processor is freely programmable and handles 148 sample vessels.
- The 838 Advanced IC Dialysis Sample Processor performs inline dialysis with heavily loaded samples.
- The 838 Advanced IC Filtration Sample Processor automates filtration.
- The 838 Advanced IC Dilution Sample Processor dilutes the samples before injection.

In addition, the 861 Advanced Compact IC has eight remote lines available for the direct control of external devices. These could be any configuration of sample changers, valves for step gradients and column switching or sample preparation modules such as dialysis or ultrafiltration. The 861 Advanced Compact IC is completely integrated in the IC Net software, forming part of very intricate and fully automated systems. It can also be combined very easily with other detectors such as UV/Vis, DAD, VA or PAD.



838 Advanced IC Sample Processor



## One by sea, on land and in air



At only 100 watts, the system's power consumption corresponds to that of a light bulb – due to this fact, the 861 is suitable for mobile use in airplanes, ships or mobile laboratories. And as such, numerous Compact ICs are currently being used in airplanes. The measurements make an important contribution to a better understanding of the atmospheric processes resulting from air pollution.

In the salty air of the rough North Sea, Compact ICs are in daily use on oil drilling platforms. Their excellent cation analysis guarantees that no precipitates form within the expensive drilling equipment, saving costly time and money.

To the north of the Polar Circle the extremely reliable Metrohm Compact ICs are being used to analyze the water of melting glaciers. This enables the clarification of weathering processes. Whenever you need to use a robust and accurate IC system with favorable acquisition and running costs while still remaining easy to operate, the 861 Advanced Compact IC is the only solution.

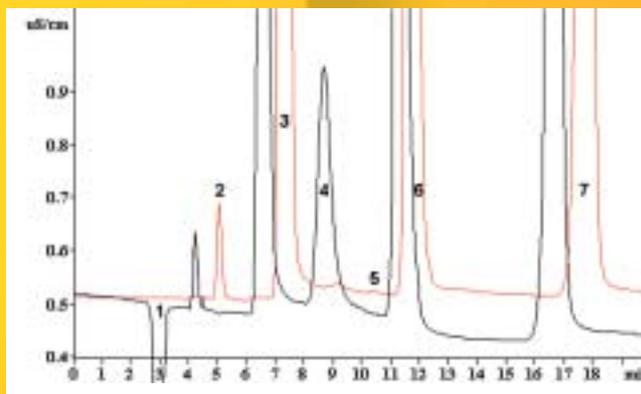
# «MCS» – 853 Metrohm CO<sub>2</sub> Suppressor

The «MCS» Metrohm CO<sub>2</sub> Suppressor is also available as a stand-alone suppressor. It can be used to easily retrofit existing Compact, Modular, Advanced and Online Metrohm IC systems. The CO<sub>2</sub> Suppressor is installed between the «MSM II» and conductivity detector. The vacuum pump of the «MCS» is controlled by remote commands and is equipped with an external power supply.

The 853 Metrohm CO<sub>2</sub> Suppressor carries the following advantages:

- 20 to 50% larger peak areas
- No injection peak
- No carbonate peak
- No interferences, even at high carbonate concentrations
- Excellent linearity of calibration with carbonate eluents
- Extremely low background conductivity at <1 µS/cm
- Noise level <0.2 nS/cm with sequential suppressor combination «MSM II» and «MCS»

Very low background conductivity – combined with larger peak areas – significantly improves detection limits. When an existing IC instrument is equipped with the «MCS» the detection limits can be lowered by up to 50%.



Drinking water Herisau (Switzerland), comparison of suppression with «MSM II» alone (black) and with «MSM II» plus «MCS» (red)

Metrosep A SUPP 5 – 100 (6.1006.510);  
3.2 mmol/L Na<sub>2</sub>CO<sub>3</sub> / 1.0 mmol/L NaHCO<sub>3</sub>; 0.7 mL/min

| No. | Ion            | Conc. (mg/L) |
|-----|----------------|--------------|
| 1   | Injection peak | –            |
| 2   | Fluoride       | 0.04         |
| 3   | Chloride       | 7.79         |
| 4   | Carbonate      | –            |
| 5   | Bromide        | 0.004        |
| 6   | Nitrate        | 7.82         |
| 7   | Sulfate        | 5.20         |





# Technical information

## Ordering information

Compact high-performance ion chromatography system with sequential chemical and CO<sub>2</sub> suppression

- Built-in six-way injection valve
- Low-pulsation serial dual-piston pump, flow range 0.2 to 2.5 mL/min
- Maximum pressure 35 MPa (350 bar, 5040 psi)
- Pulsation absorber
- Insulated column compartment
- Column heating for two separation columns – adjustable between ambient temperature +5 °C and 80 °C
- Eluent Organizer
- Detector temperature-stabilized to better than 0.01 °C, temperature range 25...45 °C in 5-°C steps, four measuring ranges 0...50 µS/cm, 0...250 µS/cm, 0...1000 µS/cm, 0...5000 µS/cm
- Metrohm Suppressor Module «MSM II»
- «MCS» Metrohm CO<sub>2</sub> Suppressor
- Built-in 22-bit A/D converter
- Analog and digital signal output
- 8 Remote output lines for controlling external devices
- Software for control and integration
- Free application updates from the Internet
- Dimensions in mm (W/H/D) 259/446/355

- 2.861.0010** 861 Advanced Compact IC for anion and cation determinations without chemical suppression
- 2.861.0020** 861 Advanced Compact IC with «MSM II» for anion determinations with chemical suppression
- 2.861.0040** 861 Advanced Compact IC with «MSM II» and «MCS» for anion determinations with chemical and CO<sub>2</sub> suppression

The IC Net and IC Cap software are included in the scope of delivery of the 861 Advanced Compact IC.

- 2.861.0500** Column heater for Advanced Compact IC 861
- 2.853.0010** «MCS» – Metrohm CO<sub>2</sub> Suppressor (stand-alone version)
- 2.837.0010** 837 IC Eluent Degasser for 2 eluents
- 2.837.0030** 837 IC Combi Degasser for 2 eluents and sample
- 6.2837.000 CO<sub>2</sub> absorber cartridge
- 6.2837.010 H<sub>2</sub>O absorber cartridge
- 6.5904.050 Internal Loop 0.25 µL (rotor) with four-way stator
- 2.813.0010** 813 Compact IC Autosampler
- 2.838.0010** 838 Advanced IC Sample Processor
- 2.838.0110** 838 Advanced IC Dialysis Sample Processor
- 2.838.0210** 838 Advanced IC Filtration Sample Processor
- 2.838.0120** 838 Advanced IC Dilution Sample Processor



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