

Wine analysis



Quality assurance of wine and wine-based drinks

 **Metrohm**



Metrohm ...

- is the global market leader in titration
- is the only company to offer a complete range of ion analysis equipment – titration, voltammetry, and ion chromatography
- is a Swiss company and manufactures exclusively in Switzerland
- grants a 3-year instrument warranty and a 10-year warranty on chemical suppressors for ion chromatography
- provides you with unparalleled application expertise
- offers you more than 1300 applications free of charge
- supports you with expert service through local representatives and regional support centers
- is not listed on the stock exchange, but is owned by a foundation
- gives the interests of customers and employees priority over maximizing profit

Metrohm – customized analysis for the wine industry

The law sets high standards

The wine industry is subject to strict regulations on the quality and safety of its products. This is not without reason. If contaminated foodstuffs reach the retail market, the consequences can be dire – not just for consumers.

Regulatory compliance

In order to guarantee the industry's strict quality and safety standards, reliable instruments and methods are needed in the QC laboratory. These instruments and methods must meet highest standards. «Regulatory compliance» is the catchword here.

Count on our support

As a leading manufacturer of instruments for chemical analysis, we are quite aware of these challenges you face. For this reason, we offer you not just the most advanced equipment but rather complete solutions for the particular task at hand. Your partners at Metrohm are experienced professionals, who develop customized applications for you and support you in every aspect of regulatory compliance with expert service.

On the following pages, discover the solutions Metrohm offers the wine industry to safeguard the quality of their products.

Metrohm instruments comply with major official standards, including the FDA regulation Title 21 CFR Part 11



Methods available from Metrohm for the wine sector

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Metrohm is your partner for all matters concerning chemical wine analysis and the validation of analytical methods. Apart from complying with official regulatory requirements, Metrohm instruments and applications satisfy all the standard test methods for quality control and product release.

The following table is organized according to product areas and lists relevant parameters that can be determined using methods developed by Metrohm. If you cannot find a parameter that is important for you, please contact us. We are continuously expanding our range of applications and will gladly assist you in meeting your specific analytical requirement.

Method	Parameters	Literature	Page
pH measurement	pH value	Application Bulletin 225 – Simple wine analysis	5
Titration	Total titratable acid Free sulfuric acid Total sulfuric acid Ascorbic acid Volatile acids CO_2 content Ash alkalinity Chloride Sulfate	Application Bulletin 225 – Simple wine analysis Wine PAC Monograph: Practical Titration	6
	Acids such as peracetic acid, pH value and conductivity (in the rinsing, cleaning and disinfection process)		
	Decarbonation (Automated sample preparation)		
Ion chromatography	Anions: chloride, nitrate, phosphate, malate, tartrate, sulfite and sulfate	Application Note S 281 Monograph: Practical IC	9
	Cations: sodium, potassium, magnesium, calcium, manganese and histamine with putrescine and cadaverine	Application Note C 070	
	organic acids and phosphate Mono-, di-, and oligosaccharides Sugar alcohols Glycols	Application Note O 006	
Voltammetry	Heavy metals: cadmium, lead, copper, iron, mercury	Application Note V 093	11

pH measurement

The pH value is of paramount importance for biological systems. It influences the growth of microorganisms, the color and hue, the taste, the redox potential, the ratio of free to bound SO₂, the possibility for forming or preventing iron phosphate cloudiness, etc.

There is no direct correlation between the pH value and the content of total titratable acid, but there is an (empirical) relationship between the pH value and the ratio of potassium hydrogen tartrate to tartaric acid.

For wines and spirits, the flat membrane electrode is recommended as a universal pH electrode. The Unitrode excels in its short adjustment times following temperature changes and is protected from contamination by its fixed ground-joint diaphragm.

pH value in wine samples with the pH meter

- Easy to use thanks to a well-structured multiple-line display
- Automatic buffer recognition
- Robust electrodes
- Extensive range of accessories from a single source



Very cost-effective pH meter – the **827 pH lab** as a laboratory setup



Buffer sachets

Buffer solutions pH 4, 7, and 9 in sachets guarantee precise calibration of the pH electrode



826 pH mobile as a portable pH meter for on-site use



Titration

Benefit from the know-how of the market leader

Choosing the right electrode is crucial for successful titration. Metrohm is the leading manufacturer in the field of titration. More than 60 years of experience and the most comprehensive and innovative portfolio on the market are proof of our strength. Tap into our extensive collection of potentiometric applications and benefit from the expertise of our application laboratories.

Of course, our applications cover the different regional/national determination methods and guarantee compliance with the respective official standards.

Besides choosing the right kind of diaphragm, the response behavior of the electrode is also important, in particular, if the titration is to be carried out to a defined endpoint. Metrohm offers an appropriate electrode for every need. Further practical tips on using Metrohm electrodes are given in the leaflets «Electrodes for titration» and «Electrodes for pH Measurement». These can be downloaded for free at www.metrohm.com

Area of application	Metrohm electrode	Features
pH value Acid content of alcoholic drinks	Flat membrane electrode	<ul style="list-style-type: none"> Ideal for determining total acid content and measuring the pH value in wine Designed for small sample volumes
Sulfite in wine	Double Pt electrode	<ul style="list-style-type: none"> Robust Long working life Easy to clean



Stabilization through sulfite

In some parts of the wine industry, there are efforts to produce wines without the addition of sulfur dioxide. For the past few years, a small number of conventional producers and also organic producers have managed to do this successfully, thanks primarily to cellar technology.

Producing naturally sweet wines without sulfur is, however, impossible, because the high residual sugar contents provide an ideal nutrient medium for microorganisms of all kinds. Depending on the particular region or kind of wine, different maximum limits for residual SO₂ apply.



Titration with Metrohm: Solutions for every need and budget

With the 848 Food/Beverage Titrino plus and the 905 Food Titrand, we offer our customers two complete titration packages. No matter which package you choose, simple and reliable work is guaranteed:

- Intelligent exchange or dosing units ensure the use of the correct titration solution and permit their monitoring
- All important titration parameters are stored with the respective methods; this means that even unskilled users quickly obtain reliable results
- GLP-compliant data output either on a printer or by digital archiving



tiamo™
titration and more

814 USB Sample Processor

Depending on the application, different sample racks can be used on the 814 USB Sample Processor, e.g., 22 sample beakers of 120 mL.

Both the measuring of the prescribed sample quantity and the complete decarbonation of the wine samples are performed fully automatically. The costs of automation pay for themselves within a very short time and reproducibility is also improved.

Control of the system and all the data handling are taken care of by the **tiamo™** software.

tiamo™ is the leading control and database software for titrators and dosing devices as well as for complete laboratory automation. This is why the name **tiamo™** stands for «titration and more» – **tiamo™** can do much more than just titrate. **tiamo™** is a titration network (NTDS = Networked Titration Data System).



815 Robotic USB Sample Processor XL

Automated system for the decarbonation and titration of total acid and sulfurous acid. Up to 100 samples can be placed on the rack. Following titration, the external vessel is cleaned thoroughly by the integral membrane pump.



Laboratory automation – and everything goes so much faster!

Automation = time savings and higher accuracy

With instruments from the Metrohm Robotic family neither erroneous results nor time-consuming manual routines are an issue. Thanks to modern automation, precise results are obtained irrespective of who the user is. Seasonal overload in the laboratory will belong to the past.

In particular, the decarbonation of carbonated drinks is still frequently performed manually. Consequently, considerably more time is spent on preparing the sample by boiling it or treating it with ultrasound than on the analysis proper.

Fast decarbonation

As a specialist in laboratory automation we, offer you a customized, fully automated system for decarbonation. Simply place the samples in the sample rack – all the rest is done fully automatically. Following very quick and effective decarbonation, the samples are measured automatically and transferred into an external titration vessel.

Automation from the market leader means:

You save time

- Precise measurement of samples is no longer done by you, but by the system – of course, that applies to the determination of total acid content as well as to sulfite determination, etc.
- Fully automated decarbonation.

You save money

- Every day. The time saved leads to a noticeable improved profitability right from day one.
- Your investment soon pays for itself.
- Fewer errors in sample handling and titration

Ion chromatography

Ion chromatography (IC) is a standard method for wine analysis. Numerous major and minor compounds that affect taste and nutrition as well as traces of contaminants can be reliably and precisely determined by IC.

Multicomponent determinations in a single analysis

In addition to anions and cations, sugar compounds, organic acids and polar substances can also be quantified in a variety of wines. The advantage of ion chromatography is that chemically similar substances can be determined simultaneously in a single analysis. Of course, all Metrohm IC instruments and the MagIC Net™ chromatography software comply with FDA regulations.

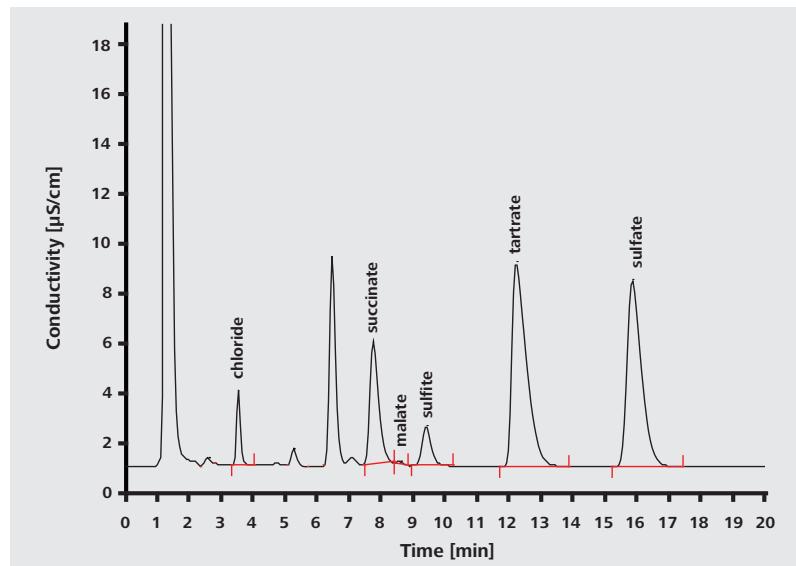
Application example

Analysis of acids in wine

Acids are an important component in wine. They preserve the wine and give it expression and character. Wine contains several kinds of acids. The most important ones are tartaric acid, malic acid, and lactic acids, as well as carbonic acid in sparkling wines.

Analysis of biogenic amines in wine

Apart from the various acids, it is also possible to detect the biogenic amines produced during malolactic fermentation, e.g., histamine, tryptamine, putrescine, and phenylethylamine, with ion chromatography.



Anion and organic acid analysis in wine: column: Metrosep A Supp 10 - 100/4.0; eluent: 5.0 mmol/L Na₂CO₃ + 5.0 mmol/L NaHCO₃, 1.0 mL/min; sample volume: 20 μL, inline dilution: 1:10

Inline Eluent Preparation



The time-consuming manual preparation of eluents is a thing of the past. Automatic inline preparation of eluents can be easily done by expanding the IC system with an additional Dosino and a Level Control. While the Level Control monitors the eluent level, the Dosino performs all dosing and liquid handling tasks.

The most efficient form of analysis

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Flexibility creates numerous opportunities

Ion chromatography is hard to beat on wine analysis.

Anions, cations, organic acids, amines, carbohydrates – all can be detected with a single system. Automation of the IC system reduces manual steps to a minimum and increases reproducibility and accuracy.

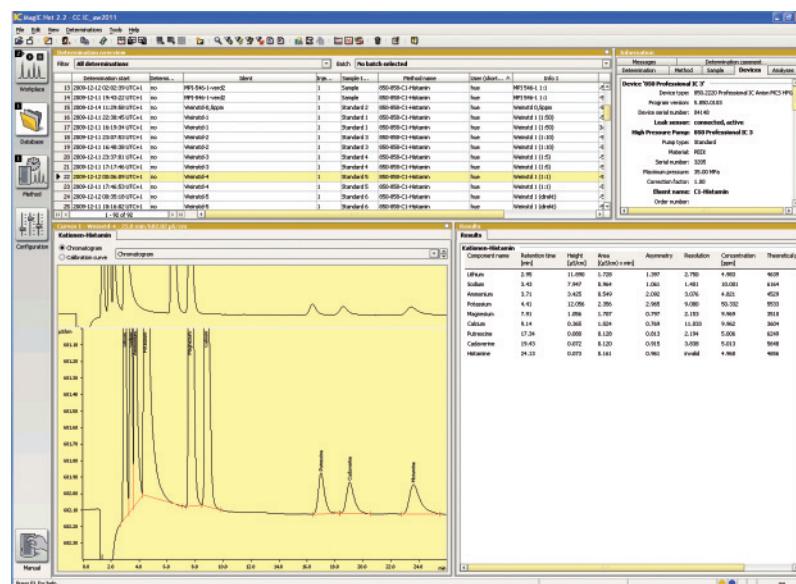


MagIC Net™

MagIC Net™ is the powerful ion chromatography software that guarantees efficient working.

The advantages of MagIC Net™

- Easy and intuitive operation
- Freely configurable user interface
- Great flexibility
- Modern data management
- Powerful report generator
- Comprehensive monitoring and control functions
- Complete traceability of all data
- Client-server software
- Complies with all FDA and GLP requirements
- Available in many different languages



Analysis of a wine standard for Li^+ , Na^+ , NH_4^+ , K^+ , Mg^{2+} , Ca^{2+} , putrescine, cadaverine, and histamine by means of 850 Professional IC; column: Metrosep C 1 - 125/4.6; eluent: 2.5 mmol/L HNO_3 with 10% acetone; sample volume: 10 μL , Inline Dilution: 1:10

What automation from the technology leader means for you:

You save time due to

- Metrohm Inline Dilution
- Metrohm Inline Eluent Preparation

You save money thanks to

- low operating costs
- a 10-year suppressor warranty
- a 3-year warranty on all instruments
- guaranteed availability of spare parts 10 years after instrument discontinuation date



Voltammetry

Superior detection sensitivity, competitive price

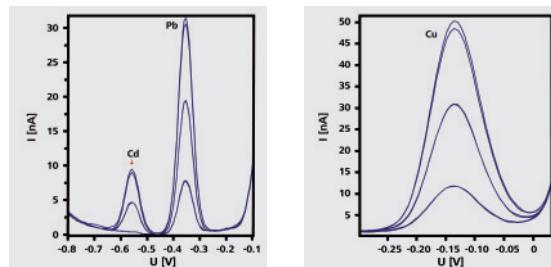
Voltammetry is an electrochemical analytical method that provides information on the type and amount of substances contained in a dissolved sample on the basis of a current-voltage relationship. The particular benefit of voltammetry lies in its high accuracy and sensitivity, the possibility of performing speciation analysis, and its favorable price-performance ratio.

Heavy metal ions that are present as contaminants in food can be determined with high sensitivity by voltammetry. To this end, food samples must be digested prior to analysis.



797 VA Computrace

The 797 VA Computrace is a state-of-the-art, computer-assisted voltammetric analysis system. The potentiostat/galvanostat built into the instrument guarantees highest precision with reduced noise. The included PC software controls the determination and calculates and archives the results.



Voltammetric determination of Cd, Pb and Cu in wine

Applications

Cd, Pb, Cu, Fe(II), Fe(III) and Hg

Most heavy metals are toxic and very low maximum limits apply regarding their presence in wine. Thus the exact determination of these elements by high-performance methods is essential. With the 797 VA Computrace, it is possible to perform the determination of heavy metals in wine and other foods after UV digestion.

Service that you can rely on: the Metrohm Quality Service

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Reliable results for the lifetime of the analytical instrument

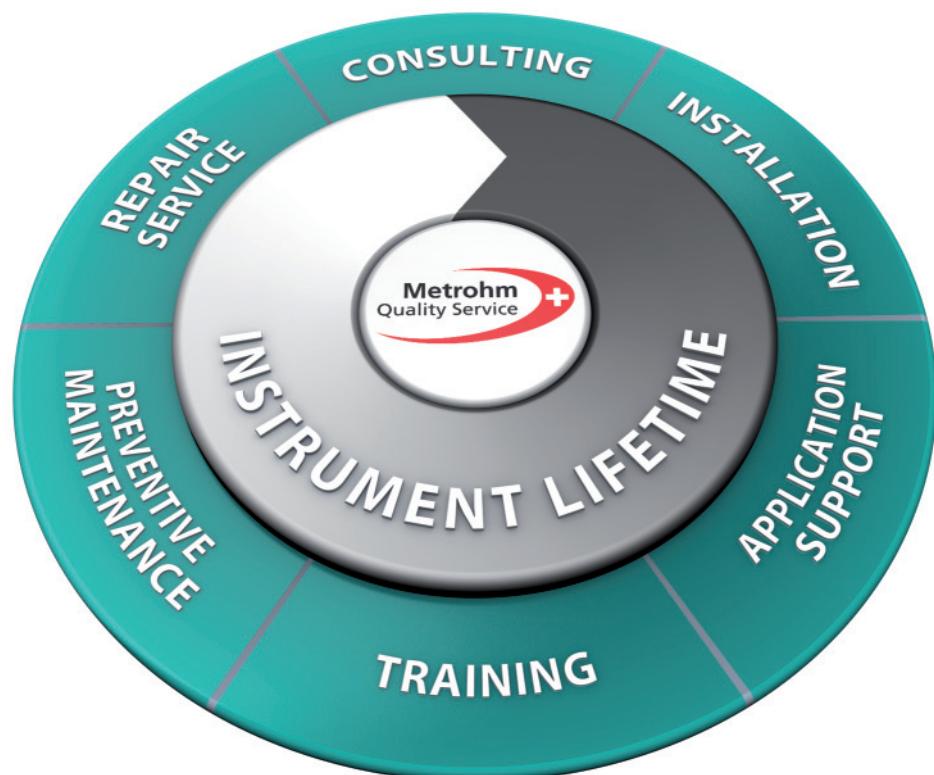
Metrohm analytical instruments are engineered to deliver extremely precise measurements. As a result, leading international companies from the food industry also put their trust in us for our comprehensive services. These services ensure that laboratory managers can rely 100% on results produced during the entire lifetime of their Metrohm analytical instruments.

Regulatory compliance made easy

The food industry is required to comply with all effective laws and guidelines on food safety. Through Metrohm Compliance Service, we ensure that your company complies with standards such as IFS, BRC, SQF and ISO 22000. If you want to put a Metrohm analytical instrument into operation, we take care of everything else.

This includes:

- Competent assistance with Design Qualification (DQ)
- Professional installation through compliant Installation Qualification (IQ)
- Operational Qualification (OQ) guaranteeing that Metrohm instruments meet the equipment specification
- All qualification and validation work, which is performed only by professionally trained and certified Metrohm service specialists
- User training taught by experts
- Competent requalification and revalidation



Why Metrohm Quality Service?

The Metrohm Quality Service is available worldwide. Preventive maintenance carried out on a regular basis extends your instrument's lifetime while providing for trouble-free operation. All maintenance work done under the label Metrohm Quality Service is carried out by our own certified service experts. You can choose between different types of service contracts. With a full

service contract, for example, you can rely on the optimum performance of your Metrohm instruments at any time, incur no additional costs whatsoever and benefit from complete and compliant verification documentation. Thanks to our service, you are perfectly prepared for audits.



An overview of Metrohm Quality Service

Our Services	Customer benefit
Application support by means of our vast selection of Application Bulletins, Applications Notes, monographs, validation brochures, technical posters, and articles Personal consultation by our specialists per telephone or e-mail	Quick and professional solution to all arising application questions and complex analytical challenges
Training courses	Competent users contribute substantially to reliable results
Certified calibrations, for example of dosing and exchange units	Accurate measurements Verification documentation for compliance with regulations and for efficient audits
Remote maintenance	Expeditious resolution of software questions
Back-up support	High data security
Emergency service, for example express on-site repairs	Short response times and thus, rapid problem resolution Minimization of downtime
Original spare parts, made in Switzerland and available world wide	Lasting, successful repair; short delivery times Minimization of downtime
Guaranteed spare parts available for at least 10 years beyond instrument discontinuation date	Protection of your investment through long-term availability of spare parts and accessories
Decentralized repair workshops located around the world and a central workshop in Switzerland	Quality repairs done quickly, so your instruments are ready for use again

Thanks to Metrohm Quality Service, you can rely on your results for the lifetime of the analytical instrument.

Technical specifications and ordering information

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pH value

2.827.0214	827 pH Lab Irda 230 V EU with Unitrode
2.827.0215	827 pH Lab Irda 120 V US with Unitrode
2.827.0217	827 pH Lab Irda 240 V AUS with Unitrode
2.827.0219	827 pH Lab Irda 230 V UK with Unitrode

Total titratable acids (other potentiometric titrations require optional accessories)

2.848.1010	Food & Beverage Titrino plus
2.848.1020	Food & Beverage Titrino plus with printer
2.905.4010	Food Titrando with tiamo™ light
2.862.1010	Food & Beverage Compact Titrosampler

Optional accessories for the determination of free or total sulfurous acid sulfite

6.0309.100	Double Pt Foil Electrode
6.2104.020	Electrode cable

For instruments and accessories for other applications and their automation please contact your local Metrohm distributor.

Ion Chromatography

2.850.3030	850 Professional AnCat – MCS for anion and cation analysis
2.881.0030	881 Compact IC pro – Anion – MCS
2.858.0020	858 Professional Sample Processor for automation
2.800.0010	800 Dosino for Metrohm Inline Dilution
2.849.1030	849 Inline Eluent Preparation
6.2841.100	Rinsing Station for IC Sample Processor
6.3032.210	Dosing Unit 10 mL
6.5330.020	IC equipment for Metrohm Inline Dilution
6.5330.040	IC equipment for liquid handling with Dosino
6.1020.010	Metrosep A Supp 10 - 100/4.0 for anion and sulfite analysis
6.1020.500	Metrosep A Supp 10 Guard/4.0
6.1010.100	Metrosep C 1 - 125/4.6 for standard cation and biogenic amine analysis
6.1050.420	Metrosep C 4 - 150/4.0 for standard cation and transition metal analysis
6.1050.500	Metrosep C 4 Guard/4.0
6.6059.222	MagIC Net™ 2.2 Professional

**Voltammetric metal determination**

- 2.797.0010 797 VA Computrace for manual operation
- MVA-2 VA Computrace system with automatic standard addition. Consisting of 797 VA Computrace with two 800 Dosinos.
- MVA-3 Fully automated VA Computrace system consisting of 797 VA Computrace with 863 Compact VA Autosampler and two 800 Dosinos for automatic addition of auxiliary solutions. Enables automatic processing of up to 18 samples. This system is the optimum solution for automatic analysis of small series of samples.

Sample preparation for voltammetry

- 2.705.0016 705 UV Digester (220 V / 60 Hz) for the fast and efficient digestion of wine samples for the determination of transition metals.
- 2.705.0017 705 UV Digester (220 V / 50 Hz) for the fast and efficient digestion of wine samples for the determination of transition metals.

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