Application Note AN-T-075

Conductivity, pH value, alkalinity, and chloride in tap water

Fully automated determination including sample preparation

The analysis of tap water plays an important role to assess the water quality or to identify its possible contamination. Parameters such as conductivity, pH value, alkalinity, and chloride content are routinely measured.

In this application note, a fully automated system is presented which allows the determination of several parameters according to various standards within one analysis. These include conductivity (ISO 7888, EN 27888, ASTM D1125, EPA 120.1), pH value (EN ISO 10523, ASTM D1293, EPA 150.1), alkalinity (EN ISO 9963, ASTM D1067, EPA 310.1), and chloride content (ISO 9297, ASTM D512, EPA 325.3). Additionally the system transfers the required volume of sample into an external titration vessel, further reducing manual sample preparation. Furthermore, all sensors can be calibrated automatically and the titer of each titrant can also be determined.

This high degree of automation minimizes errors and guarantees outstanding reproducibility by freeing up valuable time for operators.

SAMPLE AND SAMPLE PREPARATION

The method is demonstrated for a tap water sample. No sample preparation is required as the system automatically transfers the defined sample volume to the external titration cell after conductivity measurement.

EXPERIMENTAL

This analysis is carried out automatically on an 815 Robotic USB Sample Processor XL equipped with two external titration vessels. One is set up with an iAquatrode plus, and the second one is set up with an iAg-Titrode.

The samples are poured into beakers and placed onto the rack. The conductivity measurement is performed directly in the beaker using a 5-ring conductivity measuring cell with integrated temperature sensor. Afterwards, a sample aliquot is transferred into the first external titration vessel where the pH measurement and then the alkalinity titration (using standardized HCl solution) is performed. Then, a second aliquot is pipetted into the second titration vessel, where (after an acidification step) the chloride is titrated with standardized silver nitrate solution. Finally, the cleaning of both titration vessels and sensors is carried out automatically.

The pH electrode and the conductivity measuring cell are calibrated prior to the analysis.

Figure 1. Example system: 815 Robotic USB Sample Processor XL with an external titration vessel, 905 Titrando and 856 Conductivity Module equipped with iAquatrode plus, iAg-Titrode, and 5-ring conductivity measuring cell for the analysis of tap water.

RESULTS

The system enables reproducible results for all analyzed parameters. The overall analysis time for one sample is less than 15 minutes. All results are summarized in Table 1.

Table 1. Analyzed parameters for tap water (n = 10).

Parameter	Mean	SD(rel) in %
Conductivity	557.8 µS/cm	2.27
pH value	7.89	0.65
p-value	N/A	N/A
m-value	5.60 mmol/L	0.36
Chloride	10.72 mg/L	1.08

CONCLUSION

The high degree of automation for water analysis allows an increase in sample throughput, minimizes errors, and guarantees outstanding reproducibility. As the presented system includes sample preparation, the sample only needs to be placed in a beaker onto the rack, and the system runs all analyses (conductivity, pH value determination, alkalinity, and chloride) autonomously. The automatic and accurate addition of the solutions combined with the automated system frees up valuable time of the operator and therefore increases the productivity in the lab.

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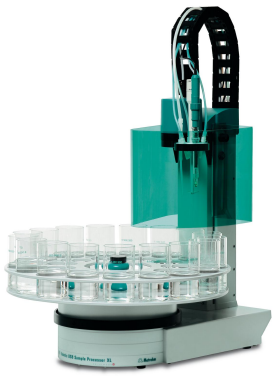
CONFIGURATION



815 Robotic USB Sample Processor XL (1T/0P)

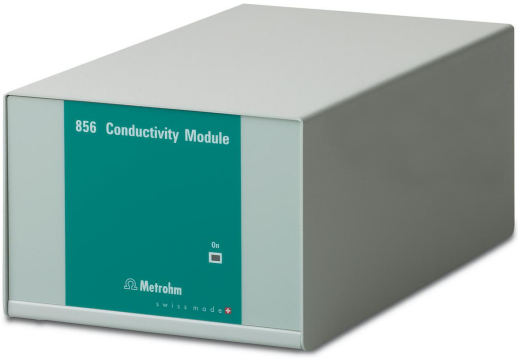
Robotic USB Sample Processor XL 包括一个工作站,可用于自理大量常品系列以及完成品前理或并列理流程。可再接多台(隔膜或蠕)和三台加液器用来行 LQH 加液理。

由于其用范很广,因此必根据具体用来合的品、拌器、滴定、机械臂和 Swing Head 以及品容器并独。

通 Touch Control 通 "stand alone" 控制。 有以下 PC 控制用件品可供: 滴定件 tiamoTM、色分析件 MagIC Net、伏安法件 viva 或 OMNIS。

843 ()

843 模 (蠕式) 含有个内置式的蠕。 它可用 程信号接口直接控制或通手按控制。

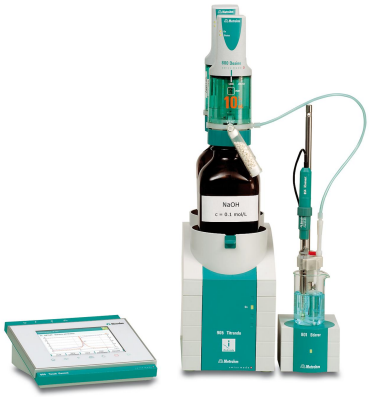


856 Conductivity Module

率量模作有 Titrando 系的展或作«独立»与 900 Touch Control 一起使用。通 856 Conductivity Module 模即可定和温度也可定溶解固体和度。它支持最新技的五。

Conductivity Module 有 2 个 USB 接口,用于接打印机、条形取器或自器,以及 4 个 MSB 接口用于接拌器或 Dosino。

使用 OMNIS-Software、tiamo-件或 Touch Control。如果需要,足 GMP/GLP 和 FDA 要求,比如 21 CFR 第 11 部分。



905 Titrando

用于使用 Dosino 加液系通个量接口位分析滴定的高端滴定。

- 多四套 800 Dosino 加液系
- 等当点滴定(DET)、等量等当点滴定(MET)和点定滴定(SET)
- 使用子性量(MEAS CONC)
- 控的加液功能,LQH
- 用于外拌器或加液器系的四个 MSB 接口
- 智能“iTrode”
- USB 接口
- 使用 OMNIS-Software、*tiamo*-件或 Touch Control
- 如果需要,足 GMP/GLP 和 FDA 要求,比如 21 CFR 第 11 部分

5 c= 0.7 cm-1 Pt1000

池常数的 5 c = 0.7 cm^{-1} (指数),集成有温度探 Pt1000 和固定 (1.2 m),用于接到 856 率模上。
感器用于量中等的率(5 µS/cm 至 20 mS/cm),例如:

- 用水
- 地表水
- 水

iAquatrode Plus Pt1000

集成了感器数据存芯片和 Pt1000 温度感器的用于在子含量低的含水介(例如,用水、工用水)中行 pH 量/滴定的数字合 pH 。在些品中示出非常快的反。
固定磨口隔膜染不敏感。
当使用 c(KCl) = 3 mol / L 作中解,建在存溶液中存。
中解可以用不含子的解(例如,硝酸 c(KNO_3) = 1 mol/L (6.2310.010))代替。存在用的解中。
iTrodes 可用于 Titrando,Ti-Touch 或 913/914 米。

iAg-Titrode

pH 玻璃膜且集成了感器数据存芯片的智能合式形,用作参比。
免用于 pH 恒定的滴定(硝酸滴定),例如:

- 化物、化物、化物
- 硫化物
- 硫化
- 硫醇
- 化物

存放在蒸水中。
据具体用,建使用 Ag_2S 的 Ag Titrode,其可以相。
iTrodes 可在 Titrando、Ti-Touch 或 913/914 Metern 上使用。