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# 日立705形自動分析装置

*Model 705 Hitachi automatic analyzer*

株式会社日立ハイテクノロジーズ／Hitachi High-Technologies Corporation

1970年代後半から、臨床検査数は急激に増加し、臨床検査の自動化が望まれていた。一方、70年代までの自動分析装置の技術では小型化が難しく、検査室に設置するためには広いスペースを必要としていた。また、分析項目ごとに測定に必要な試薬用のチューブが複数配管されており、保守点検が複雑で操作も難しく、大学病院や検査センター以外の多くの病院では生化学の自動分析装置導入は困難な状況にあった。

705形自動分析装置は、試薬分注ノズルが2本と単純な構成でありながら複数の分析項目の測定を可能とし、設置面積の大幅なコンパクト化、メンテナンス性が飛躍的に向上した。また、モニター画面で分析条件の指定と登録が可能なユーザーインターフェイスを搭載し、容易な操作性を実現した。

さらに、分析条件の柔軟性を高めたターンテーブル・ランダムアクセス方式により、日立独自の全反応過程測光など多くの革新的な技術を採用し、自動分析装置のデファクトスタンダードとして世界中の顧客に使用されてきた。

その結果、705形自動分析装置は、酵素、脂質、血糖以外に、微量蛋白の測定など幅広い検査項目に対応することができ、緊急検査室や薬物検査、人間ドックなど、臨床検査業務の主要な領域に自動分析装置の活躍の場を広げた。これにより世界中の多くの病院に導入され、80年代の臨床検査の普及による診断支援の向上に大きく貢献した。

From the late 1970's, the number of clinical examination was increased rapidly and the automation of clinical examination had been demanded.

But on the other hand, with the technology until the 70's, it was difficult to downsize automatic analyzers and thus laboratories with large space were required for the installation. Also, maintenance inspection was complicated because multiple tubes for reagent for measurement of each test were piped and it was also difficult to operate. Therefore, it had been difficult circumstances for many hospitals except university hospitals and clinical laboratories to introduce automatic analyzers of clinical chemistry.

Model 705 enabled to measure multiple examination despite the simple configuration of just only the two nozzles for reagent pipetting, which resulted in much more compact footprint and significant improvement in maintainability. And also, with a user interface which could specify and register for analytical condition on the monitor screen, it facilitated simple operation.

In addition, a number of innovative technologies were employed, such as Hitachi's own unique method "entire reaction monitoring method" by turntable-random access system for greater flexibility of analytical condition, and thus model 705 had been used by customers all over the world as the de facto standard for automatic analyzers.

As the result, Model 705 was able to support a wide range of analytical examination such as measurement for small amount of protein other than enzyme, lipid and glycemia, which served for expanding activities of automatic analyzer in the principal fields of clinical test operation such as emergency laboratories, drug tests and complete physical examinations. It was introduced in many hospitals around the world, and significantly contributed to improvement for diagnosis support by the prevalence of the 80's clinical examination.

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# pH標準液検査用高精度pH測定システム（COM-30型）およびノンリーク塩化銀式比較電極

*High-Performance pH Measurement System for Determing pH-values of pH Standrad Solutions (Model COM-30), and Non-Leaking AgCL-type Reference Electrode*

東亜ディーケーケー株式会社／DKK-TOA CORPORATION

**1. pH標準液検査用高精度pH測定システム（COM-30型）**

pH測定の多くはガラス電極法であり、標準物質として小数点以下3桁まで定められたpH標準液が使用されている。pH標準液検査には、1桁低い小数点以下4桁までを測定でき、±0.0020pH以内の精度が必要である。本システムは、これらの要求仕様に対応しており、後継機種のPHL-90とともに、pH標準液トレーサビリティ体系維持で重要な役割を担っている。

**2. ノンリーク塩化銀式比較電極**

銀／塩化銀内極式比較電極は、もっとも使用されている。本電極開発以前は、内部液中銀イオンが液絡部で銀や銀化合物を生成し、上手く測定できないケースも多発していた。

これらを鑑み、新しい発想で開発した比較電極である。塩化銀の溶解を抑制する構造とし、塩化銀を含まないKCL溶液中に銀イオン除去剤を配した内部液を用いた。長期間安定で、還元剤や硫化物などの共存試料でも測定可能となり、pH電極などへ応用して、プロセス管理や環境測定、ラボ計測等の分野で、現在でも使用されて続けている比較電極である。

**1. High-Performance pH Measurement System for Determing pH values of pH Standard Solutions (Model COM-30)**

pH is generally measured using the Glass Electrode Method and pH standard solutions are used to calibrate the instruments. The pH values of pH standard solutions are defined to three decimal points. In order to define the pH value to three decimal points, one must make pH measurements down to four decimal points in the accuracy within +/- 0.0020 pH. It became the first system, performance-wise, that was capable of determining the pH-values of pH standard solutions. Along with its successor, the PHL-90, they have been the sole bearer of the pH standard solution traceability system

**2. Non-Leaking AgCl-type Reference Electrode**

The Ag/AgCl internal electrode-type reference electrodes are the most widely used reference electrodes. Before these reference electrodes were developed, the Ag+ ions in the internal solution resulted in silver compounds or silver itself forming on the junction, causing instability in the reference electrode potential and often resulted in situations where proper sample measurements were unattainable.

Reflecting on this, a completely novel idea was used to develop these reference electrodes. To prevent the deterioration of the junction which in turn degrades performance, their structure was designed to maximize inhibition of the AgCl from dissolving. They used an aqueous solution that contained only dissolved KCl as their internal solution and, in addition, used the remover for the Ag+ ions that positioned in the internal solution. As a result, since the internal solution that leaked through the junction no longer contained Ag+ ions, the junction maintained stable performance over a long period of time. Thus, we were able to produce reference electrodes that were usable even in samples that contained reducing substances or sulfides. These reference electrodes are applied in important pH sensors that they have contributed to process control, environmental monitoring or laboratory measurement. Because of their superior performances, these products have been sold to this day.