

## An evaluation of a Jenway Performance pH Electrode.

### ■ Introduction

pH measurements are an integral part of the quality control process in a broad range of industrial processes. The accuracy demanded in these pH measurements means that many applications require the measurement to be performed potentiometrically with a modern pH meter and a combination pH electrode.

Jenway's range of performance pH electrodes have been designed to meet the ever increasing demand for improved accuracy, faster response times and greater measurement stability. The exclusion of silver ions in the integrated Platinum Plus reference systems allows customers to make highly accurate measurements in both general solutions and biological samples, containing Tris buffers, with a single electrode.

This application note will investigate and compare the stabilisation time and reproducibility of a Jenway performance pH electrode, part code 924 904 and a general purpose pH electrode, part code 924 005.

The analysis is performed on a Jenway 3520 pH meter connected to a PC with Jenway's DataWay datalogging software installed, part code 050 501. This software allows the user to record all the measurements performed on the meter with the additional benefit of allowing data to be transferred to external applications such as Microsoft Excel®.

### ■ Method

#### Reagents

pH 4 Buffer solution, part code 025 037

pH 7 Buffer solution, part code 025 038

#### Stabilisation after Temperature Change:-

Each electrode under test was initially calibrated at pH 4 and pH 7 using the two calibration buffer solutions.

Two aliquots of pH 4 buffer were prepared at temperatures of 20°C and 60°C. The electrode under test was placed into the 20°C sample which was stirred at 200rpm and the reading was allowed to stabilise. The probe was then rinsed with deionised water and transferred to the stirred sample at 60°C. The time taken for

the reading to remain stable for 10 seconds was then assessed. The test was repeated in triplicate for each probe.

#### Stabilisation after a Change in pH:-

Each electrode under test was initially calibrated at pH 4 and pH 7 using the two calibration buffer solutions.

An aliquot of pH4 and pH 7 buffers were prepared at 20°C. Each electrode was allowed to stabilise in the pH 7 buffer stirred at 200rpm and the electrode was then rinsed with deionised water and transferred to the aliquot of pH 4 buffer. The time taken for the reading to remain stable for 10 seconds was then assessed. The test was repeated in triplicate for each probe.

#### Reproducibility of a measurement:-

Each electrode under test was initially calibrated at pH 4 and pH 7 using the two calibration buffer solutions.

An aliquot of the pH 7 @20°C and pH 4 @60°C buffers were prepared and each electrode was allowed to stabilise in the pH 7 buffer stirred at 200rpm. The electrode was then rinsed with deionised water and transferred to the aliquot of pH 4 buffer for a period of 4 minutes. The electrode was again rinsed with deionised water and returned to the pH 7 buffer. The time taken for the reading to remain stable for 10 seconds was then assessed. The test was repeated in triplicate for each probe.

### ■ Results

#### Stabilisation after Temperature Change:-

The stabilisation times for each electrode are summarised in Table 1.

|      | 924 005<br>(Secs) | 924 904<br>(Secs) |
|------|-------------------|-------------------|
| 1    | 77                | 36                |
| 2    | 77                | 33                |
| 3    | 49                | 34                |
| Mean | 68                | 34                |

**Table 1. Stabilisation times after a change in the buffer solution temperature.**

The results show that the 924 904 performance pH electrode stabilises 50% faster than the 924 005 general purpose pH electrode.

electrodes from the Jenway range of performance electrodes.

### Stabilisation after a Change in pH:-

The stabilisation times for each electrode are summarised in Table 2.

|      | 924 005<br>(Secs) | 924 904<br>(Secs) |
|------|-------------------|-------------------|
| 1    | 29                | 21                |
| 2    | 31                | 26                |
| 3    | 38                | 21                |
| Mean | 33                | 23                |

**Table 2. Stabilisation times after a change in the buffer solution pH value.**

The results show that the 924 904 performance pH electrode stabilises 30% faster than the 924 005 general purpose pH electrode.

### Reproducibility of a measurement:-

The change in the response value for each electrode is summarised in Table 3.

|      | 924 005<br>(mV) | 924 904<br>(mV) |
|------|-----------------|-----------------|
| 1    | 0.4             | 1.4             |
| 2    | 0.8             | 0.3             |
| 3    | 0.9             | 0.5             |
| Mean | 0.7             | 0.7             |

**Table 3. Reproducibility of the response value in pH7 buffer after exposing the electrode to extremes of pH and temperature.**

The results show that both electrodes generate reproducible response values after exposure to a sample at a different pH and temperature.

### ■ Conclusions

Jenway's performance pH electrodes are shown to give stable response values up to 50% faster than the standard pH electrode that is supplied with our 35xx series of pH meters.

The data obtained in this study indicates that laboratories requiring a high throughput of samples will benefit greatly from the reduced analysis times that are attained when using