



Application Note

Use Of Internal Standards with BWB Flame Photometer

During the 1970s flame photometers were developed¹ using a system of internal reference. Many users, particularly in medical situations, have become familiar with this system and are wary about accepting a flame photometer not equipped with an internal reference. The BWB-XP does not use an internal standard for very good reasons which are explained below.

What is an internal standard?

It is arranged for all samples and calibration standards to be constituted with a constant concentration of an element, typically lithium, but caesium has also been used. (Sometimes the system is called dual or double beam.)

The instrumentation is configured to continually measure the signal generated by the internal standard element and, electronically the differential between the analytes (typically sodium and potassium) is maintained at a constant level. This means that any variations in flame conditions due to short-term changes in operating conditions which would normally cause noise or drift, can be eliminated. For example, if the nebuliser blocks slightly the sodium and potassium signal levels would drop and would normally be displayed as a lower concentration (an erroneous result!) If however the internal standard system were being used the signal from the reference element would also drop and this change would be used to correct the analyte readings.

Why no internal standardisation system on the BWB-XP?

One of the primary aims during the development cycle of the BWB-XP was simplification of operation and it was recognised that the use of an internal standard added significantly to the complications of obtaining a quick and accurate result. The task of adding precise amounts of an internal standard element to all samples and standards is considerable and apart from the possibility of induced errors, time and cost are real considerations.

Even with an internal standard system there are still shortcomings that can introduce inaccurate results. For instance the system would correct for non-existent changes if any of the photo-sensors exhibited drift. The most effective internal standard is lithium as its characteristics are closest to sodium and potassium, but a significant downside to using lithium is that it cannot then be easily analysed in its own right, something which is a particular disadvantage to many users. We wanted to make the BWB-XP as useful as



possible and the measurement of lithium was considered critical. It was recognised that to make a unit with the performance of an internal standardised system but without the complications then some aspects of the design of the BWB-XP would have to offer improvement over existing technology. It is worth remembering that units using the internal standardisation system were designed in the 70's and 80's and technology has moved along considerably in the meantime, so our task was made easier by having access to modern, sophisticated components and processes.

Much emphasis was placed on nebuliser design, traditionally a source of many shortcomings. The result is a novel device which is precision moulded in highly resistant thermo plastic. Our extensive testing has shown that performance levels are constant over long periods and there is limited tendency for partial or complete blockages.

The sensors used in the BWB-XP are state of the art, solid state devices which have integrated optical filters. The effect is that sensor drift and noise have been almost completely eliminated.

The integral compressor unit has been selected to be unstressed during normal operation - there is lots of performance in-hand which guarantees constant pressure at all times. A common problem experienced with external compressors which leads to noisy and erroneous results, even with internal standardisation, is condensation in the airline. On the BWB-XP this has been eliminated.

The mixing chamber and flame system has also been subjected to close scrutiny and the resulting configuration has been optimised for stability and ease of drainage.

The overall effect is that the BWB-XP performs as well as a unit using the internal standardisation system but without the complication and cost.

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