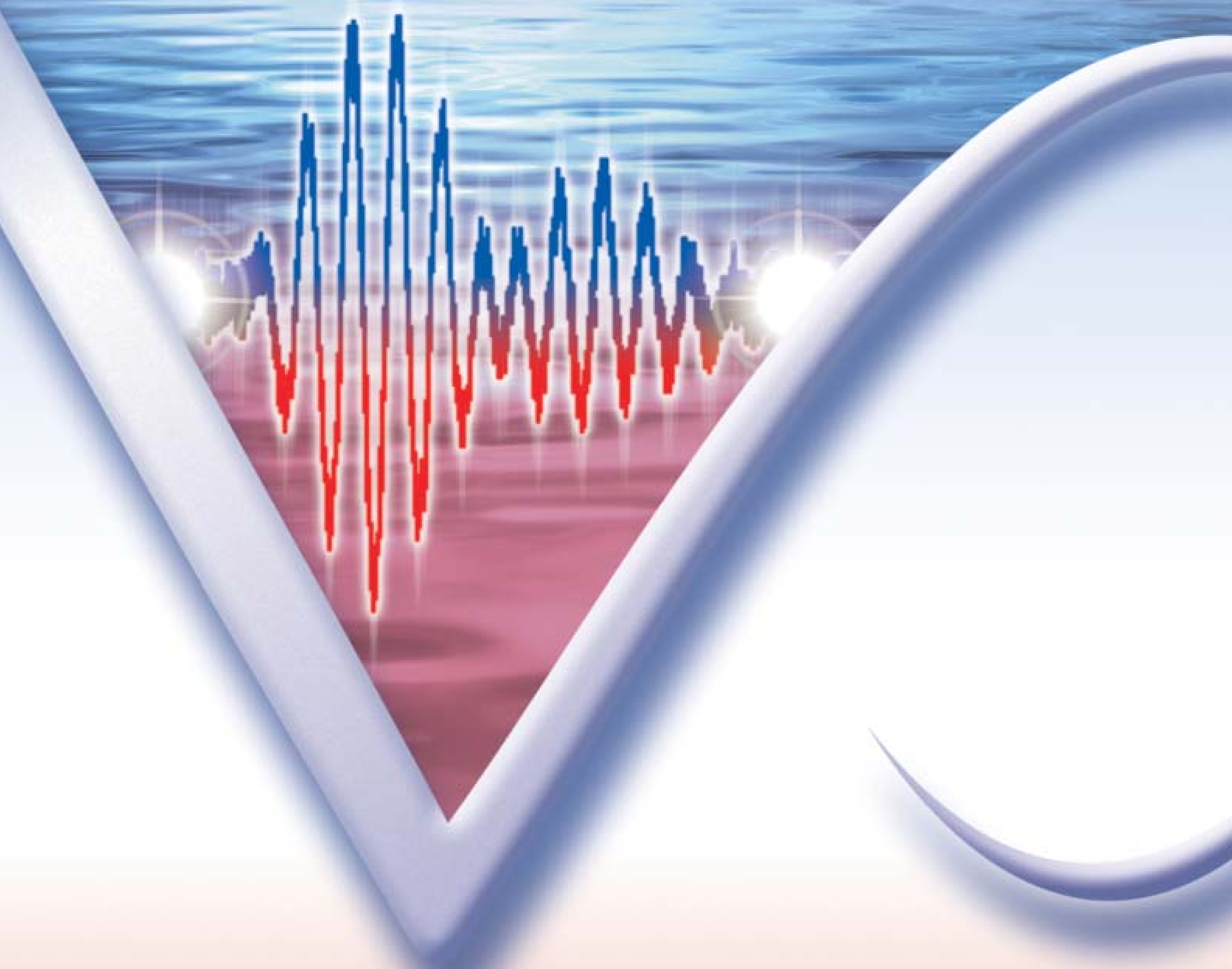
SOUND VELOCITY

Products and Services Portfolio



VALEPORT

Technology you can trust

Valeport - the Sound Decision

Sonar, multi-beams, single beams, underwater positioning systems - they all use acoustic signals, and all rely on accurate knowledge of the speed of sound for optimal performance. Estimates can be made from measurement of other parameters (Conductivity, Temperature & Pressure), but the best method is just to measure the speed of sound directly.

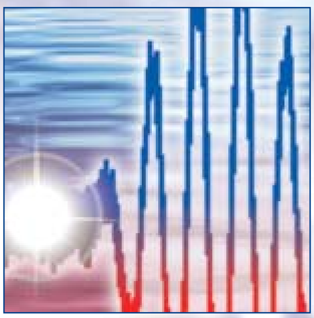
The Valeport digital time of flight sensor is as good as it gets - state of the art digital signal processing techniques allow us to accurately time a pulse of sound to nearest 10^{-11} of a second. The technique is so reliable that even with sound velocities in the region of 1500 m/s, the signal noise from the sensor is just ±0.001m/s - that's less than 1 part per million.

- Stability is guaranteed with advanced composite sensor construction to give strength and immunity to thermal effects.
- Today's surface mount pcb technology and powerful processors allow the sensor to use a circuit just half the size of a credit card.
- The sensor is now available in a variety of products to suit many applications. Choose from miniaturised OEM types for installation on ROV's, AUV's, transponders and the like, through hand held instruments for calibrating echosounders on small boat surveys, to full ocean depth profiling systems.

A standard feature of all Valeport's top of the range products is synchronised sampling, and nowhere is it more appropriate than a Sound Velocity Profiler. Not only do you start with the most accurate sensor you can buy, but the synchronised sampling technique means that you measure all the sensors at exactly the same instant, not in sequence. So when the instrument tells you what the sound velocity is at a certain depth, you know it's exactly right.

And if you still the need the benefits of a CTD (Salinity and Density data), there's even an instrument that gives you the best of both worlds - CTD sensors and a true sound velocity sensor. You can even add an altimeter, or any other sensor you want.

If you need to know the speed of sound, make sure you know it exactly.



So why is it better than the Speed of Sound data from a CTD?

All the CTD formulae contain inherent errors - even the best of them are only accurate to about 0.25m/s. It doesn't matter how good your CTD is - most can track a specific formula to within a few cm/s - but you always have to consider that the actual answer could be 0.25m/s different. One of our products actually has both, so you can compare measured and calculated data - it's interesting.

So how do you calibrate it then?

Fortunately, speed of sound in pure water is rather better defined than in sea water; assuming you are at surface level, there is only one variable - temperature. This means that by calibrating it in pure water, the technique has fewer sources of error, and it is actually easier than calibrating a CTD. You just have to accurately measure the temperature of pure water while you run the sensor in a controlled, stable environment. The beauty of the digital timing technique is that it reduces the calibration process to just defining a straight line with two points.

But surely a multi-point calibration is more accurate?

Not at all. Measuring more points just gives you more points to draw a straight line through, and the accuracy figures we quote assume that we've made the worst case error on both of the points we do measure. There is not a single part of the sensor that is non-linear in performance, so by definition, a straight line calibration is all that is required. We could measure more points and try to force a high order polynomial equation through them, but all that means is that our calibration is only valid over the range we have measured. Polynomial calibrations can give huge errors outside the calibration range, whatever the sensor in question. The straight line concept means that the calibration is valid over any range. This means you can get accurate data in places where it wasn't previously possible, like the Dead Sea (Sound Velocity ~ 1840m/s).

Does it drift over time?

In the years we have been making them, no more than a few mm/s, and this could be down to drift in the calibration equipment rather than the sensor. So not measurably, no.

What about fouling?

Well, fouling will cause a problem, but then it does with a CTD too. Most applications are only short term anyway, so a quick clean will do the job, but for long term deployments we offer copper sensor components to reduce the risk of fouling on key surfaces.

OK, so why do I need to measure sound velocity so accurately?

Quite simply because the more accurate your SV measurement, the more accurate the data from your acoustic device, be it a transponder, echo sounder or sonar. The drive for more accurate data comes from end-user expectations, and the manufacturer's obligations to satisfy them - by getting one part of the overall system as near to absolutely correct as possible, the potential sources for error are reduced. That can only be a good thing. And anyway, the cost of these sensors is not really very different from a CTD, so why compromise?

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