

Which hydrophone calibration do I need?



IS THERE A REQUIREMENT TO HAVE A CALIBRATED HYDROPHONE?

This depends on the nature of your measurements.

If you are working towards a particular regulatory standard then yes, there are strict requirements for hydrophone calibrations, or if you are working within your organization's quality system there may be requirements to have your hydrophone regularly calibrated.

An annual calibration is sufficient for most applications.

CAN I USE AN UNCALIBRATED HYDROPHONE?

Yes, a hydrophone will still function if uncalibrated, but reliable pressure readings cannot be derived. Relative measurements are, however, possible with an uncalibrated hydrophone.

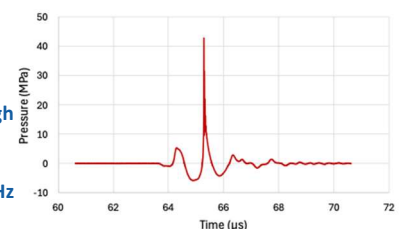
DO I REALLY NEED THE 1-40 MHZ OPTION OR WILL 1-30 MHZ BE OK?

This depends on the type of signals you are measuring.

High frequency containing signals:

- Diagnostic pulses (non-linear)
- Shockwaves

Figure 1. Example of a high frequency diagnostic/shockwave pulse generated by a 1MHz transducer.



Both of the above waveform types contain high frequency content within the waveform and require high frequency calibration data to accurately derive acoustic parameters.

EN IEC 62127-1 requires that the hydrophone's acoustic working frequency (f_{awf}) be characterised from $\frac{1}{2}$ to $8x$ the working frequency (equation 1). In the example of a 5 MHz diagnostic source, a calibration from 2.5 MHz to 40 MHz is required.

$$\frac{f_{awf}}{2} \leq f \leq 8f_{awf} \quad (1)$$

CAN I HAVE FINE-INCREMENT CALIBRATION DATA?

The measurement technique we use for our 1-20 MHz, 1-30 MHz and 1-40 MHz calibrations uses non-linear generation of harmonic content to provide frequency content at integer multiples of 1 MHz. This determines the frequency increment we can provide in this range.

However, at request we can provide fine-frequency increment calibrations over the range 0.3 to 5 MHz.

DO I NEED A DIFFERENT CALIBRATION FOR WORKING AT HIGH PRESSURES?

No. Our hydrophones are linear devices over their working range, so the calibration data is valid for all pressures within the working range of the hydrophone.

DOES IT MAKE A DIFFERENCE IF I WANT TO MEASURE A SHORT PULSE OR A LONG SIGNAL?

At frequencies above 400kHz there is generally little difference, however at lower frequencies the nature of the acoustic field and the mounting arrangement of the hydrophone need careful consideration to avoid reflected wave artifacts distorting the apparent sensitivity of the hydrophone.

For further information: S. Rajagopal *et al.*, "On the Importance of Consistent Insonation Conditions During Hydrophone Calibration and Use," in *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 70, no. 2, pp. 120-127, Feb. 2023, doi: 10.1109/TUFFC.2022.3205851

FOR RECALIBRATIONS, DO I NEED TO RETURN MY PREAMPLIFIER/DC COUPLER?

Ideally yes, however it is possible for us to calibrate your hydrophone using one of our in-house preamplifiers and DC couplers, at the expense of a slightly higher uncertainty – typically 2%.

All information is based on results gained from experience and tests, and is believed to be accurate but is given without acceptance of liability for loss or damage attributable to reliance thereon as conditions of use lie outside the control of Precision Acoustics Ltd.