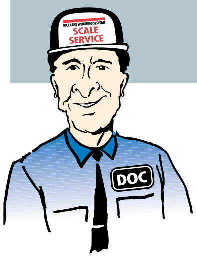
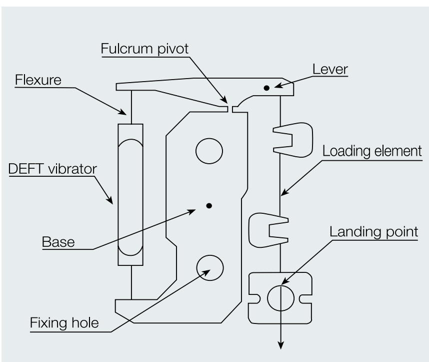



# Understanding Tuning Fork Technology

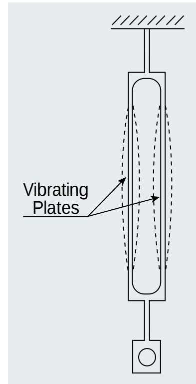
Since Rice Lake began offering Ishida industrial balances featuring tuning fork technology, a lot of people (including myself) have been curious about how these balances are able to outperform traditional load cell-based balances. After some research and discussion with experts in the force measurement field, I've decided to explain this amazing technology and the benefits it provides.

## Tuning Fork Sensor

Surprisingly, tuning fork technology is relatively easy to understand. The actual tuning fork sensor is constructed from an alloy material and consists of a double-ended tuning fork vibrator (DETF), a fulcrum point, a lever, a loading element, and a base with fixing holes.




The sensor establishes the amount of force applied to the balance by measuring the resonant frequency generated on the DETF vibrator. The vibrating element consists of a pair of rectangular flat plates symmetrical to the center axis and parallel with each other; they oscillate at a fundamental frequency with the symmetrical mode shown by the broken line.




Two piezo-ceramic transducer elements are placed close to the lower end of the vibrating plates. One piezo-ceramic element connects to the output terminal and the other to an amplifier input terminal. Together they establish a stimulation and detection circuit to maintain vibration—one for exciting and the other for sensing.

## Superior Performance

To achieve high accuracy, a balance must compensate for the influence of temperature fluctuation at the force sensor. The temperature range of a tuning fork-based balance is extremely small. This is due to the tuning fork sensor's superior heat capacity and conductivity. The DETF vibrator requires a very small amount of excitation energy, allowing it to have very simple temperature and heat transfer characteristics. What's more, the tuning fork sensor doesn't require any A-D converters, analog circuits, or magnetic circuits which cause complex temperature characteristics. This allows Ishida balances to maintain incredibly long-term stability. And since the tuning fork sensor measures force by reading changes in resonant frequency, the possibility of hysteresis is practically eliminated.

## Easy to Maintain

I've often found untraditional technologies a hassle to fix or find parts for, however, that's not the case with Ishida's tuning-fork balances. They just don't wear out, but if they are damaged due to an accident, repairs are inexpensive and easy. Additionally, they do not incorporate an internal magnetic coil—enabling them to remain virtually free from damaging dust.

*Ishida IB-2000*

## Make the Switch

If you're tired of dealing with problems inherent to load cell-based balances, consider switching to Ishida tuning fork-based balances. Their superior characteristics make them the perfect choice for light industrial applications such as weighing dyes, pharmaceuticals, and jewels, as well as quality control applications.

Doc

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