Explanations of output unit and calculation basis of VW load cell

1. Explanation of output unit of vibrating load cell

Vibration sensor sends frequency signal, so frequency (Hz) and cycle (sec) can be used as default, and the amplified high sensitive frequency (10^3Hz^2) can be used.

The frequency is the number of oscillations per second, which is the raw value, and the period is the reciprocal of the frequency, representing the time it takes for the sine wave to travel through one cycle.
Because it is displayed as a very small number of decimal places, it is expressed in μsec (micro-sec) multiplied by one million (106)

The true value of the output value (μsec) displayed on the output device is the value expressed in a few millionths.

The meaning of the broadened high sensitivity frequency (10^3 Hz^2) is the value expressed by uniting (1000) since 1000 is displayed in very large unit when the frequency is squared and amplified.

1) Hz(frequency) = 1 / cycle(sec)
2) 10^3Hz^2 = Hz x Hz / 1000
3) μsec = sec x 10^6

2. Frequency output unit according to manufacturer

Depending on the company that manufactures the Geotechnical measuring instrument and the output device (Readout Unit, Data Logger type), the following engineering units can be selected slightly differently

1) Ace Instrument Co., Ltd : Hz, 10^3Hz^2, μsec, 4 types of strain (με), 2 types of temperature sensor (Thermistor, RTD)
2) US "S" manufacturer : Hz, 10^3Hz^2, μsec, 3 types of strain (με), 2 types of temperature sensors (Thermistor, RTD)
3) US "G" and, "R" manufacturer : μsec, 3 types of strain (με), 1 type of temperature sensor (Thermistor)
4) Canadian "R" manufacturer : Hz, 10^3Hz^2, μsec, 3 types of strain (με), 1 type of temperature sensor(Thermistor)
5) UK "S" manufacturer : 10^3Hz^2, 10^{-7}sec, 1 type of temperature sensor (Thermistor)

Here, the strain mode is a numerical value obtained by performing a secondary processing so that the strain gage length of a strain gage manufactured by an output device manufacturer is calculated by software and immediately displayed as a strain rate
When measuring the strain gauge, it is convenient to check the gauge distance and measure it with the corresponding strain mode. Vibrating wire sensor type should determine which company's output device is to be used and which unit to measure .From the engineer's point of view, if user read in frequency mode, Hz or μsec, in Hz mode, the accuracy of the calculated value will be higher than in μsec mode This is because the Hz mode is normally displayed as 4 digits, and μsec mode is usually displayed as 3 digits. However, if you are familiar with μsec mode, doesn't matter to use them.

3. Theory of Calculation of Vibrating wire Load cell.

It is not always necessary to use this unit when measuring a vibrating wire load cell, but it is common to use a high-sensitivity frequency (10^3Hz^2).

The Load cell used in Geotechnical engineering field is compression type, and if using high sensitivity frequency, calibration can be made more precisely in the calculation of the measurement value, so it will be calibrated in this unit.

Most domestic manufacturers are also calibrating in this unit.

As described above, it is recommended to use this unit when measuring the pressure gauge or piezometer, which has better resolution than other units and requires precise measurement because it is the value that amplifies Hz value.

When calibrating or the vibrating wire sensor, it can use the Gage Factor for the first order function or the ABC Factor for the second order function.

Depending on the manufacturer, one of the two calculation methods is selected and displayed.

The advantage of the Gage Factor is that it is simple to calculate with two variables, and the advantage of ABC Factor is that it is a little complicated, but it can be more accurate because there are three variables.

The engineer can also use calculations which is familiar.