

Description and conversion formula of vibrating wire sensor

1. Description

Frequency can be calculated according to below numerical formula with length of string, tension, density, gravity acceleration, elastic modulus and rate of transformation.

The vibrating wire sensor's basic value of output is frequency and according to kind of measurement devices, it changes a measurement unit and gets a value of engineering units (load, pressure, angle, replacement and rate of train) very usefully. Also, because manufacturing companies have different units, Sometimes units need to be altered.

2. Measuring unit description and conversion formula of the vibrating wire sensor

1) Hz (Frequency)

It can show frequency and apply to all the vibrating sensors by its basic value of output, And it can also output as data of the second function..

2) 10^3Hz^2 (Linear value)

It is usually used as the vibrating wire pressure gauge or the vibrating wire load gauge. And while modifying, in case frequency value according to increase of benchmark engineering unit decreases, is used mainly. Moreover, it can make fixed frequency change about fixed change of standard price and is displayed to data of the first function.

a) Convert Hz unit to 10^3Hz^2 unit

$$10^3\text{Hz}^2 = \text{Hz} \times \text{Hz} / 1000$$

b) Convert 10^3Hz^2 unit to Hz unit

$$\text{Hz} = \sqrt{10^3\text{Hz}^2 \times 1000}$$

3) μsec (Period)

It refers to period of vibration and express required of time per once. It is reciprocal with frequency. Value of sec of μ sec is very small, so it should be multiplied the value by 1000000.

$$\text{sec} = 1 / \text{Hz}$$

a) Convert Hz unit to μsec unit

$$\mu\text{sec} = 1 / \text{Hz} \times 1000000$$

4) $\mu\epsilon$ (Strain)

It is the rate of strain(transformation) and it is the only unit for the system of rate of strain among measuring instruments. It is according to spot welding type, welding style, laying style, shock Lied type, its application changes. Strain can multiply elastic modulus (E:kg/cm²) of absence and calculate easily by stress (σ :kg/cm²) if measure by straining(ϵ) unit. Strain conversion by kind of strain is same with the following.

a) VW Spot-weldable strain gage / Model 1210, 1215

$$\mu\epsilon = 0.3911 \times 0.001 \times \text{Hz} \times \text{Hz}$$

$$\text{Hz} = \sqrt{\mu\epsilon / (0.3911 \times 0.001)}$$

b) VW Weldable strain gage / Model 1220

$$\mu\epsilon = 4.062 \times 0.001 \times \text{Hz} \times \text{Hz}$$

$$\text{Hz} = \sqrt{\mu\epsilon / (4.062 \times 0.001)}$$

c) VW Embedment strain gage / Model 1240

$$\mu\epsilon = 3.304 \times 0.001 \times \text{Hz} \times \text{Hz}$$

$$\text{Hz} = \sqrt{\mu\epsilon / (3.304 \times 0.001)}$$

d) VW Shotcrete strain gage / Model 1230

$$\mu\epsilon = 0.7756 \times 0.001 \times \text{Hz} \times \text{Hz}$$

$$\text{Hz} = \sqrt{\mu\epsilon / (0.7756 \times 0.001)}$$