

# Proposal for selection of tunnel measurement sensors

The rockbolt stressmeter, the underground displacement meter, and the shock stress meter should be important judgment data of the tunnel measurement. In the design and manufacture of measuring instruments for tunnels in Korea, the quality and level of manufacturing are so poor that low-level instruments are used. Unfortunately, there are too many unusual cases, so we need to select and operate the civil engineer's tuner instruments properly

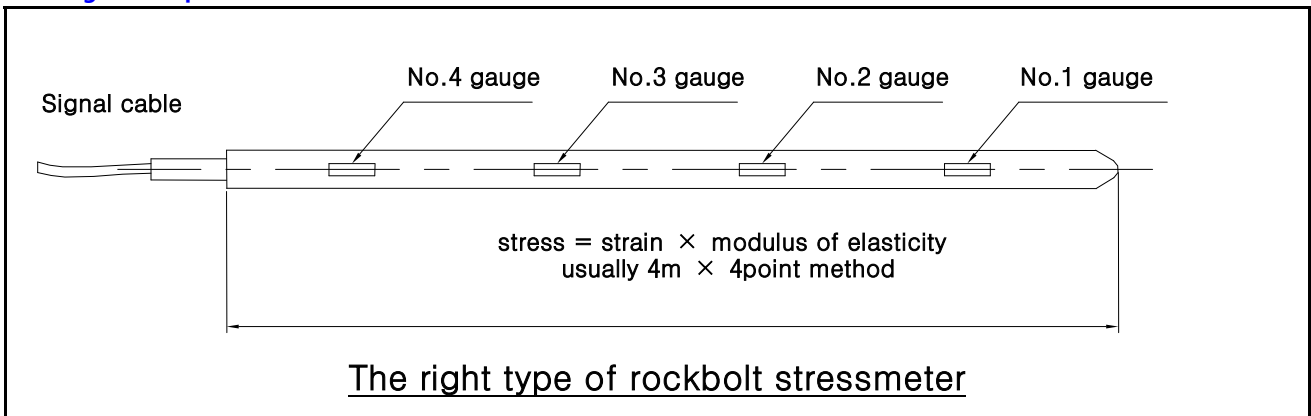
## 1. About Electric Tunnel Instruments

The electric rockbolt stressmeter and the underground displacement meter supplied from Korea except our company products, have a potentiometer with a measuring range of 50~60mm which is equivalent to about 1000won per piece, is built into the housing and four potentiometer are usually built in the housing. This type of potentiometer is developed for listening to audible frequency and cannot be expressed as sensor precision. It is a 3~10% accuracy resistance sensor which cannot be verified itself and is very sensitive to moisture and does not satisfy sensor requirement itself.

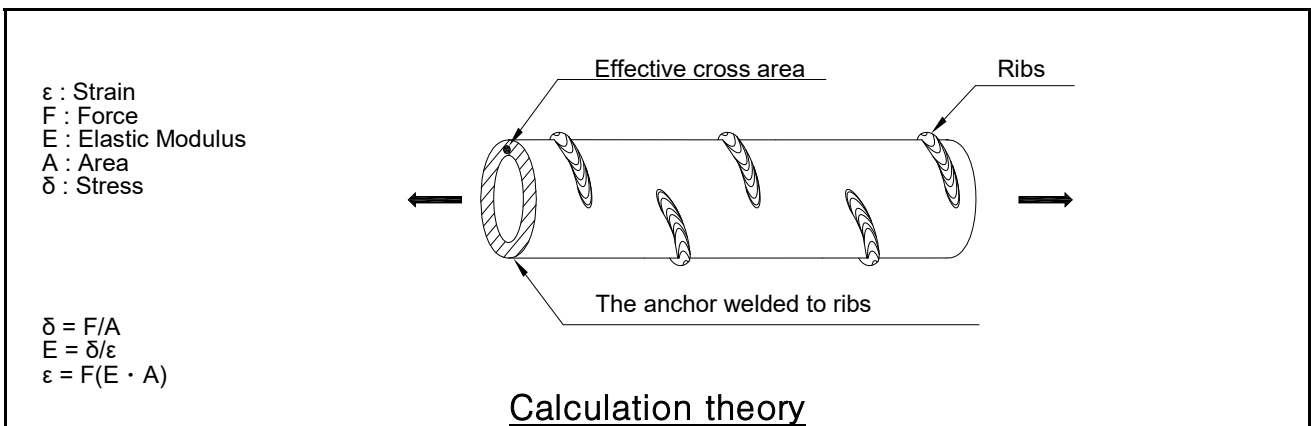
Manufacture and supply of these instruments are considered to be harmful to the civil engineering industry, and many companies sell electric cracking systems using these low-grade variable resistance sensors.

Also, in the case of mounting an electric displacement sensor, it has to be possible to install a high-grade potentiometer (at least 60,000~100,000 won per unit) such as made in Japan or a product equipped with a displacement sensor using a thin plate resistance strain gauge. This is a product that must be purchased and calibrated and kept more confidential.

## 2. Design Principle of Rockbolt Stressmeter

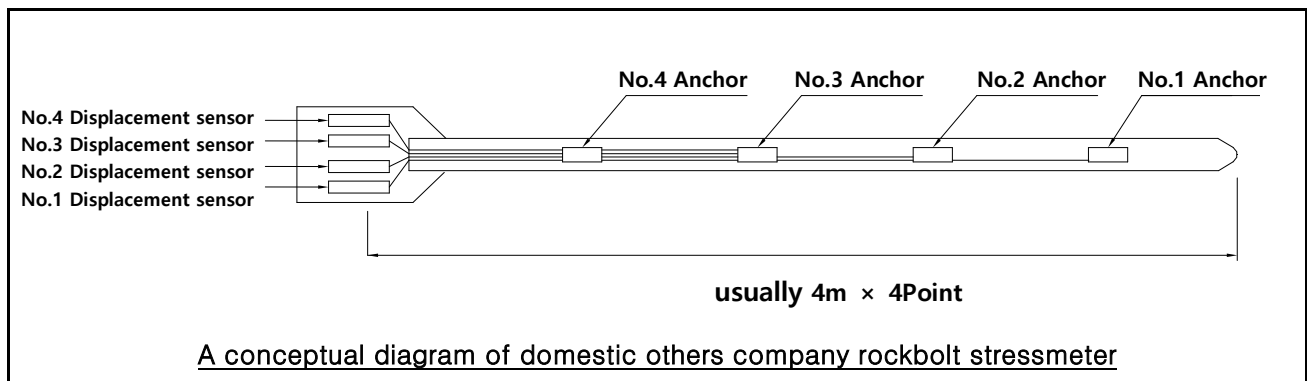


Axial force must be expressed in terms of stress or strain, and therefore must have a built-in strain gauge at the measuring point or a strain gauge attached to the outside of the anchor.



Nevertheless, the domestic rockbolt stressmeter, which is supplied to the market, has a fixing point screwed into the anchor at the measuring point and incorporates an electric displacement sensor or a strain gauge type strain gauge at the tip of the rock bolt gauge. Also, there is a wire structure between the fixed point and the sensor. Even if the strain meter is attached to the tip of the structure, the structure theory is satisfactory. However, there is no explanation method that incorporates a low-grade electric displacement sensor

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When the maximum axial force is applied to the anchor, the strain sensor can confine up to 2000 microstrain. When the strain sensor is converted into the displacement amount, the displacement sensor having a small displacement of about 0.1 mm to 0.2 mm can detect displacement sensors of 4 m, 3 m, 2 m, Can not deliver a fine-scale strain through a thin wire strand. This is because wire ropes used as connection rods are usually wrapped in a narrow space constraint at the product manufacturing plant.

The more rockbolt stressmeter of these material is used, the greater the distrust of the domestic measuring instrument will be, and the tunnel measurement skepticism will be further increased.