

**KES**

**Test Standard for  
Molding of Steel Plate**

**KES T – L423**

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## 1. Scope of Application

This standard shall be applied to test method and indication method of a press strip for vehicles, which thickness is less than 3mm, and molding of steel plate.

## 2. Definition of Terminology

Terminologies used in this standard are as following.

- (1) Load (F) is a force hung on a test sample during the tensile test, and especially, the maximum load hung on the sample is called a tensile load.
- (2) Nominal stress (S) is a value that the load (F) on the test sample is divided by an initial cross section area (A<sub>0</sub>).

$$S \text{ (kg f / mm}^2\text{)} = F \text{ (kg f)} / A_0 \text{ (mm}^2\text{)}$$

- (3) Nominal strain ratio (e) is the value that a deformed length is divided by an initial marked distance.

$$\ln \left( \frac{\sigma_1}{\sigma_2} \right) = n \ln \left( \frac{\epsilon_1}{\epsilon_2} \right)$$

Here, L<sub>0</sub> = Initial marked distance

L = Marked distance after deformation

ΔL = deformed length (L – L<sub>0</sub>)

- (4) Yield point (YP) is a stress at a point where a line drawn from a point at strain ratio of 0.002 parallel to a straight line in a range of elasticity meets the load-strain ratio curve.
- (5) True stress (δ) is a value that a load (F) is divided by a cross section area (A) of the sample, and in real elastic domain, A<sub>0</sub> and A are almost same, but if the plastic deformation is excessive, there are large difference between A<sub>0</sub> and A.
- (6) True strain ratio is defined as following.

$$\begin{aligned} \epsilon &= \frac{L_1 - L_0}{L_0} + \frac{L_2 - L_1}{L_1} + \frac{L_3 - L_2}{L_2} + \dots = \int_{L_0}^L \frac{1}{L} dL = \ln \left( \frac{L}{L_0} \right) \\ &= \ln \left( \frac{L - L_0 + L_0}{L_0} \right) = \ln \left( \frac{L - L_0}{L_0} + 1 \right) = (e + 1) \end{aligned}$$

- (7) General mathematical expression for a flow curve between the true stress and the true strain ratio is as following.

$$\sigma = K\varepsilon^n$$

Here, K is a stress at  $\varepsilon = 1$  and called a strength coefficient, and n is a work hardening index, which is a measure that expresses a degree of resistance according to a deformation of the material.

- (8) Lankford value ( $R_{deg}$ ) is a measure that expresses a different degree for each direction of the thickness of the plate or the surface of the plate for the strength of press strip and the plate.

- (9) Erickson number is a measure of resistance against tensile strength on the material.

### 3. Test Method

#### 3.1 Tensile test method

For the tensile test method, in order to minimize differences of results according to the test method, follow the following items, and for items that are not indicated, follow KES T-L004 (Tensile test for metallic material).

- (1) For the tensile test sample, obtain number 5 test sample of the KES T-L005 (Tensile test sample for metallic material), and its length of the parallel part should be longer than 70mm.
- (2) Tensile speed shall be separated in the elastic domain and the plastic domain, an increase ratio of average stress is  $1\text{kg} / \text{mm}^2.\text{sec}$  in the elastic domain (Before the yield point), and for an apparatus, which control of the increase ratio for the load is not possible, the tensile force shall be applied at  $0.5\text{mm} / \text{min}$ .  
In addition, in the plastic domain (After the yield point), the tensile force shall be applied at  $20\text{mm} / \text{min}$ .
- (3) Width measuring device and elongation measuring device shall be principally attached