

KES

General Test Code of
Cylinder Head Gasket
for Automobile Engine

KES T – K029

(EST.) 1989 – 03 – 30

Contents

1. Scope of Application
 2. Explanation of Terminologies
 3. Test Items
 4. Material Property Test Method
 5. Performance Test
- Additional Rule

1. Scope of Application

This standard shall regulate the cylinder head gasket for automobile engine.

2. Explanation of Terminologies

2.1 Grommet : A metal that covers area around holes in a main body of the gasket

2.2 Free thickness : A thickness at completion of processing of the gasket

2.3 Tightening thickness : A thickness when tightening the gasket with the cylinder head and cylinder block at specific tightening torque

2.4 Pressure sensitive paper : As a paper that shows a depth of color according to a force applied, there are a single-color-outbreak type and a composite-color-outbreak type.

2.5 Contact face leakage : A leakage from the contact face of the gasket and the cylinder block, or the cylinder head.

2.6 Penetration leakage : A leakage occurred by a penetration into the gasket itself.

2.7 Measuring element : Plastic material (Pb alloy) used to measure an accurate tightness thickness of the tightened gasket.

3. Test Items

3.1 Material property test

- 1) Tensile strength
- 2) Compressibility and restorability
- 3) Oil resistance
- 4) Thermal resistance
- 5) Coolant resistance

3.2 Performance test

- 1) Surface pressure distribution test

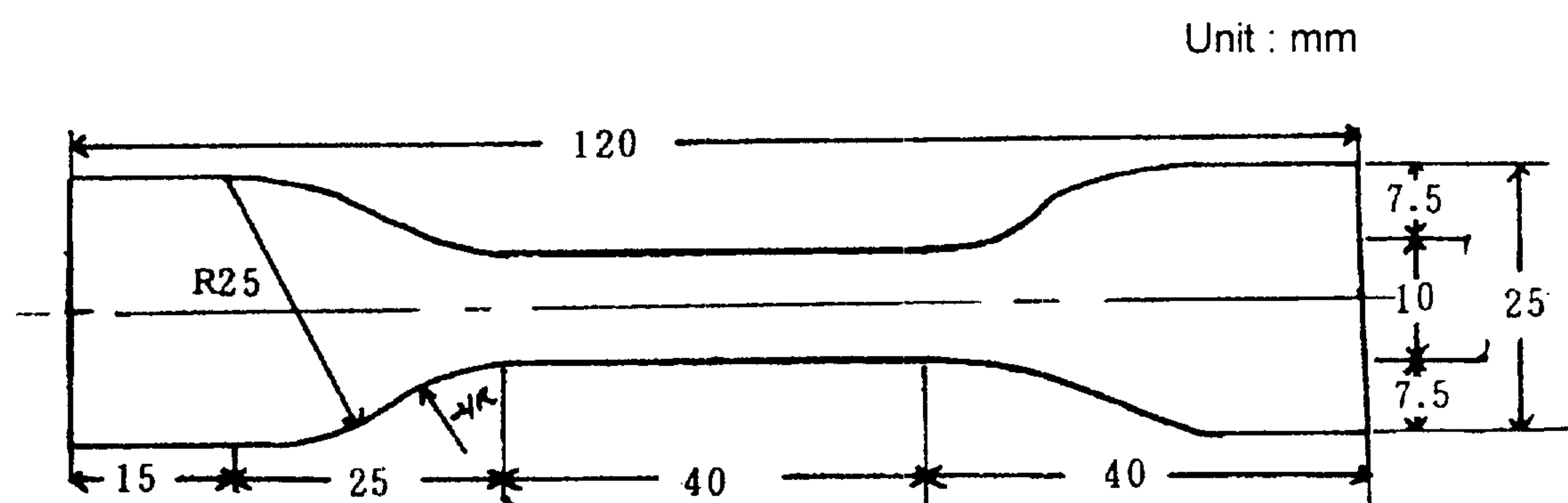
- 2) Thickness when cold-attached
- 3) Compressibility
- 4) Modulus of elasticity
- 5) Permanent deformability
- 6) Seal for water-hole test
- 7) State of ring test

4. Material Property Test Method

4.1 Tensile strength test

4.1.1 Testing plate

Use KSM 6518 dumbbell-shape no. 1 and its measurements are shown below.



Obtain the testing plate by cutting horizontally with an iron board scissors.

4.1.2 Method

Place the testing plate in a testing machine, which can adjust to tension speed of

300 ± 25 mm / min, and apply the load.

Record the load when the testing plate is cut.

4.1.3 Result

Write down an average of three test results.

4.2 Compressibility and restorability

4.2.1 Testing plate

Cut three square plates with a side of 25 mm with the iron board scissors and use them as the testing plates.

4.2.2 Equipments

- 1) Anvil : Use the one, which surface contains small holes, that has been polished and is 32 mm in diameter.
- 2) Penetrator : Use a round bar that has been polished several times and is 6.4mm in diameter.

In this case, a permissible error is ± 0.02 mm.

- 3) Dial Gage : Since this is used to indicate the thickness of the measuring testing plate, use the one that can measure down to 0.01 mm scale.

4.2.3 Test method

- 1) Place the testing plate on the center of the Anvil and apply a preload of 2.27 kgf for 15 seconds, then measure the thickness. (P)
- 2) Immediately, within 10 seconds, apply a load of 111kgf for 60 seconds, and then measure the thickness. (M)
- 3) Remove the load, then measure and record the thickness. (R)

4.2.4 Report

Calculate as shown below, and report the average value of three tests as the test result.

$$\text{Compressibility} = \frac{P - M}{P} \times 100$$

$$\text{Restorability} = \frac{R - M}{P - M} \times 100$$

P : Thickness by the load (mm)

M : “ “

R : Thickness after removal of the load (mm)

4.3 Oil resistance (ASTM No. 3 Oil)

4.3.1 Test items

- 1) Compressibility
- 2) Restorability
- 3) Rate of increase of thickness
- 4) Rate of increase of weight

4.3.2 Testing plate

Cut six square plates with a side of 25 mm with the iron board scissors and use them as the testing plates.

Three of them are used for the compressibility and restorability tests, and the other three are used for measurements of rates of increase of thickness and weight.

4.3.3 Test apparatuses

- 1) Dry Oven : Use the one that can increase up to 150 ± 4 °C.
- 2) Micrometer : Use the one that can measure down to 0.01 mm scale.
- 3) Balance : Use the one that can measure down to 0.001 g scales.

4.3.4 Test method

- 1) Obtain 3 extra testing plates and measure thickness down to 0.01 mm and weight down to 0.001g scales.
- 2) After dipping three plates from 1) and three other plates into ASTM No. 3 Oil, put them in the Dry Oven, raise temperature to 150 ± 4 °C and keep there for 5 hours.
- 3) After 5 hours, cool them in the room temperature, wipe out the oil with Toluene.
At this time, do not wipe with pressure.
- 4) Measure the compressibility and restorability with the other three plates according to

4.2.