

KES

**General Durability Test
Standard for Power Train DY**

KES T – F001

(EST.) 1988 – 05 – 25

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1. Scope of Application

This shall be applied to the entire vehicles (below 1.4 ton, except 4*4) with a manual transmission.

2. Purpose

This shall be for the purpose of making the general durability test efficient by confirming the general items such as test preparation, method and setting of equipments in the general durability test for a power train DY.

3. Abstract

3.1 Test Purpose

Perform the general test for the trustworthiness of the driving units such as manual T/M, T/A, Diff, P/shaft and drive shaft by simulating the real driving condition by operating the engine or motor according to a program.

3.2 Evaluation Standard

During or after driving of the regulated distance (for passenger car : 35,000 km), there should be no damage, crack, abnormal abrasion, oil leakage and decrease of fixing torque in each part.

3.3 Required time for test

Preparation work (50Hr, on the basis of 2 persons)

Driving time (400~900Hr)

4. Test Condition

4.1 Selecting engine

Select the each maximum torque engine out of gasoline, diesel and rotary engine with

the same T/M and T/A.

4.2 Transmission oil

Inject the regulated amount of the designated oil. (design spec)

4.3 Disassemble the test sample and check the specifications of each part.

Remark 1. Apply the lower limit of the design tolerance.

4.4 Setting of equipment

(a) Fly wheel inertia : standard weight of vehicle strength

(b) driving resistance 0 % incline

Tire loss : 0

5. Test Method

5.1 Used fixture : Power train dynamometer

5.2 Driving pattern : See the test driving mode. (attached)

5.3 Driving distance : 35,000 km (on the basis of passenger car)

Remark 2. Adjust the driving cycle to the life required in the market for a taxi and special purpose vehicle. (discuss it with design)

3. Assure 100,000 km in the market by 35,000km.

6. Test Preparation

6.1 Engine preparation

(1) Remove engine oil

(2) Oil pan work

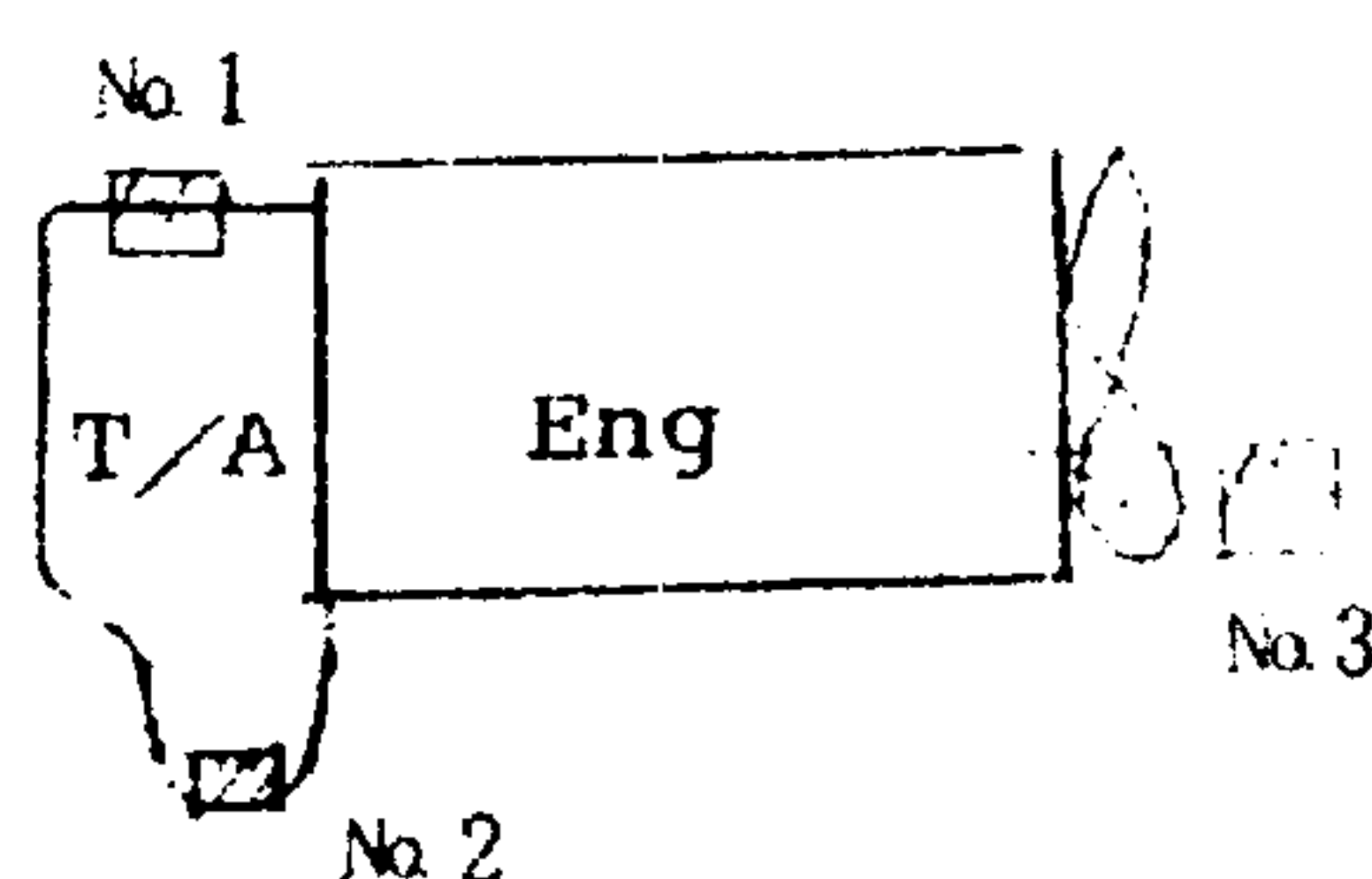
(a) Separate the oil pan.

(b) Weld the oil circulation pipe. (for oil cooling circulation)

(c) Attach the oil pan.

Remark 4. Oil circulation pipe $\varnothing$ 25~30 mm

- (3) Attach the gear for picking up the engine speed. (for measuring engine rpm)
- (4) Attach clutch disc and cover for a test. (observe the regulated torque.)
- (5) Attach T/A for a test.
- (6) Attach the engine and mission mounting.



(Fixing position)

- (7) Move the engine to the designated position.
- (8) Attach the wheel hub flange to Md1 and Md2. (connection jig of drive shaft and fixture)
- (9) Attach the drive shaft for a test.
- (10) Perform a horizontal adjustment of the engine.
- (11) Adjust the angle of the drive shaft. ($L_H : 5^\circ$, $R_H : 3^\circ$)
- (12) Fasten the entire bolts in the supports. (bed nut, eng support)
- (13) Set up the engine oil line and coolant circulation line.
- (14) Set up the rubber pipe for emitting the exhaust gas. (sus jabara)
- (15) Attach the thermometer.(T/A, oil pan)
- (16) Inject the engine oil and T/A oil. (observe the appropriate amount)
- (17) Set up the engine wire harness.

6.2 T/A preparation

- (1) Check the exterior of T/A
(damage condition, oil sealing condition)
- (2) Measure the fixing torque of the entire T/A bolts.

(3) Disassemble T/A. (Disassemble the T/A case.)

(4) Measure the amount of the end play of the gear set by a gap gauge.

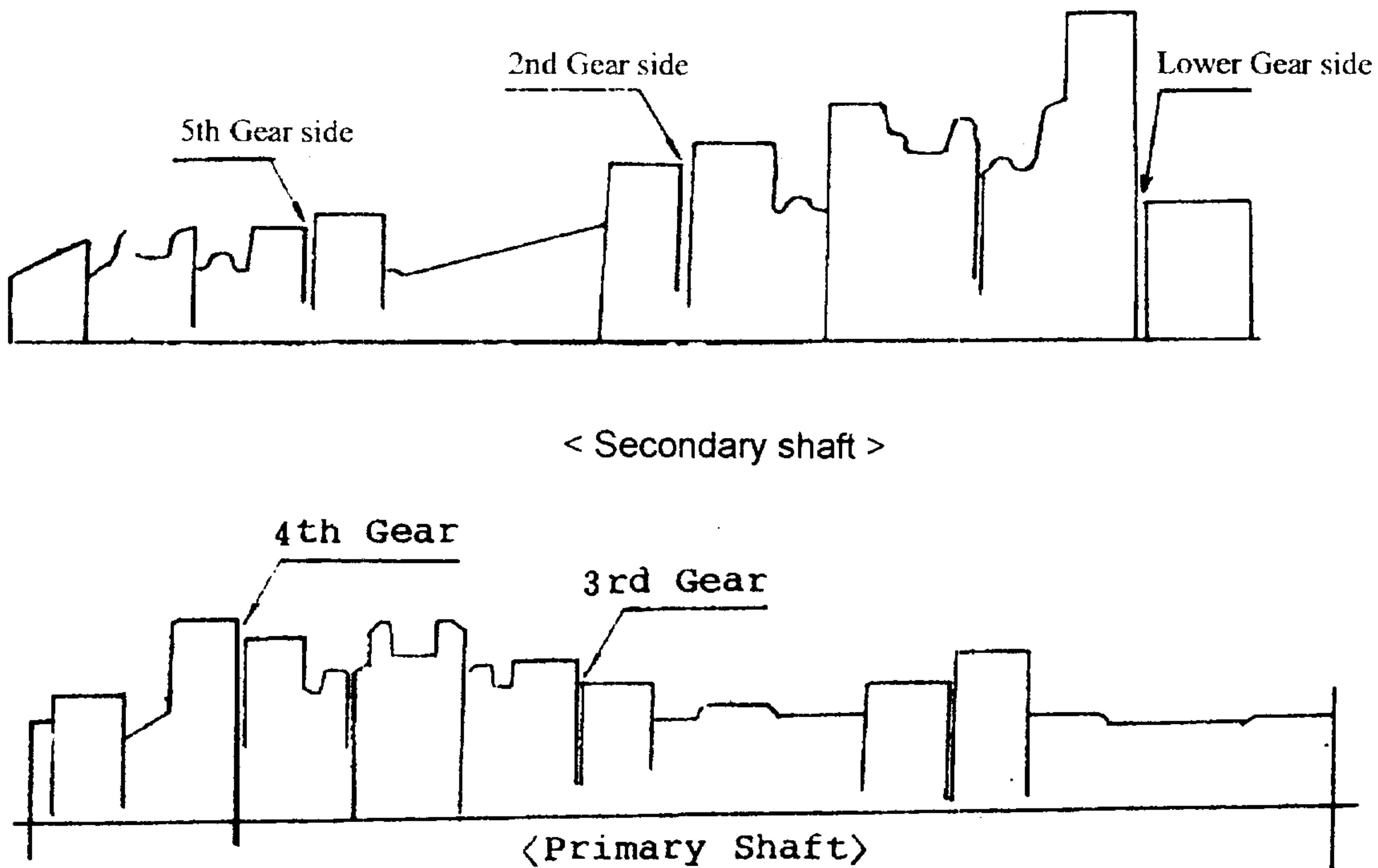


Figure 2. Measurement positions of end play

(5) Disassemble the gear set completely according to the procedures with the disassembling jig.

(6) Wash each parts.

(7) Measure each parts.

Outer diameter of the shaft (measure it with outer diameter micrometer.)

1st shaft (3rd, 4th, 5th)

2nd shaft (1st, 2nd)

Inner diameter of each gear (cylinder gauge)

Thickness of the edge section of the shift fork (outer diameter micrometer)

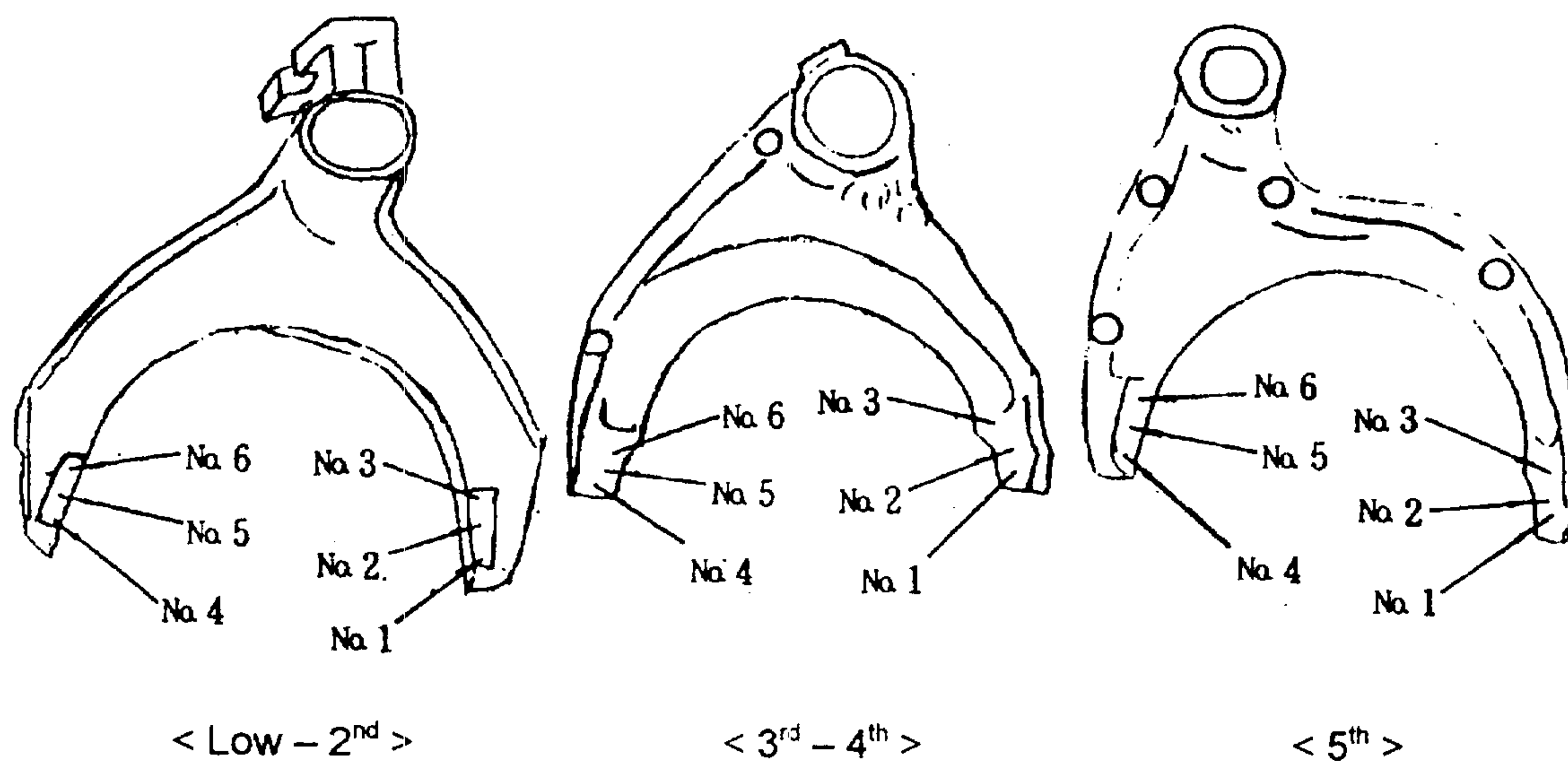
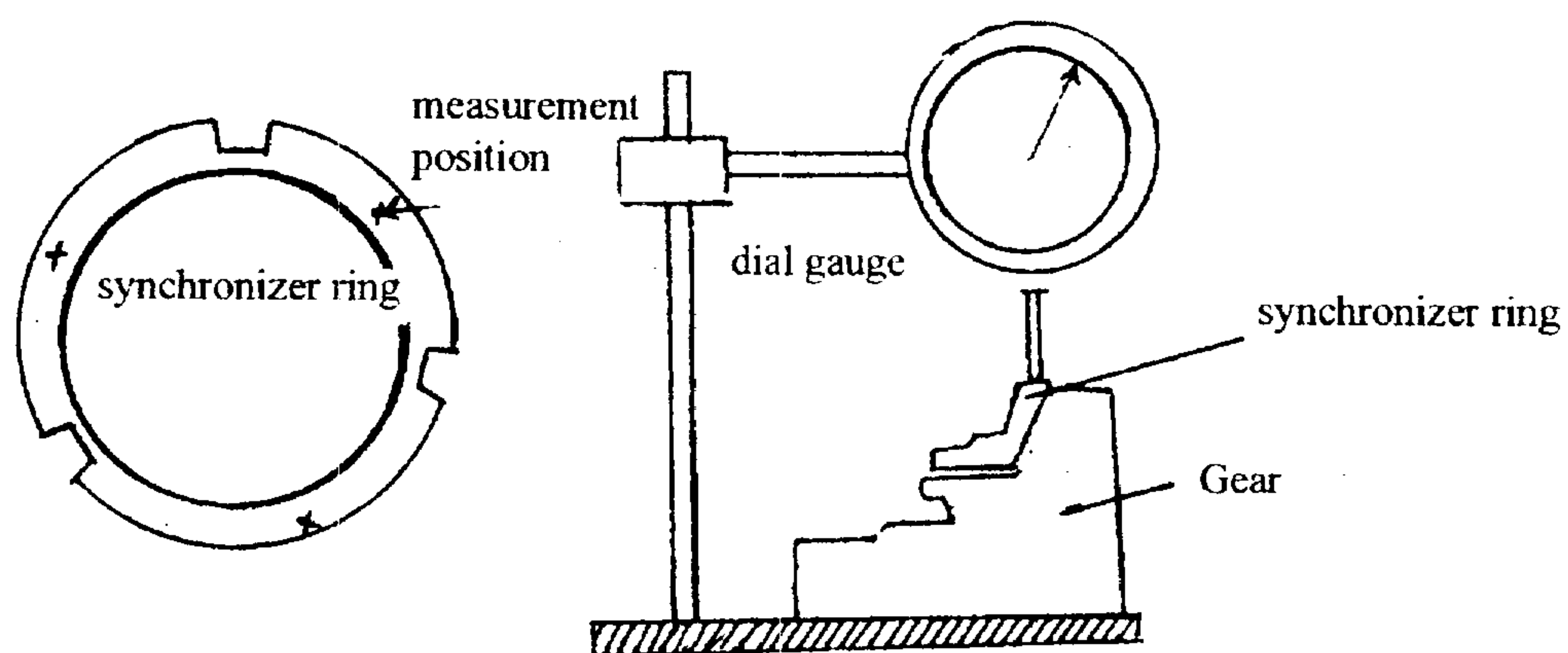


Figure 3. Synchronizer ring

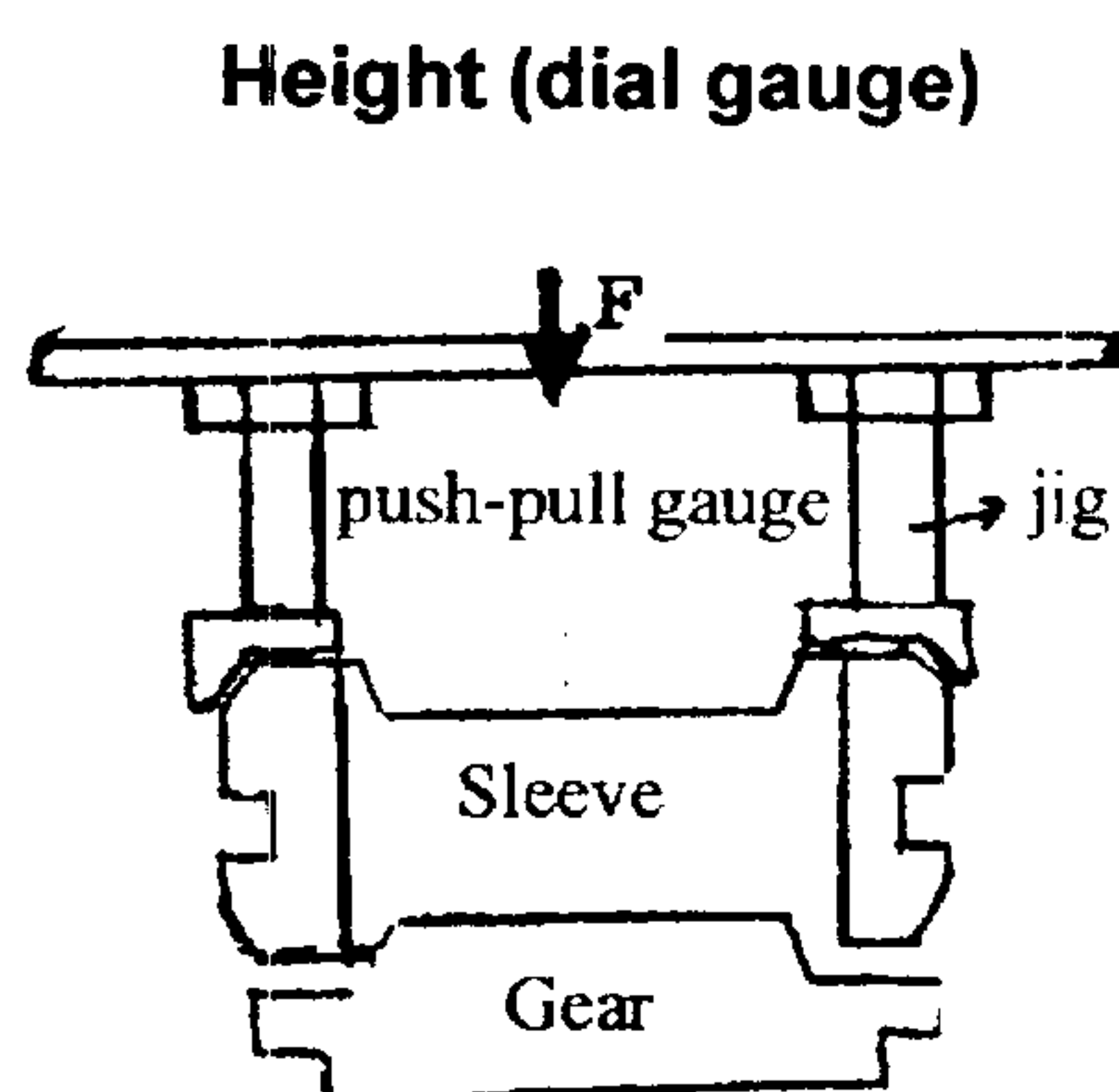


Figure 4. Rising load measurement of key-spring (Push-pull gauge)

Measure the width of the hub sleeve. (inner diameter micrometer)

Check the condition of the bearing. (naked eyes)

Check the condition of the other parts.

- (8) Assemble the T/A according to the procedures.
- (9) Measure the amount of the end play. (on the basis of the design standard)
- (10) Adjust the shim by measuring the pre-load.
- (11) Fasten the entire fixing bolts with the regulated torque. (design spec)
- (12) Check the condition changing each gear.
- (13) Insert the release collar bearing.

7. Equipment Setting

7.1 Setting the inertial weight of flywheel (mechanical + electrical)

7.1.1 Mechanical control

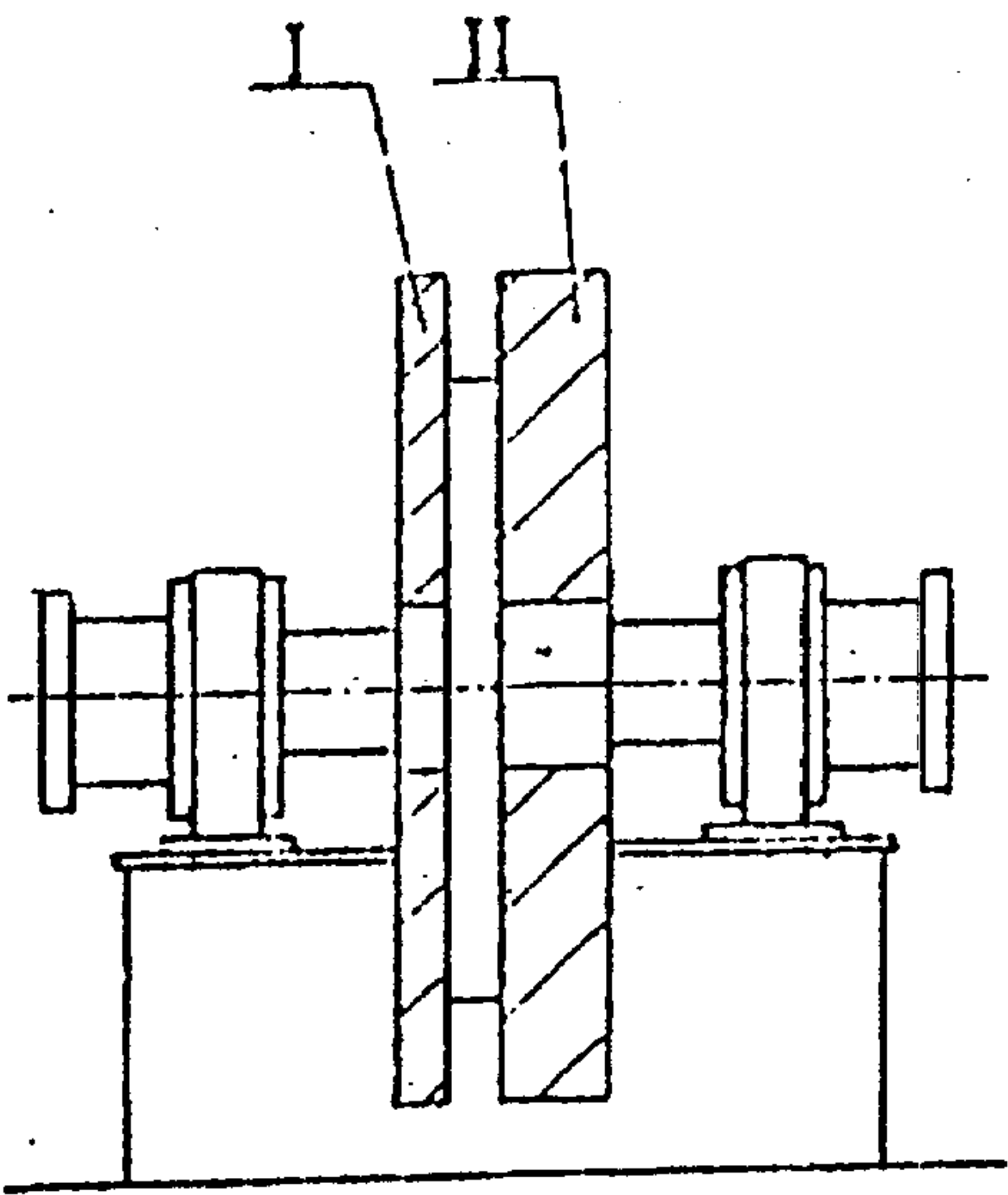
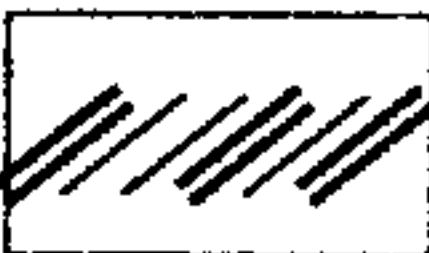


Figure 5



Basic Fly Wheel : $20 \text{ kg} \cdot \text{m}^2$



Additional Flywheel : I $38.33 \text{ kg} \cdot \text{m}^2$
 II $76.67 \text{ kg} \cdot \text{m}^2$

(1) Flywheel

This shall be aligned with the motor in a straight line by a clamping device and a basic and 2 auxiliary flywheels shall be fixed with bolts. The auxiliary flywheels shall be assembled and disassembled to the basic flywheel by moving to the shaft direction by a oil pressure.

(2) Assembling procedures of flywheel

- (a) Locate a saw to the marking of the flywheel for assembling.
- (b) Release the screw joint fixed to the frame.
- (c) Locate the valve to the arrow indicated position and pull rod to the left and right limit positions by operating the hand operated pump.
- (d) Insert the set pin between the pull rod and flywheel.
- (e) Lay the valve to the reverse direction and make the flywheel contact with the base by operating the hand operated pump.
- (f) Fix the upper mounting screw. ⁽¹⁾
- (g) Remove the set pin and flywheel carrier.
- (h) Fix the lower mounting screw.
- (i) Disassemble the flywheel in the procedures reverse to the assembling.

Remark ⁽¹⁾ For assembling the main and auxiliary flywheel.

7.1.2 Electrical control

Set the electrical supplements of the deficient inertial value of flywheel.

Formula : $I = mR^2$

Where, I : Inertial weight

m : Vehicle gross weight

R : Dynamic radius of tire

(1) Selecting m (vehicle gross weight)

$m = G. V. W. \text{ of vehicle} \times \eta \text{ (weight coefficient)}$
 $= (\text{Empty vehicle weight} + \text{Loaded weight (luggage+passenger)} \times \text{Passenger number}) \times \eta$

Table 1. η (weight coefficient)

	Passenger car	Commercial car
Strength standard	1	1.3 ~ 1.5
Performance standard	0.8	0.8
Limit performance standard	0.6	0.6

Example : For NB-V (FE)

$M : 1,386 \text{ kg}$

$R : 0.301 \text{ m}$

$I = mR^2$

$= 1,386 \times 0.301^2 = 125.6 \text{ kg} \cdot \text{m}^2$

Because the setting inertial is the total inertial weight/2, $125.6/2 = 62.8 \text{ kg} \cdot \text{m}^2$

Because the setting inertial is mechanical + electrical part,

$(20 \oplus 38.33) \oplus 4.47 = 62.8 \text{ kg} \cdot \text{m}^2$
(Basic F/W) – (Assist F/W I) – (Electric inertial weight)

Electric inertial weight shall be 4.47.

However, input $4.47 \times 10 = 44.7$ finally because the acceleration(α) of the fixture is set to be 10.

(2) Input method (See the driving resistance input section of the following page.)

(a) $\boxed{J \frac{Dn}{Dt}}$ Key Push

(b) Adjust $\boxed{44.7}$ 44.7 Nm by turning $\boxed{\begin{smallmatrix} \square \\ O \end{smallmatrix}}$ the dial.