

KES

Drive Shaft

KES D-B001

(EST.) 1988 - 07 - 12

Contents

1. Purpose
2. Scope of Application
3. Report of Evaluation Result
4. Meaning of Terminology
5. Specification Indicated in
Engineering Drawings
6. Evaluation Standard
7. Evaluation Method
8. Alteration of Specification
9. Indication Method in
Engineering Specification

Appendix



1. Purpose

This standard aims at securing proper quality by standardizing specifications.

Remark: This standard and a drawing communicate together our requirements.

2. Scope of Application

This standard specifies the constant velocity joint for automobile drive shafts (hereinafter referred to as 'joint').

3. Report of Evaluation Result

The quality evaluation results at each stage from development to mass production shall be submitted to KIA according to the Appendix.

4. Meaning of Terminology

(1) BJ: birfield type constant velocity Joint and Rzeppa type constant velocity Joint

Stationary type constant velocity joint having balls positioned and bolstered by a supporter and having concentric inner braces and outer braces in the curved ball grooves being offset in the outer wheel and inner wheel axis direction. Its construction is shown in Figure 1

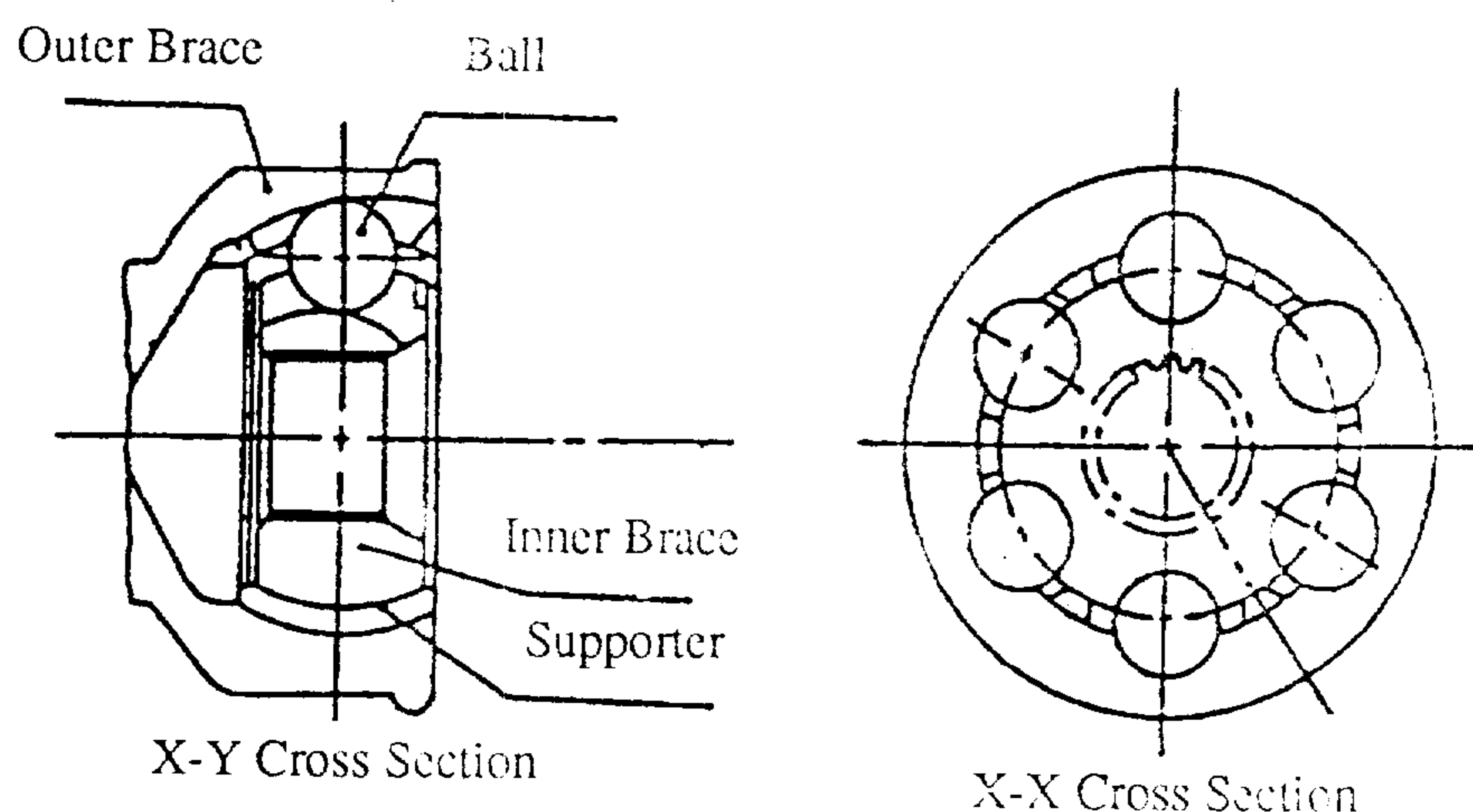


Fig. 1 The Construction of BJ

(2) DOJ: Double Offset type constant velocity Joint

Sliding type joint having the balls positioned and bolstered by a supporter and having the outer and inner braces being offset inside the straight ball grooves, parallel to the outer brace and inner brace axis direction. The construction is shown in Figure 2.

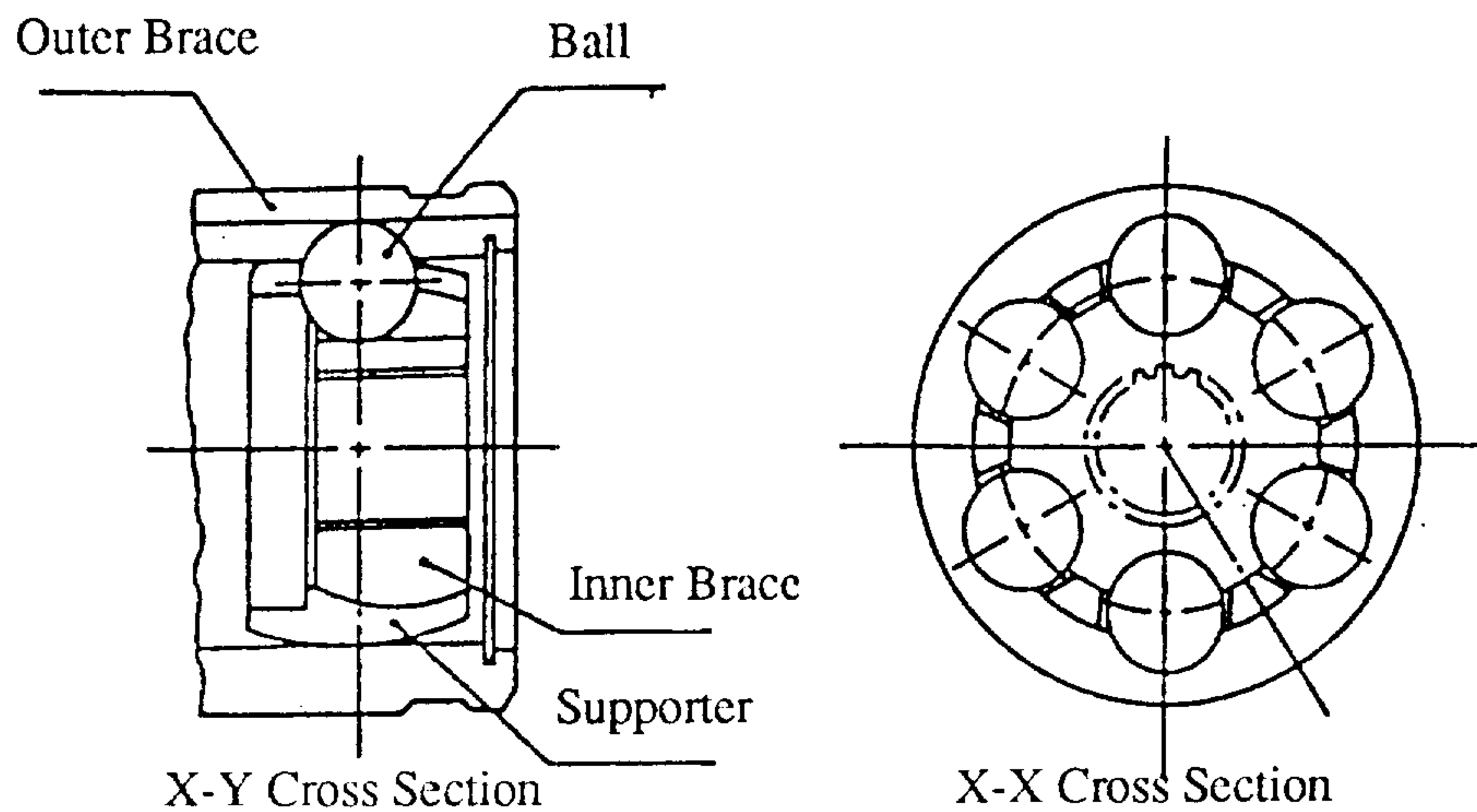


Fig. 2 Construction of DOJ

(3) TJ: Tripod Type Constant Velocity Joint.

Sliding type constant velocity joint having the rollers assembled at three tripod axis inside the straight roller grooves, parallel to the other brace axis direction. The construction is shown in Figure 3.

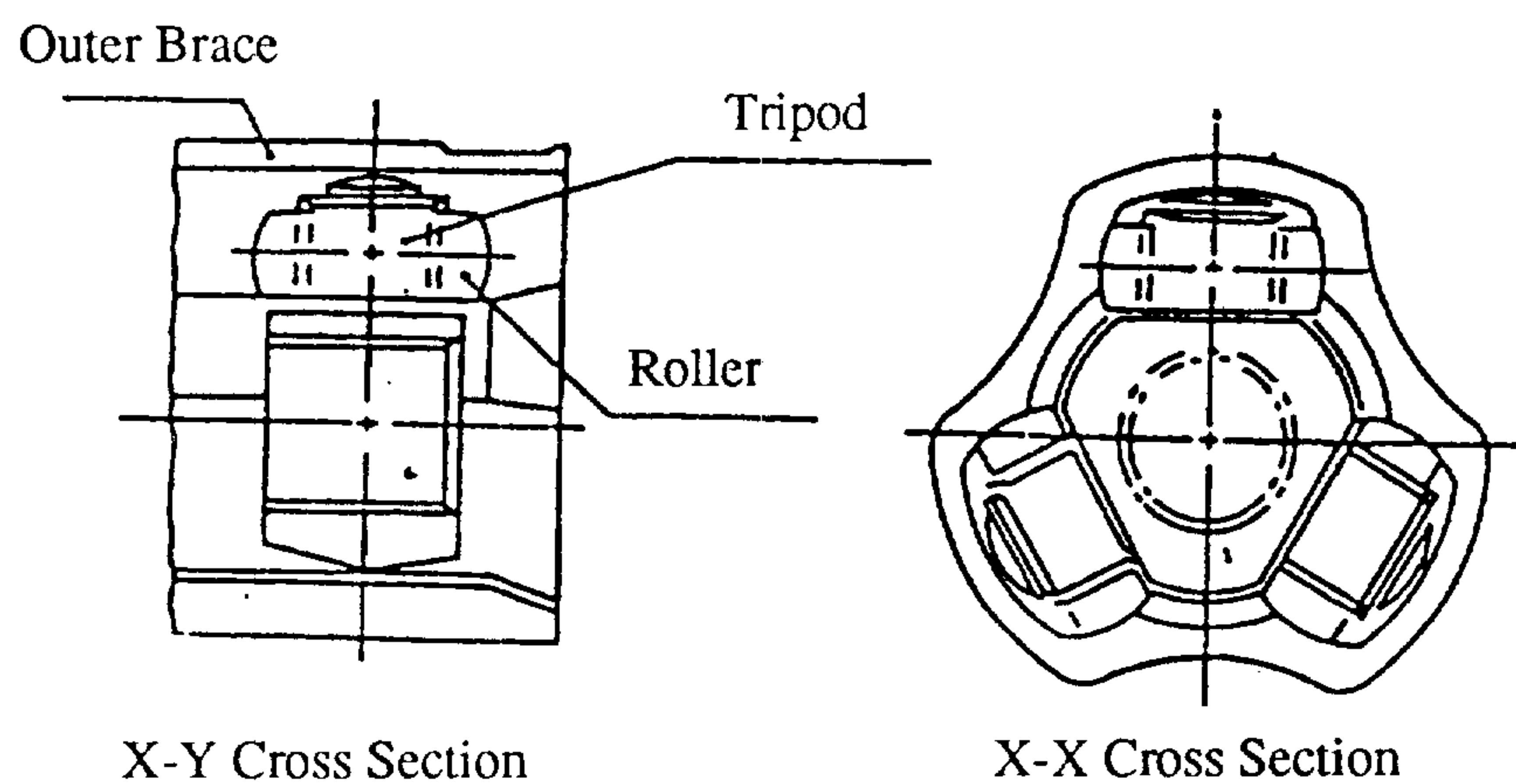


Fig. 3 The Construction of TJ

(4) Outer brace stem part: Shaft section of joint outer brace. Refer to Figure 4.

(5) Shaft: The shaft connected to the joint. Refer to Figure 4.

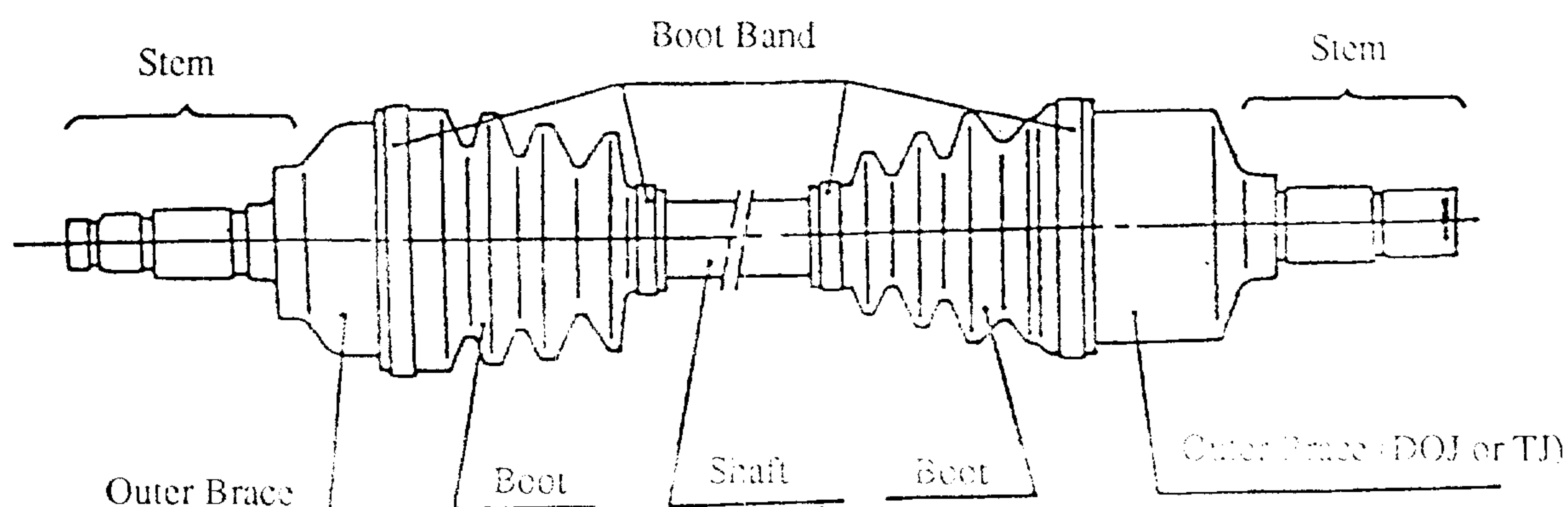


Fig. 4 Terms of each part of the shaft

- (6) Maximum permissible angle: Maximum angle that joints can take geometrically.
- (7) Over angle strength: With the joint at a maximum permissible angle, the breaking point force when exerting moment in the direction of the increasing angle
- (8) Tightening amount of the boot: Dimensional difference between the inner dia of the boot and joint outer brace outer dia or shaft outer dia at the connecting part between the boot and joint outer brace or shaft.
- (9) Slide range graph: The graph which represents the slide amount required at DOJ or TJ by the relation between the bending angle and slide amount.

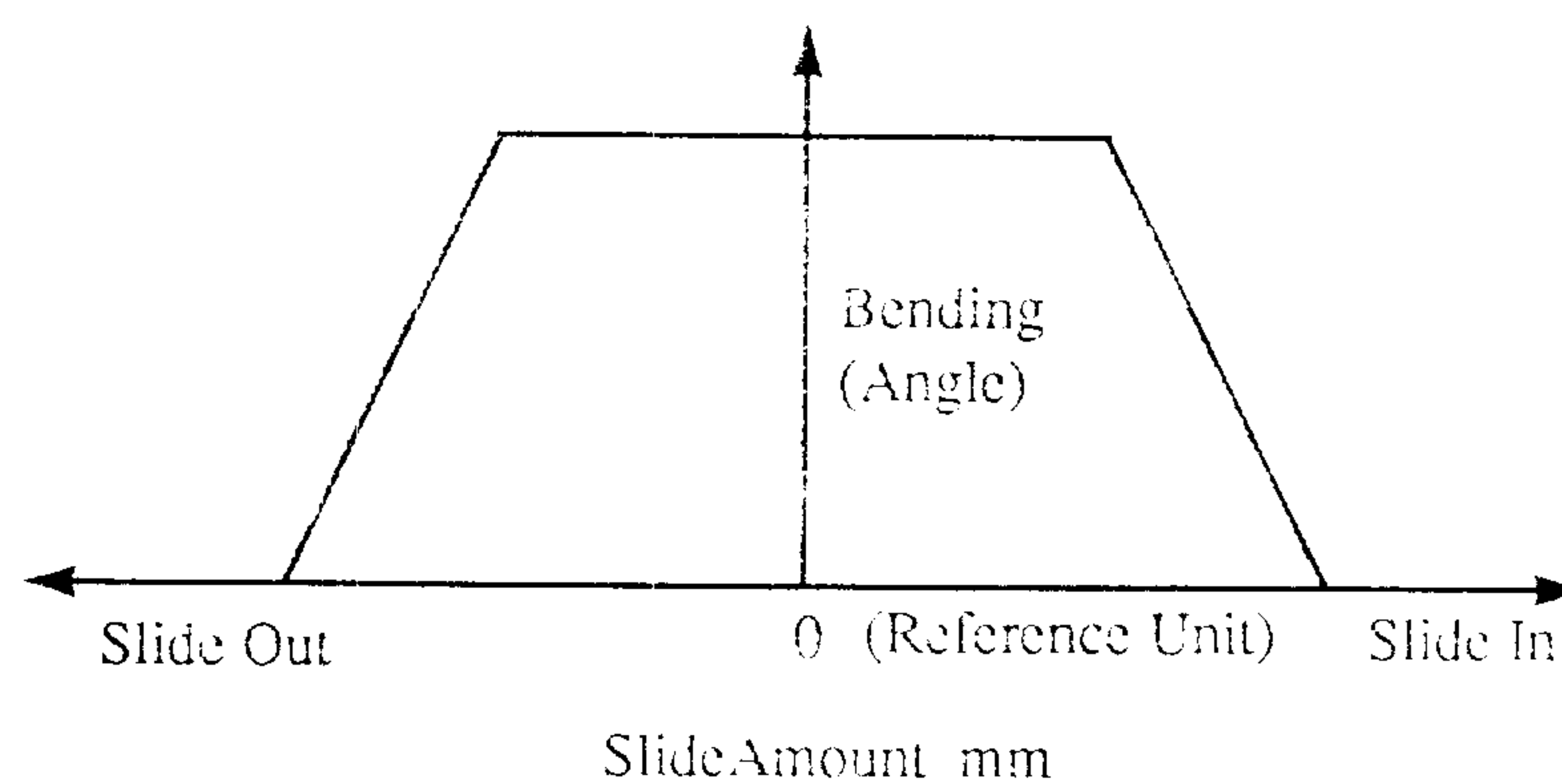


Fig. 5.

Slide Range Graph

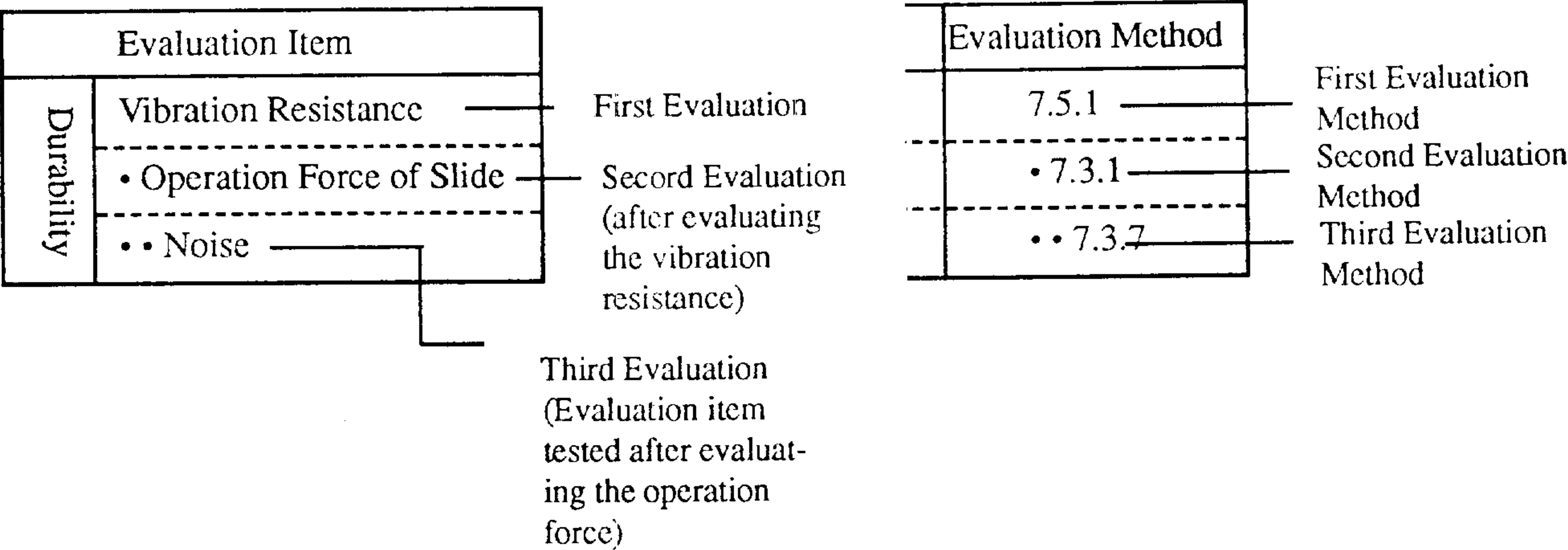
5. Specification Indicated in Engineering Drawings

- (1) Shock torque
- (2) Bending angle when evaluating the positive twist breakage
- (3) Slide range graph
- (4) Load torque when evaluating the twist endurance
- (5) Load torque when evaluating low load, high speed rotational endurance
- (6) Bending angle when evaluating low load, high speed rotational endurance
- (7) Load forque when evaluating low load, high speed rotational endurance
- (8) Rotation speed when evaluating boot rotational expansion
- (9) Abbreviations for serration

6. Evaluation Standard

The evaluation standard of the joint shall conform to the Table 1.

Remarks 1. The evaluation item and method in Table 1 shall be as follows:



2. The quality rank shall be represented by A, AR, B or C. The definitions shall conform to the KES Q-A 002(Determination and procedure of quality rankings).

Table 1

	Evaluation Item	Evaluation Standard			Rank	Evaluation Method
Joint Strength	Positive Twist Breakage	The ratio between the breakage torque(T_d) and shock torque(T_s) should be above the following values:			A	7.2.1
			Bending Angle	Bending Angle Specified in Drawing		
		T_d/T_s	Above 1.2	Above 0.8		
		As to joints which doesn't conform to the above evaluation standards KIA shall perform a vehicle shock strength test and determine its suitability according to the results.				
Joint Endurance	Over Angle Strength	Report the evaluation results to KIA and get approval			A	7.2.2
	Twist Endurance	At 250,000 cycle for passenger cars and 500,000 cycle for trucks, there shall have no damage, cracks, or deformation at any part of the drive shaft.			A	7.3.1
	Low Load, High Speed Rotational Endurance	No occurrence of flaking within 1.4×10^7 turns. Joints which does not conform to the above evaluation standards, should report the evaluation results to KIA and get approval.			A	7.3.2
	Hight Load, Low Speed Rotational Endurance	(1) BJ shall have no occurrence of flaking within 2×10^6 turns. (2) DOJ or TJ shall have no occurrence of flaking within 2.5×10^6 turns. Joints which doesn't conform to the evaluation standards, should report the results to KIA and get approval.			B	7.3.3
Water Proof, Dust Proof	Sealing Efficiency	No penetration of moisture into the joint Water content of grease shall be less than 1% or less			B	7.4.1

	Evaluation Item	Evaluation Standard	Rank	Evaluation Method
Boot Strength Endurance	Rotational Expansion	(1) At the r.p.m specified in the drawing, the amount of expansion shall be less than 5mm or less in diameter. (2) At 1.2 times the r.p.m specified in the drawing, there shall have no abnormal deformations. Here, the abnormal deformations are defined as. (2.1) Unsymmetrical deformation of the boot due to an unbalance placement of grease (2.2) Expansion more than 10mm in diameter	B	7.5.1
	Shrinkage	(1) Within the range of 20° of the joint bending angle to the maximum permissible angle of the joint, the negative pressure at the occurrence of shrinkage shall be above the permissible limit line shown in Figure 1 of Appendix 2. (2) As to the DoJ or TJ boot, within the range of 0° of the bending angle to the maximum permissible angle of joint, the negative pressure at the occurrence of shrinkage shall be above the permissible limit line shown in Figure 2 of Appendix 2.	B	7.5.2
		Elongation of the boot shall be 40% or less of the maximum bending angle of the constant speed joint	B	7.5.3
	Engagement	No flaws or tears.	B	7.5.4
	Large Bending Angle Endurance	Report the evaluation results to KIA	B	7.5.5
Boot Strength Endurance	High Temperature Rotation	(1) No fractures, cracks or leakage of grease. (2) At normal temperature, the internal negative pressure at the bending angle when evaluating the positive twist breakage indicated according to the drawing shall be below permissible limit line shown in Figure 1 or Figure 2 of Appendix 2. (3) Off-position of the large dia part and small dia part of the boot shall be 5° or less.	B	7.6.1

	Evaluation Item	Evaluation Standard	Rank	Evaluation Method
	Low Temperature Rotation	(1) No fractures, cracks or leakage of grease (2) Off-position of the large dia part and small dia part of the boot shall be 10° or less.	B	7.6.2
	Low Temperature Single Stop Impact Test	(1) No fractures, cracks, or leakage of grease at -40°C (2) No fractures, cracks, or leakage of grease at -35°C and the off-position of the small dia part shall be 10° or less	B	7.6.3
	Ozone Resistance	Within 60 hours, no cracks 0.1mm or more of depth, fractures or leakage of grease shall occur.	B	7.6.4

7. Evaluation Method

7.1 Common Condition for Evaluation

7.1.1 Standard atmospheric condition for testing

Unless otherwise specified, the condition shall be the normal temperature condition of 20°C class 15(20±15°C) and normal humidity condition of 65%, class 20(65±20%) specified in KS A 0006(Standard atmospheric condition for testing). $\Delta \pm$

7.2 Joint Strength

7.2.1 Positive twist breakage

Evaluations for positive twist breakage shall be performed according to following (1)~(3).

(1) Test condition

(a) Test piece specification: Outer brace stem part and shaft shall be quenching depth

(b) Attaching angle:

① 0°

② Specified in the drawing

(c) Center position of DOJ or TJ joint: Reference position within the slide range specified in the drawing.

(d) Twist direction: Forward direction of the vehicle

(2) Test Apparatus

Test equipment shall conform to the Figure 6.

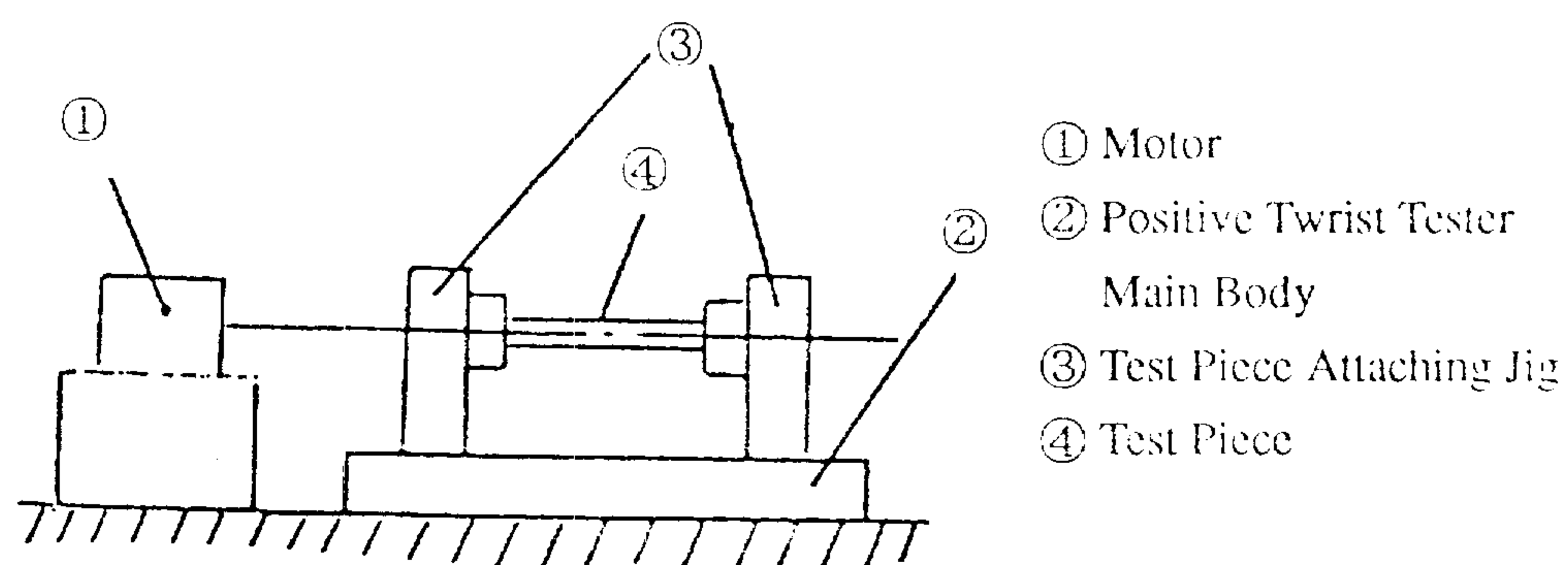


Fig. 6

(3) Test method

- (a) Attach the test piece ④ to the jig
- (b) Start the Motor ①, apply torque to test piece ④, and Read the torque at the breakage of test piece ④. In case of cracks before breakage, the torque shall be regarded as breakage torque.

7.2.2 Over angle strength

Evaluation of the over angle strength shall be performed in accordance with (1)~(2).

(1) Test apparatus

Test apparatus shall conform to the Figure 7

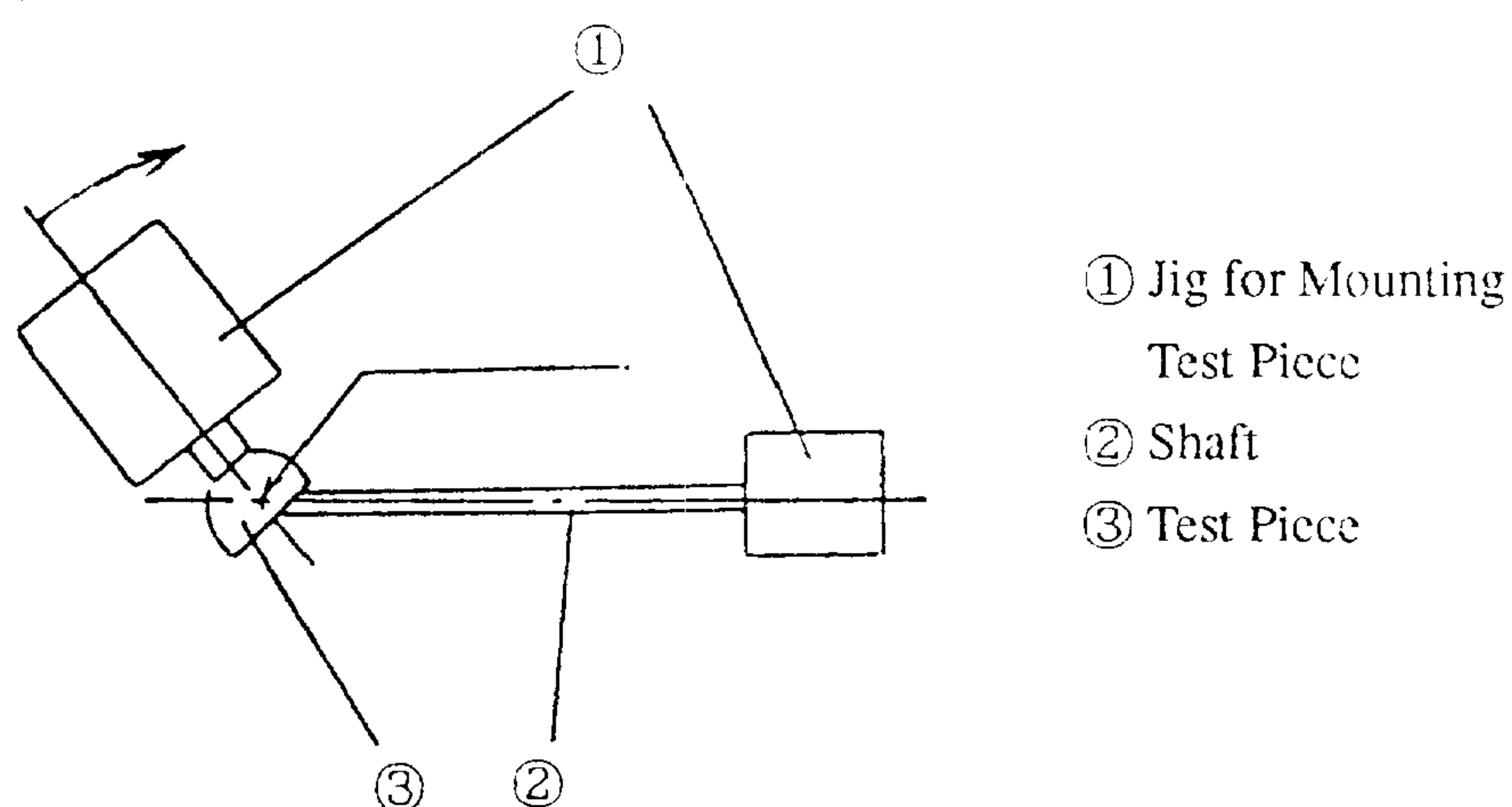


Fig. 7

(2) Test method

- (a) Mount the test piece assembled with shaft ② on the test piece mounting jig.
- (b) Read the bending momentum at the fracture time by applying an over angle to test piece ③.

7.3 Joint Endurance

7.3.1 Twist endurance

Evaluation for twisting endurance shall be performed according to the following (1)~(3)

(1) Test condition

- (a) Test piece Specification: Outer brace stem part and shaft shall be quenching depth
- (b) Load torque: Specified in the drawing
- (c) Mounting angle: 0°
- (d) Repetition speed: Arbitrary speed within 1~10Hz
- (e) Loading method: Partial vibration load of standing wave as shown in figure 8.

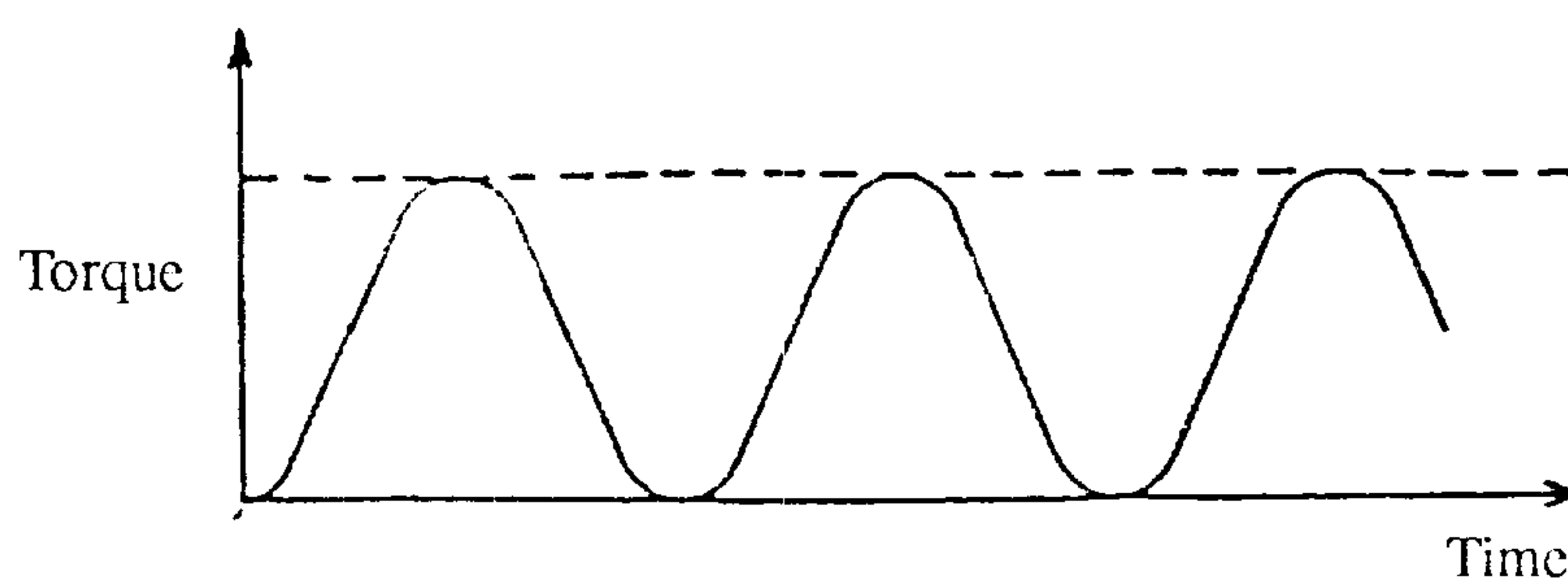


Fig. 8

- (f) DOJ or TJ joint center position: Reference position in the midst of the slide range. Specified in the drawing.
 - (g) Twist direction: Forward direction of the vehicle
- (2) Test apparatus
- Test apparatus shall conform to the Figure 9.