

KES

Energy Absorbing Shaft

KES D-B204

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1. Purpose

This standard aims at securing proper quality by standardizing specifications.

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

2. Scope of Application

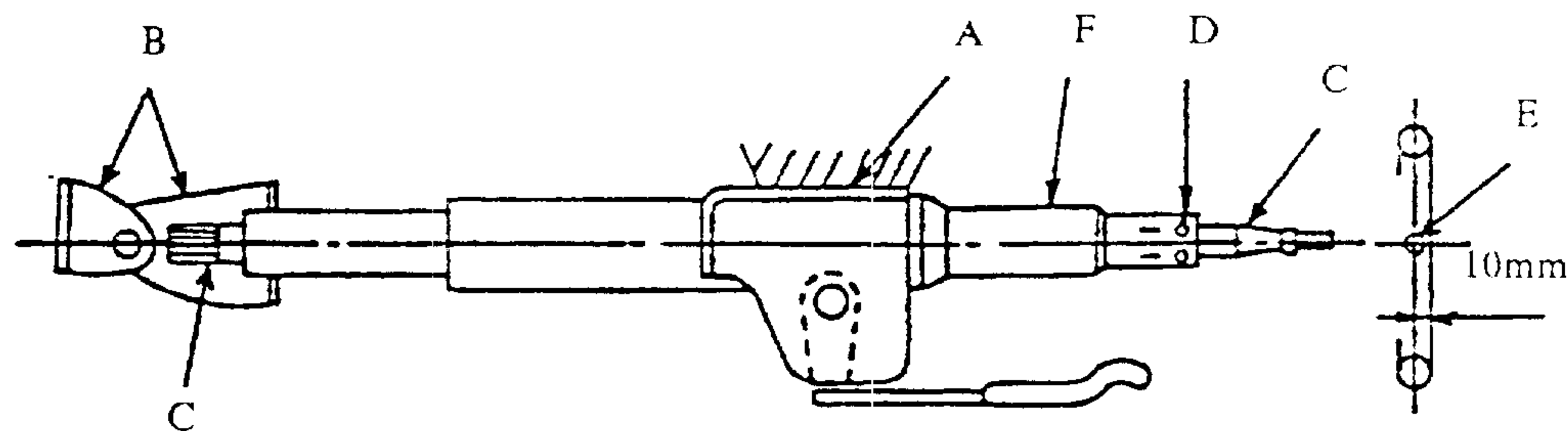
This standard specifies the energy absorbing shaft for automobiles (hereinafter referred to as the "shaft").

3. Report of Evaluation Result

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

4. Definition of Terminology

- (1) Fixing bracket: Bracket to support the shaft and the nearest bracket to the steering wheel marked with A in the figure below.
- (2) Lower bracket: Bracket to support the shaft; marked with B in the figure below.
- (3) Inner shaft: The shaft marked with C in the figure shown below, which transmits the rotations of the steering wheel attached to this shaft.
- (4) Upper bearing: This is a bearing to support the inner shaft. It is the nearest bearing to the steering wheel and marked with D in the figure shown below.
- (5) Steering wheel center: This is the base of the steering wheel position, the position marked with E in the figure shown below.
- (6) Upper tube: This is the tube to support the inner shaft through a bearing and is the part marked with F in the figure shown below.
- (7) Self-locking method: The method of locking the tilt lock lever automatically by the force of a spring, etc. without manual fastening.



5. Specifications Indicated in Drawing

- (1) Position of the steering wheel center
- (2) Attaching angle of the shaft in a vehicle θ_1
- (3) No. of the parts used for the regulation test
 - Steering wheel
 - Steering lock
 - Combination switch
- (4) Presence of surface treatment
- (5) Quantity of collapsible stroke
- (6) The part No. of the intermediate shaft used for testing

6. Evaluation Standard

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

Remark 1. The way of reading evaluation items and methods in Table 1 shall conform to the following example.

Evaluation Item			Evaluation Method		
Durability	Vibration resistance	First evaluation	7.5.1		First evaluation method
	. Operating force of slider	Second evaluation	.7.3.1		Second evaluation method
	.. Noise	Third evaluation	..7.3.7		Third evaluation method

Remark 2. The quality rank shall be represented by A, AR, B or C.

The definitions shall conform to KES Q-A002 (Determination and Procedure of Quality Ranking).

Table 1

Evaluation Item		Evaluation Standard	Quality Rank	Evaluation Method
External appearance	Burrs, flaws, dent, sink, color, drawing of the tilt lock lever	Conform to an acceptance sample.	C	By visual and sensory inspection
	Looseness in the axial direction	Allowable looseness is 0.1 mm max.	B	7.2.1
Looseness	Looseness in the diametric direction	Max. 0.04 mm	B	7.2.2
	Looseness in the rotating direction	Rotation angle α shall be 0°	B	7.2.3
	Looseness in the lateral direction of the tilt lock lever	Max. 5 mm	C	7.2.4
Rotating resistance		Max. 2.5 kgf.cm {24.5 N.cm}	C	7.3
Load-stroke characteristics	Operating load of the telesco.	1) Max. 5 kgf {49.0 N} 2) Smooth operation	C	7.4.1
	Operating load of the tilt	1) Max. 5 kgf {49.0 N} 2) Smooth operation	C	7.4.2
	Holding capacity of tilt lock	For fastening lock type 50 kgf {490 N} min.	B	7.4.3
		For self-locking type 100 kgf {980 N} min.	B	
	Holding capacity of telesco. lock	Min. 50 kgf {490 N}	B	7.4.4
	Operating force of the tilt lock lever	For fastening lock type 9 kgf {83.2 N} max.	C	7.4.5
		For self-locking type 5 kgf {4.9 N} max.	C	
Current passage ability	Voltage drop	Max. 1 V	AR	7.5.1

Table 1 (Continued)

Evaluation Item		Evaluation Standard	Quality Rank	Evaluation Method
Stiffness	Bending stiffness in vertical direction	Max. 0.35 mm	B	7.6.1
	Bending stiffness in lateral direction	Max. 1.0 mm	B	7.6.2
	Stiffness of tilt lock lever in fastening direction	Max. 1.0 mm/kgf {0.02 mm/N}	C	7.6.3
	Stiffness of tilt lock lever in lateral direction	Max. 1.0 mm/kgf {0.02 mm/N}	C	7.6.4
Regulation	Steering impact	Max. 1020 kgf {9996 N}	AR	Conform to Regulation Test Method of the Article 10 of the Korean Safety Standard, FMVSS No.203 ADR No.10B ECE No. 12-02.
	Steering lock	No inability of steering and releasing the lock after 24 kgf.m {235.2 N•m} for 30 sec.	AR	Conform to the regulation testing method of ECE No.18, EEC No.74-61
Weatherability (Execute this only if the material is rubber or plastics.)		This evaluation standard of KES B-L005, K2 shall be satisfied.	B	Carry out ozone resistance test of KES B-L006.

Table 1 (Continued)

Evaluation Item		Evaluation Standard	Quality Rank	Evaluation Method
Cold impact		There shall be no damage.	A	7.7
Heavy load	Torsion strength	There shall be no damage.	A	7.8.1
	Bending strength (This is applied to cab-over type vehicles with a payload capacity 2000 kg min.)	There shall be no damage.	A	7.8.2
	Tightening strength	10 kgf.m{98 N.m} min.	A	7.8.3
Durability	The durability of the holding capacity of the tilt lock	1) Dislocation of the tilt lock lever shall be 2 mm max. 2) The holding capacity of the tilt lock shall be 50 kgf {490 N} min.	B	7.9.1
	The durability of the holding capacity of the telesco. lock	1) Dislocation of the telesco. lock lever shall be 2 mm max. 2) The holding capacity of the telesco. lock shall be 50 kgf {490 N} min.	B	7.9.2
	Rotation durability (This is applied to one-piece of steering gear box and shaft)	There shall be no troubles such as the occurrence of snatchy and rough feeling in bearings.	A	7.9.3
	Rotation durability of upper bearings feeling in bearings.	There shall be no troubles such as the occurrence of snatchy and rough	A	7.9.4
	Torsional durability with rotation	There shall be no occurrence of damages and looseness.	A	7.9.5
	Torsional durability without rotation	There shall be no occurrence of damages and looseness.	A	7.9.6

Table 1 (Continued)

Evaluation Item		Evaluation Standard	Quality Rank	Evaluation Method
	Bending durability in the vertical direction	1) There shall be no occurrence of damages and looseness. 2) Drop of fastening torque of bolts shall be 30% max.	A	7.9.7
	Bending durability in the vertical direction	1) There shall be no occurrence of damages and looseness. 2) Drop of fastening torque of bolts shall be 30% max.	A	7.9.8
	Vibration durability	1) There shall be no occurrence of damages and looseness. 2) Fastening torque of bolts shall not drop.	A	7.9.9

7. Evaluation Method

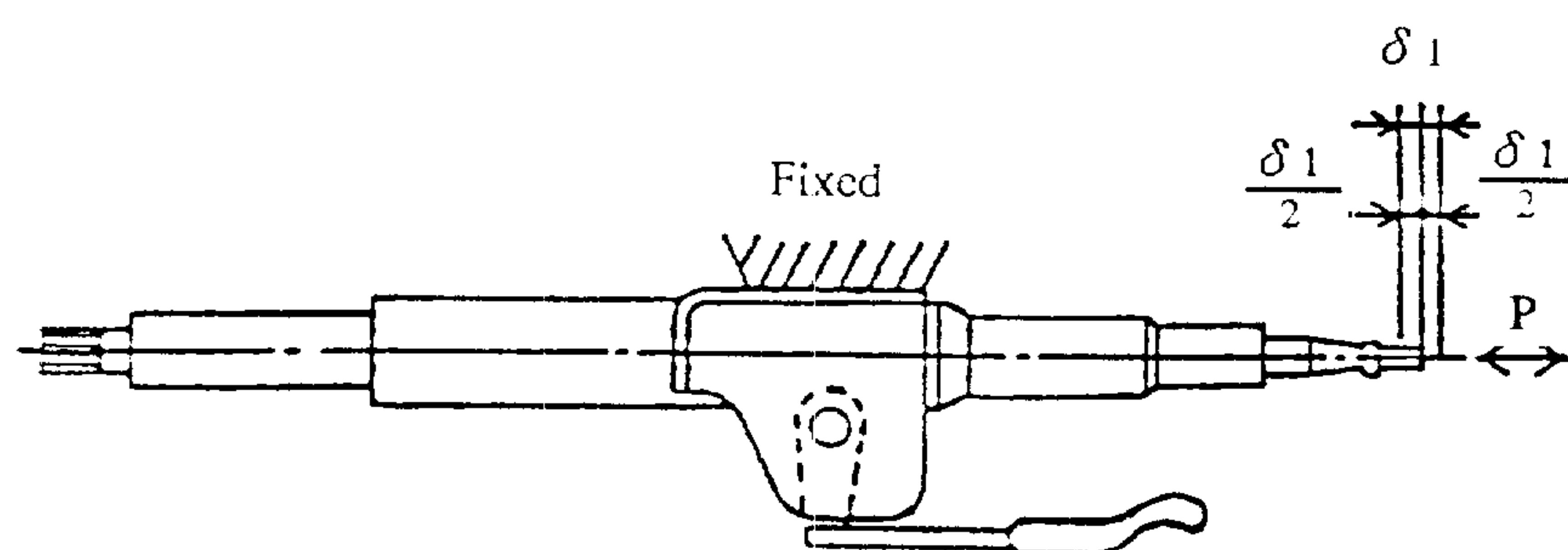
7.1 Common Evaluation Conditions

7.1.1 Standard atmospheric conditions for testing: Unless otherwise specified, the standard atmospheric condition shall be a standard temperature condition of 20°C, class 15 ($20 \pm 15^\circ\text{C}$) and a standard humidity condition of 65%, class 20 ($65 \pm 20\%$) specified in JIS Z 8703 (Standard Atmospheric Conditions for Testing).

7.2 Looseness

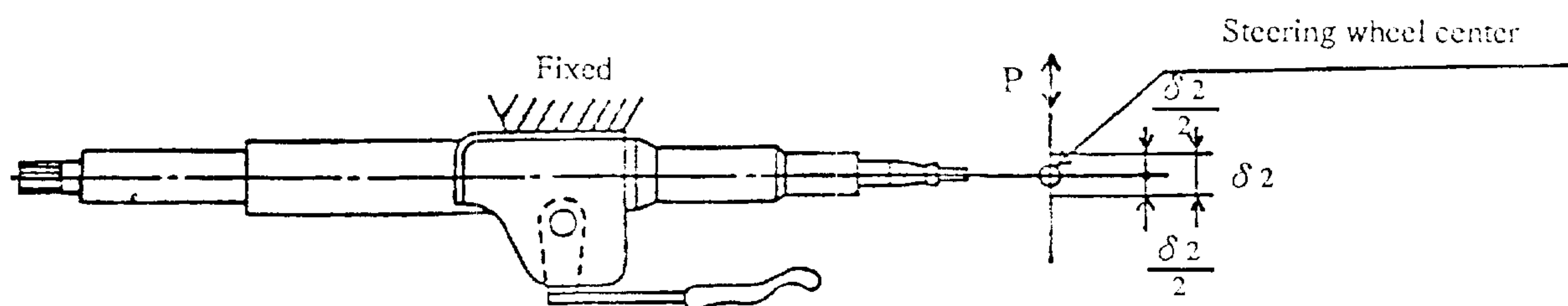
7.2.1 Looseness in the axial direction: Fix a fixing bracket, and measure the displacement of the inner shaft δ_1 , when a load $P = \pm 2.5 \text{ kgf}$ { $\pm 24.5 \text{ N}$ } is applied to the steering wheel side of the inner shaft.

Fig. 1



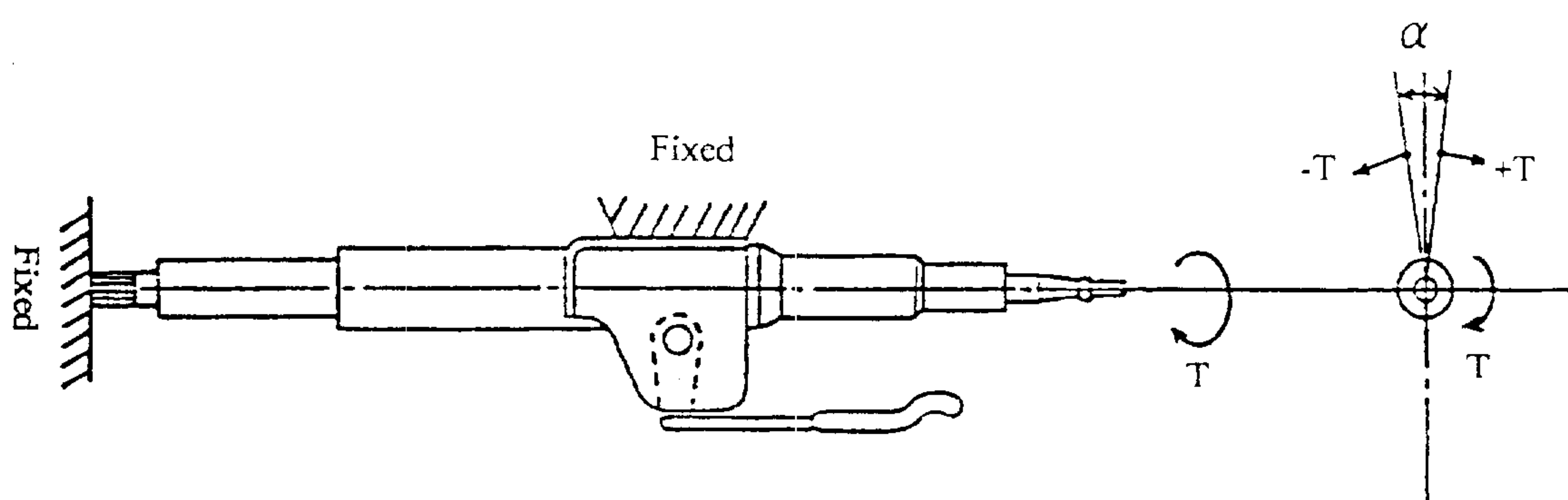
- 7.2.2 Looseness in the diametric direction: Fasten the fixing bracket, and measure the displacement of the steering wheel center δ_2 when a load $P = \pm 2.0 \text{ kgf}$ ($\pm 19.6 \text{ N}$) is applied to the shaft on the steering wheel center in the diametric direction. A proper device may be added to get the steering wheel center on the inner shaft.

Fig. 2



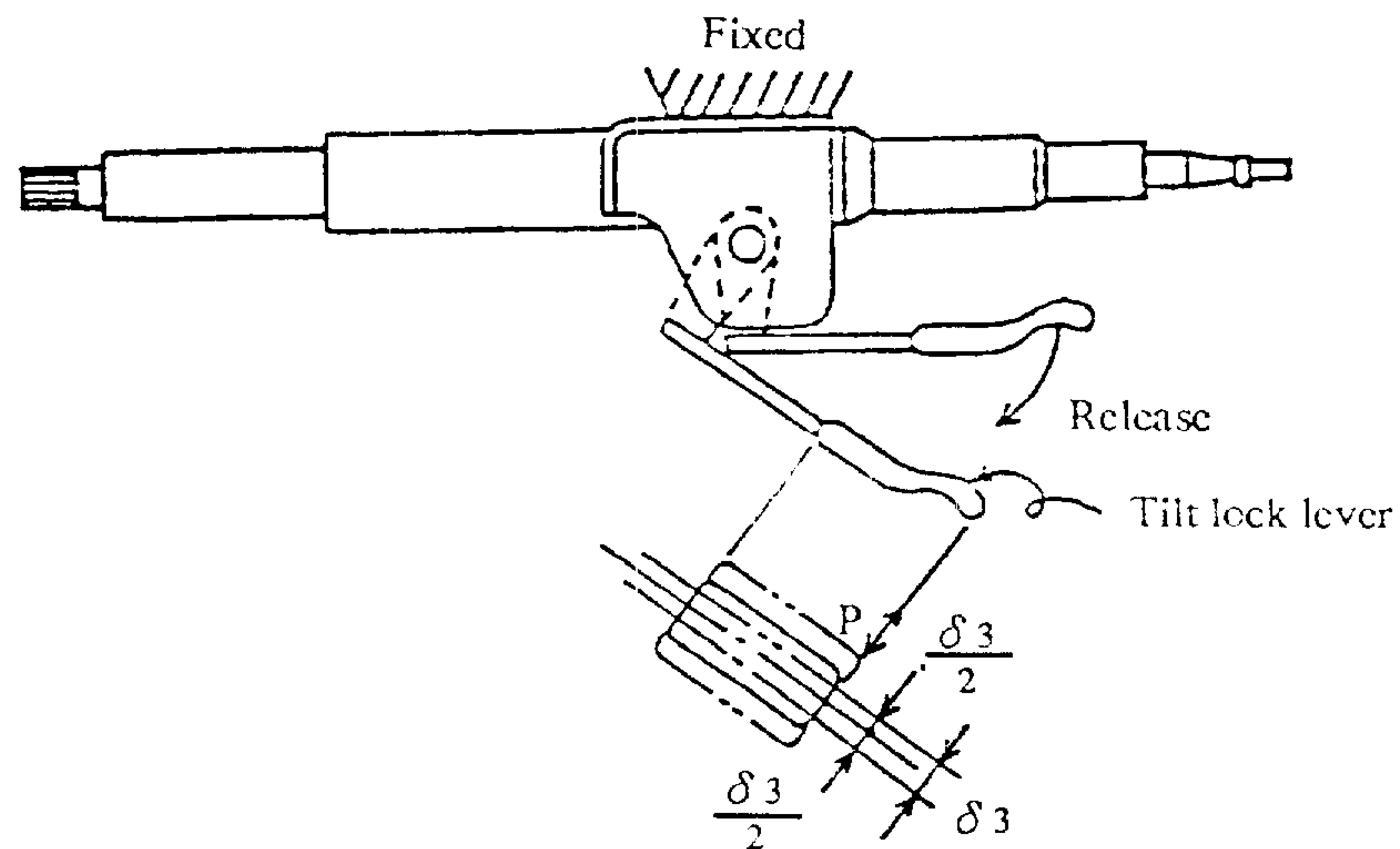
- 7.2.3 Looseness in the rotating direction: Fix the fixing bracket and the lower side of the inner shaft, and measure the rotation angle α when a torque $T = \pm 10 \text{ kgf.cm}$ ($\pm 98 \text{ N.cm}$) is applied to the steering wheel side of the inner shaft.

Fig. 3



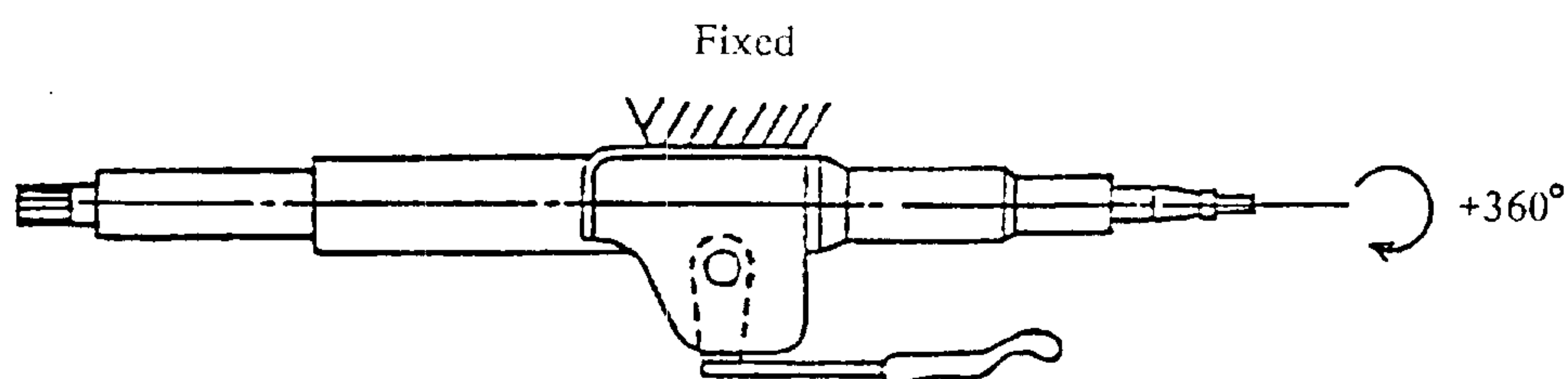
- 7.2.4 Looseness in the lateral direction of the tilt lock lever: Fix the fixing bracket, and measure the displacement δ_3 of the tilt lock lever tip when a load $P = 5 \text{ kgf}$ (49 N) is applied to the tip in the lateral direction. The tilt lock lever shall be in released position.

Fig. 4



- 7.3 Rotating resistance: Fasten the fixing bracket, and measure the resistance torque when the steering wheel side of the inner shaft has been turned by $\pm 360^\circ$ angles.

Fig. 5



7.4 Load-stroke Characteristics

- 7.4.1 Operating load in the tilt: Attach the shaft in the same angle as in vehicle condition, and add a mass of 2.4 kg to the steering wheel center.

Then release the tilt lock lever, and measure the vertical load W in the normal direction to the axis at the steering wheel center.