

KES

Rear Drum Brakes

KES D-B057

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1. Purpose

This standard aims at securing proper quality by standardizing specifications.

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

2. Scope of Application

This standard specifies LT type rear drum brakes for automobiles (hereinafter referred to as the “drum brake”).

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. Definition of Terminology

- (1) S.C.C (Shoe Center Clearance) : Clearance between the drum and the shoe at the shoe center portion
- (2) Limit strength : Strength at which brake can not satisfy its basic characteristics, function and performance, or strength judged by permanent set of 1 mm or less at every portion during test and presence of interference.
- (3) Breaking strength : Strength at which brake fails.

5. Specification Indicated in Drawings

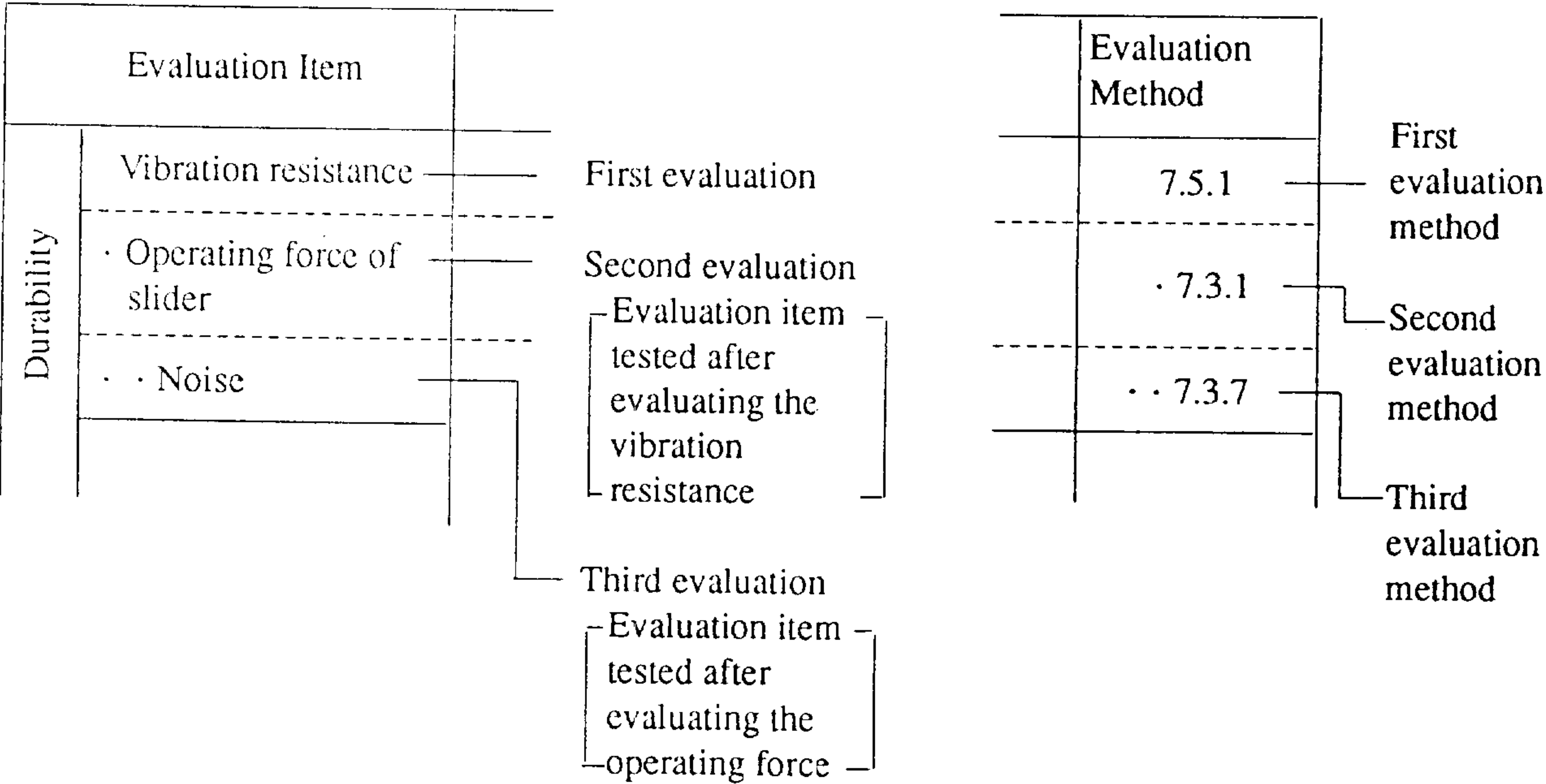
- (1) Brake size and wheel cylinder size
- (2) Standard value of required fluid volume
- (3) Standard values of pressure at which the main brake begins to work and returns.
- (4) Standard values of operating force of the operating lever at which the parking brake begins to work and returns.
- (5) Standard value of drag torque
- (6) Standard value of brake factor (main brake and parking brake)
- (7) Standard value of shoe clearance (min. value and max. value)
- (8) Tightening torque of fixing bolt (min. value and max. value)
- (9) Standard value of operating force of the operating lever of the parking brake
- (10) Maximum and minimum specified tightening torque of a flare nut and screws
- (11) Attaching angle of the brake
- (12) List of the brake specifications
- (13) Test mode of the noise dynamo (to be selected from Type I -1, Type I -2, Type II and Type III)
- (14) Vehicle classification of dynamo general test mode (to be selected from A, B, C and S)
- (15) Shape of the brake drum
- (16) Shape of the peripheral parts of the brake

- (17) Width, thickness, and area of the lining
- (18) Whether or not the vacuum air vent method is applied
- (19) Shape and dimension of the back plate and the dust ring on the labyrinth part
- (20) Maximum wear limit diameter of the brake drum
- (21) Evaluation condition for the shoe with two-layer material
- (22) Destination
- (23) Inertia in one defective system
- (24) Performance standard weight
- (25) Strength standard weight
- (26) Vehicle weight
- (27) Light payload weight and maximum payload weight
- (28) Vehicle classification of heat damage on the brake (to be selected from a, b and c)
- (29) Loading condition of the shoe clearance (to be selected from L and M)

6. Evaluation Standard

This evaluation standard of the drum brake shall conform to Table 1.

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



Remark 2. The quality rank shall be represented by A, AR,B or C.
The definitions shall conform to MES K01-002 (Determination and Procedure of Quality Ranking).

Table 1

Evaluation Item		Evaluation Standard	Quality Rank	Evaluation Method	
Basic characteristics	Required brake fluid volume	Standard value max. at the hydraulic pressure of 60kgf/cm ² (5.88 MPa) and at SCC of 0.3	B	7.2.1	
	Pressure at beginning of work and returning of main brake	(1) Pressure at beginning of work : Standard value max. (2) Pressure at returning : Standard value min.	B	7.2.2	
	Operating force at beginning of work and returning of parking brake	(1) Operating lever input at beginning of work : Standard value max. (2) Operating lever input at returning : Standard value min.	B	7.2.3	
	Drag torque	Standard value max.	B	7.2.4	
Performance	First effect	Brake factor after burnish (BF ₁) × 1.4 > First brake factor (BF ₀) > brake factor after burnish (BF ₁) × 0.6	A	7.3.1	
	Main brake performance	BF ₁ : Within the standard value	AR	7.3.2	
	Parking brake performance (Static)	Operating force of the operating lever : Standard value max.	AR	7.3.3	
Function	Shoe clearance	Cold spike (at roll off the assembly line)	B	7.4.1	
		Normal use			
		Cold spike			
		At fade			
		Heating spike			
	Followability of auto-adjustment		Min. standard value ≤ SCC ≤ Max. standard value	B	7.4.2
	Cease of auto-adjustment		To cease with L side shoes thickness 0.5 mm remained, as target	B	7.4.3
	Self-lock		No self-lock	A	7.4.4
Centering		No abnormal dislocation of the shoe within the range of 100 Hz or less.	B	7.4.5	

Table 1 (Continued)

Evaluation Item		Evaluation Standard	Quality Rank	Evaluation Method
Strength and durability	Torque breaking strength	(1) Breaking strength : Ideal distribution $0.8 G \{7.8m/s^2\} \times 3$ or more (2) Limit strength : Ideal distribution $0.8 G \{7.8m/s^2\} \times 2.5$ or more	A	7.5.1
	Torque durability	(1) No breaking, fluid leak nor abnormal scraping and yield (2) Decrease of tightening torque : 30% or less of the minimum specified tightening torque	A	7.5.2
	Durability of parking brake system	(1) No breaking nor abnormal scraping and yield (2) Decrease of tightening torque of a flare nut : 30% or less of the initial torque	A	7.5.3
	Strength of parking brake system	Increase of the operating lever stroke at the pulling force of 20kgf {96N} of the hand lever after 35 times of burnish : 30% max.	A	7.5.4
	Strength of dynamic parking brake	No breaking, interference with mating parts nor slip-out of the web	A	7.5.5
	Strength of threaded portion	No damage	A	7.5.6
	Vibration	No breaking, deformation nor fluid leak	A	7.5.7
	Detaching and attaching of spring	Load decrease : 10% max.	A	7.5.8
	Operational durability of spring	Load decrease : 10% max.	A	7.5.9
Weatherability	Corrosion resistance (Salt spray)	(1) 10% or less of the rusting area on the visible part in the vehicle condition after 1 cycle of test (2) No corrosion that might affect the function and the performance after 8 cycles of test	A	7.6.1

Table 1 (Continued)

Evaluation Item		Evaluation Standard	Quality Rank	Evaluation Method
Weatherability	Corrosion resistance (Salt spray)	(3) Pressure at beginning of work of the main brake and operating force of the operating lever at beginning of work of the parking brake : 2 times or less of new one	A	7.6.1
	Ozone resistance	No crack confirmable with a magnifier of 2 magnification	A	7.6.2
	Cold resistance		A	7.6.3
Abrasion resistance	Life of lining	30,000 km min.	B	7.7.1
Heat damage	Heat damage on brake	(1) Brake fluid temperature : ① Mode Ⅰ : 140℃ max. ② Mode Ⅱ : 150℃ max. (2) No damage on boots	A	7.8.1
	Heat damage on boots	No damage on boots	A	7.8.2
Brake noise	Noise	(1) Noise index shall satisfy ① to ④ below. ① Type Ⅰ - 1 (a) 0.1 max. from the 1st to the 4th noise check (b) 0.25 max. for the 5th noise check. However, groan shall be 0.1 max. from the 1st to the 5th noise check. ② Type Ⅰ - 2 (a) 0.5 max. from the 1st to the 4th noise check (b) 1.0 max. for the 5th noise check However, groan shall be 0.1 max. from the 1st to the 5th noise check. ③ Type Ⅰ (a) 2.5 max. from the 1st to the 4th noise check (b) 5.0 max. for the 5th noise check	B	7.9.1

Table 1 (Continued)

Evaluation Item		Evaluation Standard	Quality Rank	Evaluation Method
Brake noise	Noise	④ Type III (a) 0.5 max. from the 1st to the 7th noise check (2) Noise level at fading shall be the level C max. (3) No brake noise (squeak) shall occur at non-braking.	B	7.9.1
	Noise dynamo (matrix mode)	(1) Noise index in each cycle shall satisfy the following. ① Passenger car (including taxi but not 1 Box) : 0.5 max. ② Truck (including 1 Box) : 2.0 max. (2) No level B min. in Table 7 shall occur.	B	7.9.2
	Brake noise	(1) No noise (2) However, no occurrence of sliding noise between the shoe and the back plate by 15,000 km of general durability test	B	7.9.3
	Brake judder	Level D max. in Table 7	B	7.9.4
Safety	Conformity to regulation	Taking account of the allowance rate, i.e. operating force 20% min. and deceleration 10% min., the structural requirement of the following (1) to (4) corresponding to the destination shall be satisfied. (1) FMVSS No. 105 (2) ADR No. 31/35A (3) ECE No. 13 (4) Japanese safety standard, and laws and regulations of other countries	AR	7.10.1
	Safety at full abrasion	No functional damage such as fluid leak, slip-out from the shoe ledge surface, interference of each part, etc.	A	7.10.2
	Slip-out of parking cable	No slip-out	A	7.10.3

Table 1 (Continued)

Evaluation Item		Evaluation Standard	Quality Rank	Evaluation Method
Safety	Ingress of water and foreign matter	No ingress of water and foreign matter which damage the function or the performance	A	7.10.4
	Serviceability	(1) No need of a special tool (2) Equal service hours to other cars in the same class	B	7.11.1
Others	Misassembly or missing of parts	To provide fool proof or identification	B	7.11.2
	Parts transportation	No slip-out due to vibration, inclusion of foreign matter, deformation and the like	B	7.11.3

7. Evaluation Method

7.1 Common evaluation conditions

7.1.1 Standard atmospheric condition for testing : Unless otherwise specified, the standard atmospheric condition shall be a standard temperature condition of 20℃, class 15 (20 ± 15 ℃) and a standard humidity condition of 65%, class 20 ($65 \pm 20\%$) specified in *1 KS A0006 (Standard Atmospheric Conditions for Testing).

*1 JIS Z 8703

7.1.2 Standard condition of test parts

(1) Shoes and drums for test shall be new. Other test parts also shall be new as a rule. However, they may be reused provided that no deterioration of characteristics, flaw and corrosion, etc. is present.

(2) As for the evaluation condition for a shoe with two-layer material, whether to use the new or the used shall be indicated in the drawing.

7.1.3 Brake fluid for test : Shall conform to KES B-M023 (Motor Vehicle Brake Fluids) or JIS K 2233 (Non-Petroleum Base Motor Vehicle Brake Fluids).

7.1.4 Inertia

(1) Inertia I is determined by the following formula, The flywheel with the most approximate value is selected. *1

*1. For example, in case of inertia with a pitch of 0.5

3.19 → 3.0, 3.20 → 3.5

In case of inertia with a pitch of 0.25

3.09 → 3.0 3.10 → 3.25

$$I = \frac{M}{9.8} \times R \times R \times \frac{K}{2} \text{ (kg ms}^2\text{)}$$

Where, M : Tested mass (kg) To be selected according to the test purpose

R : Radius of tire dynamic load (m)

K : Braking distribution factor

① In case of a dual dynamo (for a test of the front and rear wheels)

$$K = 1$$

*2. In case of the test for the right and left wheels of a dual dynamo, inertia shall be two times of that of a single dynamo.

② In case of a single dynamo (including a test of a single wheel with a dual dynamo)

$$K = \frac{f}{f+1} \text{ (front)} \quad K = \frac{1}{1+1} \text{ (rear)}$$

Where, f is the braking distribution (front braking force/rear braking force) for the deceleration of 0.5 G {4.9m/s²}

(2) Inertia in one defective system is calculated by the following formula. The flywheel with the most approximate value is selected and indicated in the drawing.

① Vehicles with H-type piping

$$I = \frac{M}{9.8} \times R \times R \times \frac{1}{2}$$

Note 1. When break points vary, the distribution due to the change shall be determined.

② Vehicles with X-type piping

$$I = \frac{M}{9.8} \times R \times R \times K$$

Note 1. K shall be the active braking distribution in the proximity of 0.3 G {2.9 m/s²} in deceleration during defect.

2. When break points vary, the distribution due to the change shall be determined.

③ Vehicles with Other Piping methods : Conform to the drawing.

(3) Other items shall conform to *1 KS R 1009 (General Rules of Brake Test Method of Automobiles Motor Cycles)

*1 JIS D 0210

7.1.5 Braking torque : Setting torque T for the test under the torque control shall be calculated by the following formula.

$$T = \frac{I \cdot \dot{V}}{r}$$

Where, I : Inertia

$\dot{V}$: Target deceleration

r : Radius of tire dynamic load

7.1.6 Shoe clearance : Unless otherwise specified, shoe clearance shall be as follows.

Drum brake with automatic adjuster : Stable SCC during burnish

Drum brake without automatic adjuster : $SCC = 0.3 \text{ mm}$

7.1.7 Confirmation of limit and breaking strength : In the strength and durability test, it is desirable to confirm the limit and breaking strength by continued test after having evaluated.

7.1.8 Burnish : Burnish prior to each test shall conform to the burnish of the dynamo general test mode indicated in Table 3.

7.2 Basic characteristics

7.2.1 Required brake fluid volume

(1) Air vent shown in ① and ② below shall be carried out in the vehicle condition.

① Let the brake fluid flow for about 5 to 10 seconds.

② Regarding (application of hydraulic pressure of 20 kgf/cm^2 {1960 MPa } → release of the bleeder) as 1 cycle, carry out the air vent of 10 cycles to 20 cycles repeatedly until no coming-out air is visually confirmed.

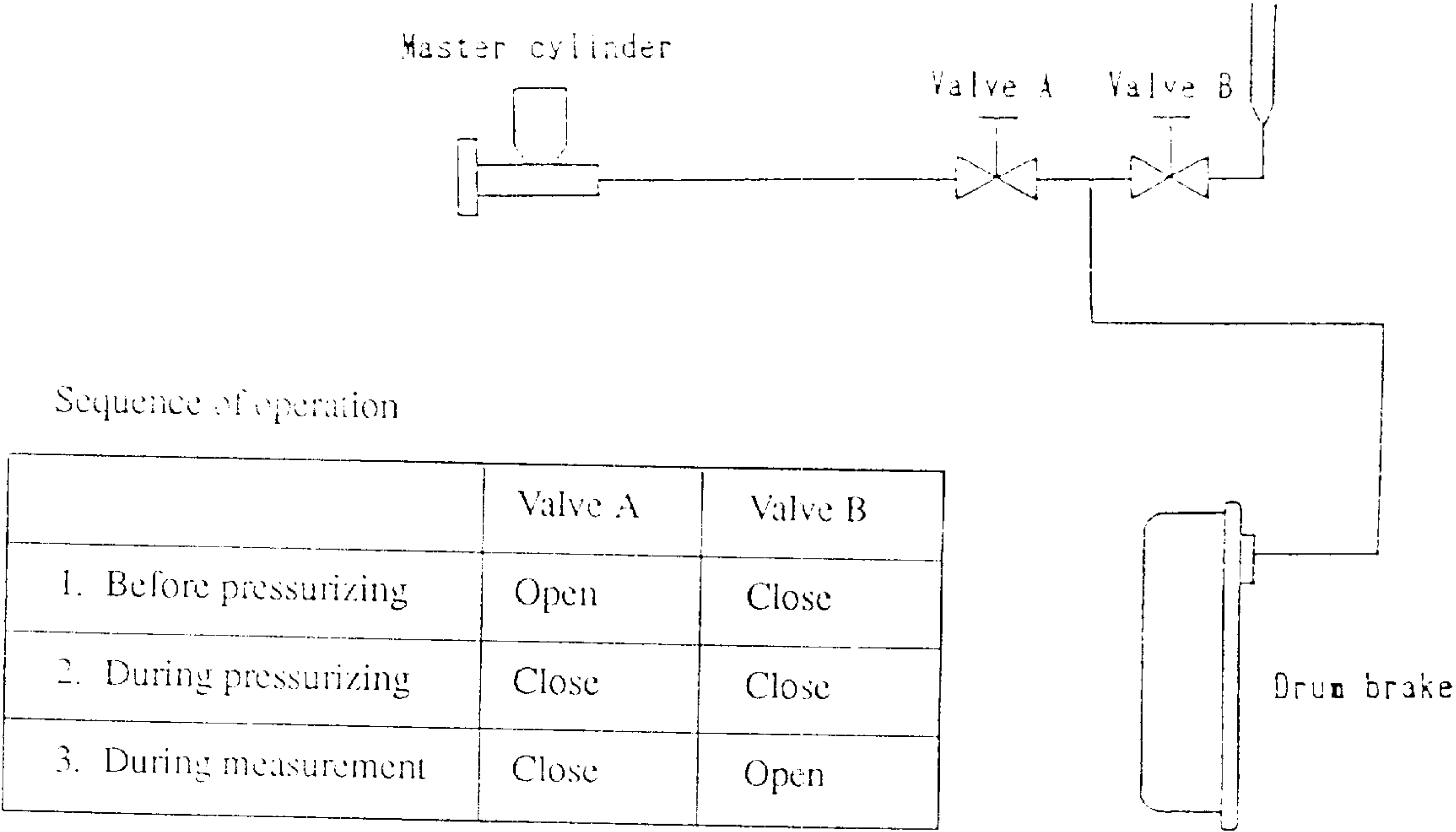
(2) Burnish shall be carried out in the vehicle condition. Then apply prehydraulic pressure of 70 kgf/cm^2 {69 MPa } 5 times to calculate the mean volume by measuring the required fluid volume 5 times at each hydraulic pressure of 5, 10, 20, 30, 40, 70, 100 kgf/cm^2 {0.49, 0.98, 1.96, 2.94, 3.92, 6.86, 9.81 MPa }.

(3) Median of the radius R of the lining outer circumference shall be applied.

(4) Measurement shall be made at SCC of 0.1, 0.3 and 0.5 mm respectively.

Fig. 1 Shows an example of a test equipment.

Fig. 1

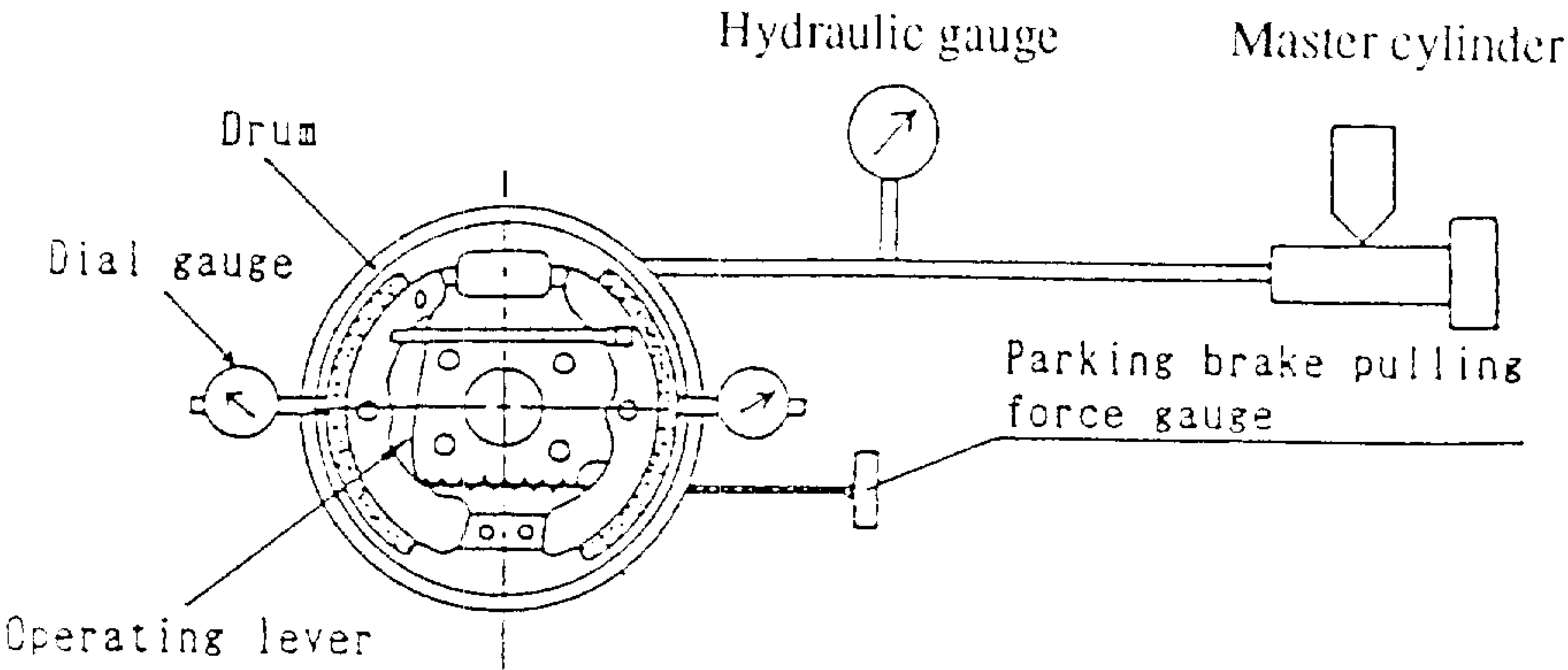


7.2.2 Pressure at beginning of work and returning of main brake

- (1) Pressure at beginning of work : Hydraulic or pneumatic pressure and the movement of the shoe until the full contact of the drum and shoe shall be measured in the vehicle condition.
- (2) Pressure at returning : Hydraulic or pneumatic pressure shall be applied until the full contact of the drum and the shoe in the vehicle condition, thereafter, it shall be released. Then, the hydraulic or pneumatic pressure and the movement of the shoe shall be measured.

Fig. 2 shows an example of a test equipment.

Fig. 2

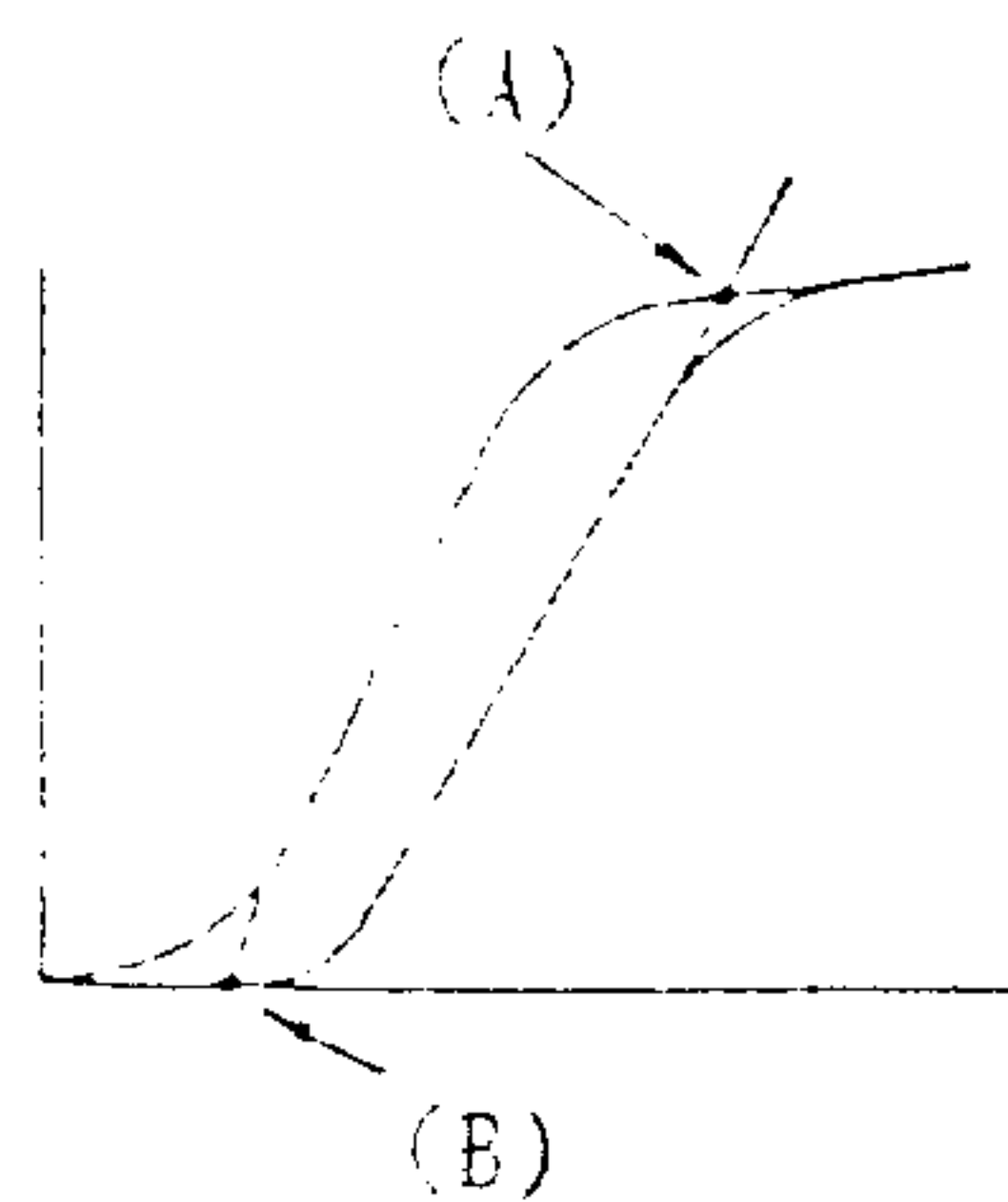


(3) Pressures at beginning and returning of work are shown in ① and ② below.

① Pressure at beginning of work : (A) in Fig. 3

② Pressure at returning of work : (B) in Fig. 3

Fig 3



7.2.3 Operating force at beginning of work and returning of parking brake

- (1) Operating force at beginning of work : The operating force and the movement of the shoe until the full contact of the drum and the shoe shall be measured in the vehicle condition.
- (2) Operating force at returning : Pressure shall be applied until the full contact of the drum and the shoe in the vehicle condition, thereafter, it shall be released. Then, the operating force and the movement of the shoe shall be measured.

7.2.4 Drag torque : The test shall be made under the following conditions to measure the drag torque.

- (1) Initial measurement : The drag torque shall be measured in the vehicle condition.
- (2) Abrasion test : The abrasion test shall be made under the following conditions of ① , ② and Table 2.
 - ① Test weight : Performance standard weight
 - ② Braking distribution : Active braking distribution of 0.3 G {2.9 m/s²}