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LEXUS

# Service Bulletin

| | |
|---|---|
| Section : | Chassis / Power Train |
| Ref. No. : | CP-6004 |
| Date : | Apr.,2006 |
| Page : | 1 of 13 |

Area Application : USA, Canada, Europe, General, G.C.C. Countries, Australia
Model Name : ALL MODELS
Model Code : ALL

## Subject : JUDGEMENT FOR OIL LEAKAGE OF SHOCK ABSORBER

Foreword

Shock absorber is designed to keep very thin oil film on the rod surface due to functional purposes. This oil film is scraped off by the dust lip of an oil seal at the time of compression, and a small quantity of oil may remain on the upper part of an oil seal. Since this oil has high permeability, it begins to permeate the lower part from the shock absorber body upper part, and makes a thin film; customers may misinterpret this status as a leakage. This service bulletin is to provide a quick reference for dealers so that they can easily judge whether a shock absorber should be replaced with new one. The criteria of shock absorber replacement are also given for reference.



### Part No. Information :

| New Part No. | New Part Name | Qty |
|---|---|---|
| NA | NA | NA |

### Production Effective :

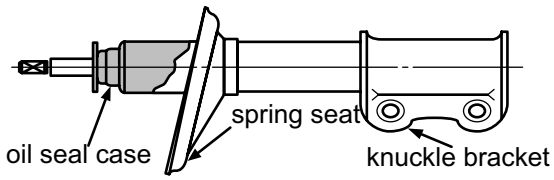
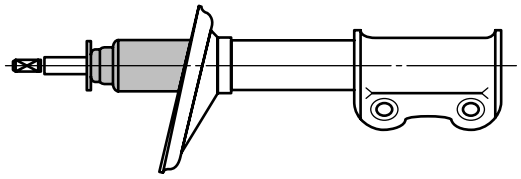
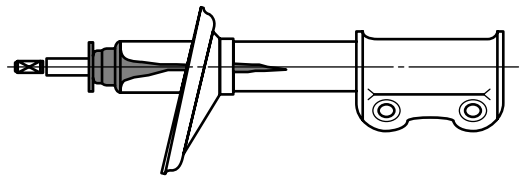
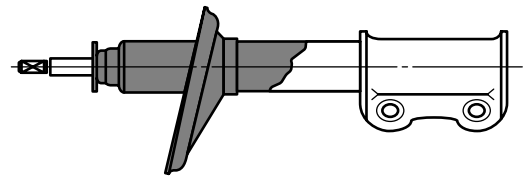
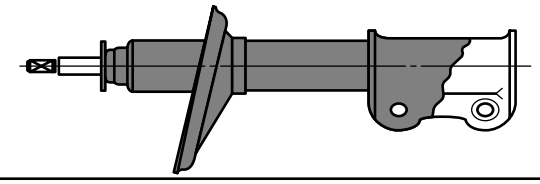
| Frame No. | Production Date |
|---|---|
| NA | NA |

# SUSPENSION

## JUDGEMENT FOR OIL LEAKAGE OF SHOCK ABSORBER

## 1.JUDGEMENT FOR OIL LEAKAGE OF SHOCK ABSORBER

**1. Strut Type**

| Oil Leak Criteria | Explanation | Procedure |
|---|---|---|
| Oil seepage: rank 4<br>  | Oil seepage between case and spring seat<br>(Oil from evaporation process) | No necessary to replace the shock absorber<br>**OK** |
| Oil seepage: rank 3 ⇐ oil amount: about 0.2 cc<br>  | Oil seepage between case and spring seat<br>(Oil from evaporation process) | No necessary to replace the shock absorber<br>**OK** |
| Oil leakage: rank 2<br>  | Drip: Oil leak under the spring seat | Replace the shock absorber<br>**NG** |
| Oil leakage: rank 2<br>  | Oil leak under the spring seat | Replace the shock absorber<br>**NG** |
| Oil leakage: rank 1 ⇐ oil amount: about 1 cc<br>  | Oil leaks and reaches the knuckled bracket. | Replace the shock absorber<br>**NG** |

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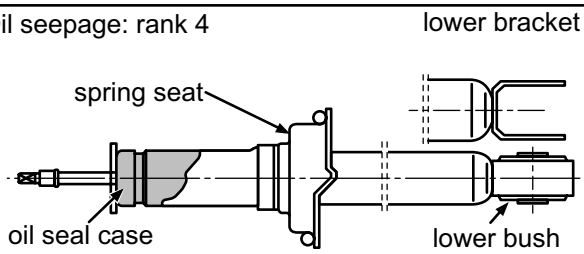
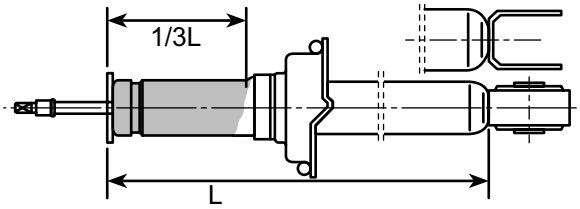
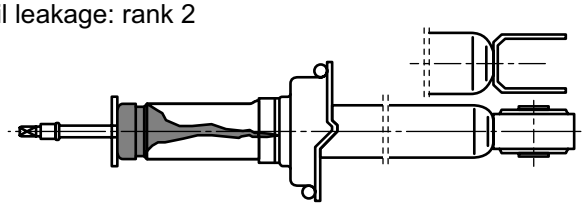
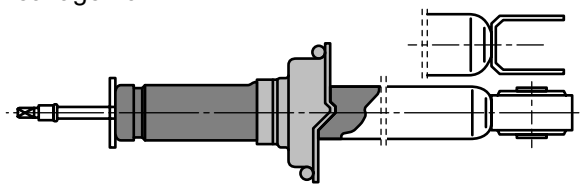
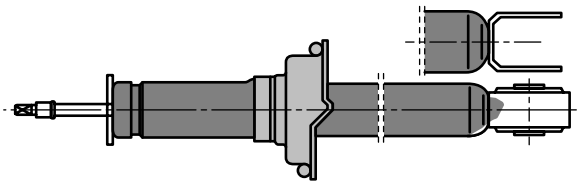
**2. Shock Absorber Type with Spring Seat**

| Oil Leak Criteria | Explanation | Procedure |
|---|---|---|
| Oil seepage: rank 4<br>  | Oil seepage between case and spring seat<br>(Oil from evaporation process) | No necessary to replace the shock absorber<br>**OK** |
| Oil seepage: rank 3 ⇒ oil amount: about 0.2 cc<br>  | Oil seepage between case and spring seat<br>(Oil from evaporation process) | No necessary to replace the shock absorber<br>**OK** |
| Oil leakage: rank 2<br>  | Drip: Oil leak under the spring seat | Replace the shock absorber<br>**NG** |
| Oil leakage: rank 2<br>  | Oil leak under the spring seat | Replace the shock absorber<br>**NG** |
| Oil leakage: rank 1 ⇐ oil amount: about 1 cc<br>  | Oil leakage to lower bush | Replace the shock absorber<br>**NG** |

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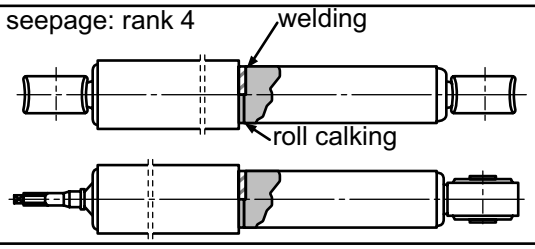
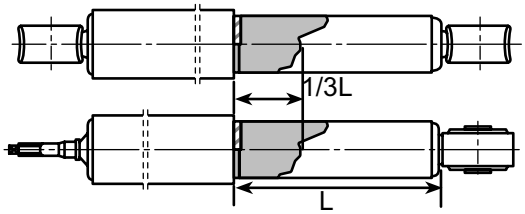
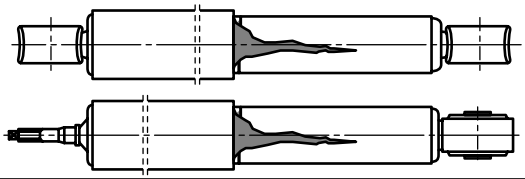
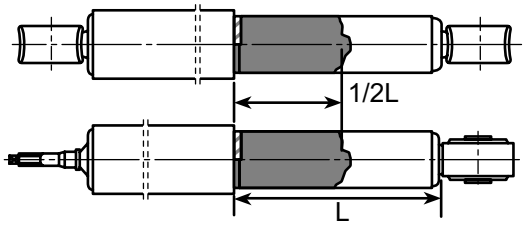
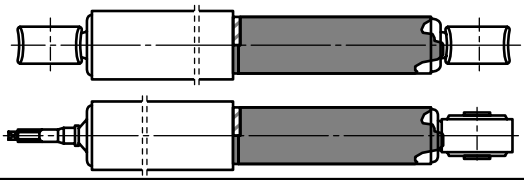
### 3. Shock Absorber Type

| Oil Leak Criteria | Explanation | Procedure |
|---|---|---|
| Oil seepage: rank 4<br>  | Oil seepage 1/4L or less from top of outer tube | No necessary to replace the shock absorber<br>**OK** |
| Oil seepage: rank 3 ⇐ oil amount: about 0.2 cc<br>  | Oil seepage 1/3L or less from top of outer tube | No necessary to replace the shock absorber<br>**OK** |
| Oil leakage: rank 2<br>  | Drip: Oil leak under the spring seat | Replace the shock absorber<br>**NG** |
| Oil leakage: rank 2<br>  | Oil leakage over 1/2L of outer tube length | Replace the shock absorber<br>**NG** |
| Oil leakage: rank 1 ⇐ oil amount: about 1 cc<br>  | Oil leakage to lower bush | Replace the shock absorber<br>**NG** |

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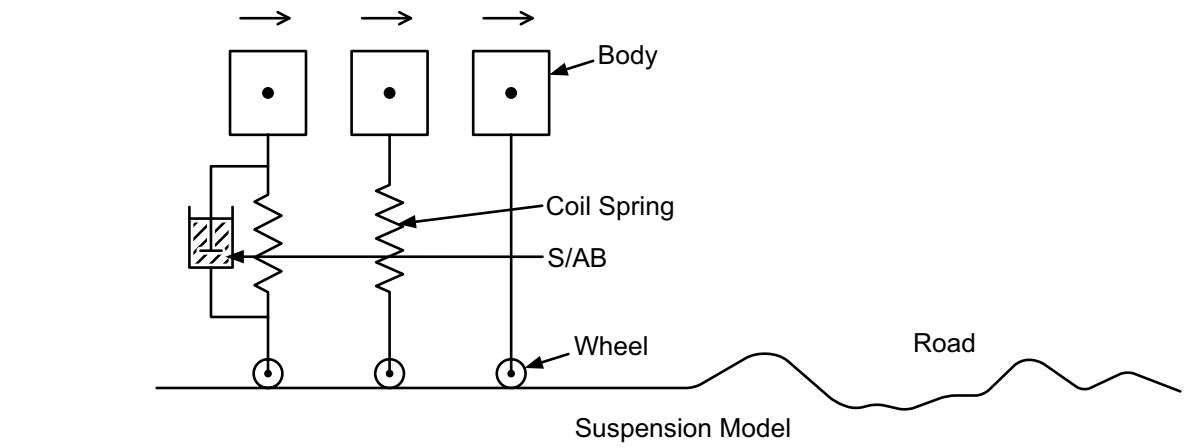
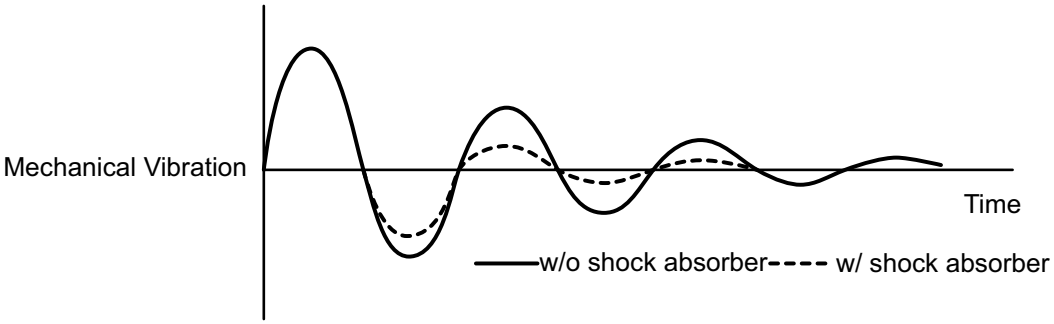
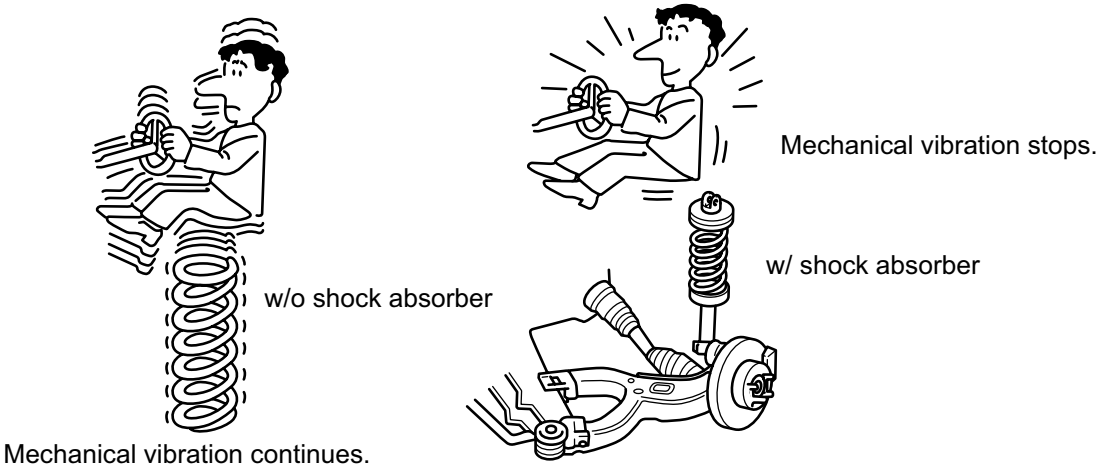
## 2.Function of Shock Absorber (S/AB)




Suspension Model




Damping Force of S/AB




Function of S/AB

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Coil springs soften the impact from the road surface by expanding and contracting themselves. If the vehicle has only coil springs, the mechanical vibration of the vehicle continues. In the case of only coil springs, controllability, stability, and ride comfort are not good. The function of S/AB is to reduce and eliminate this kind of mechanical vibration.

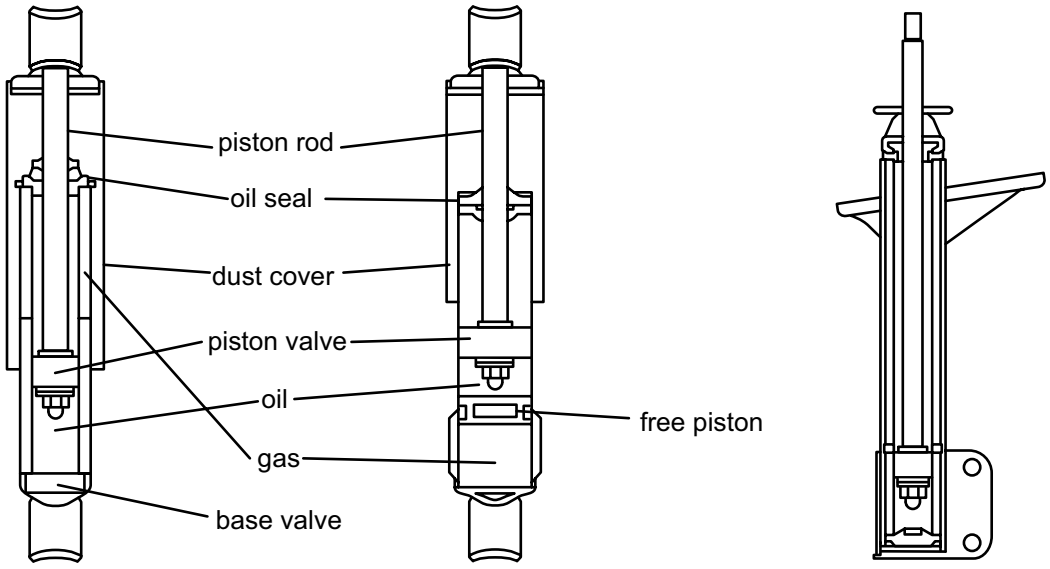
## 3.Structure and Mechanism of Shock Absorber (S/AB)

### 1. Structure of S/AB

Twin Tube S/AB
(Shock Absorber Type)

Mono Tube S/AB

Twin Tube S/AB
(Strut Type)




Structure and Description of S/AB

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| Twin Tube S/AB (Shock Absorber Type) | Mono Tube S/AB | Twin Tube S/AB (Strut Type) |
|---|---|---|
| This type of S/AB is the most common type. | In order to improve response, gas and oil are separated. Since the damping force is secured by the gas pressure, high-pressure gas is enclosed. | Strut Type S/AB has the function to position a wheel as a part of suspension member; therefore its piston rod and cylinder are thick and strong. |

## 2. Mechanism of Damping Force Generation

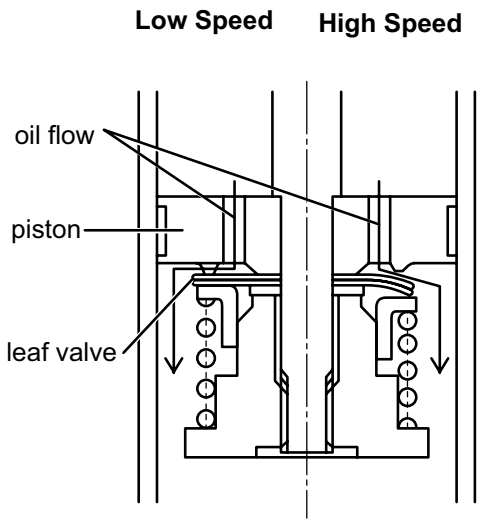


Figure 1 Mechanism of Damping Force

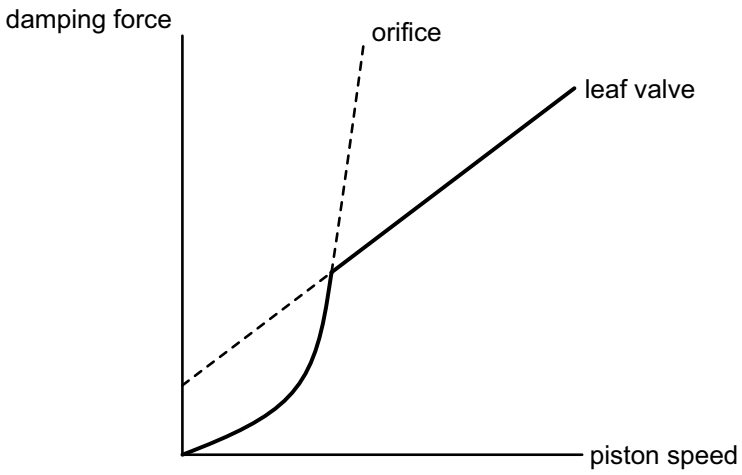


Figure 2 Characteristic of Damping Force

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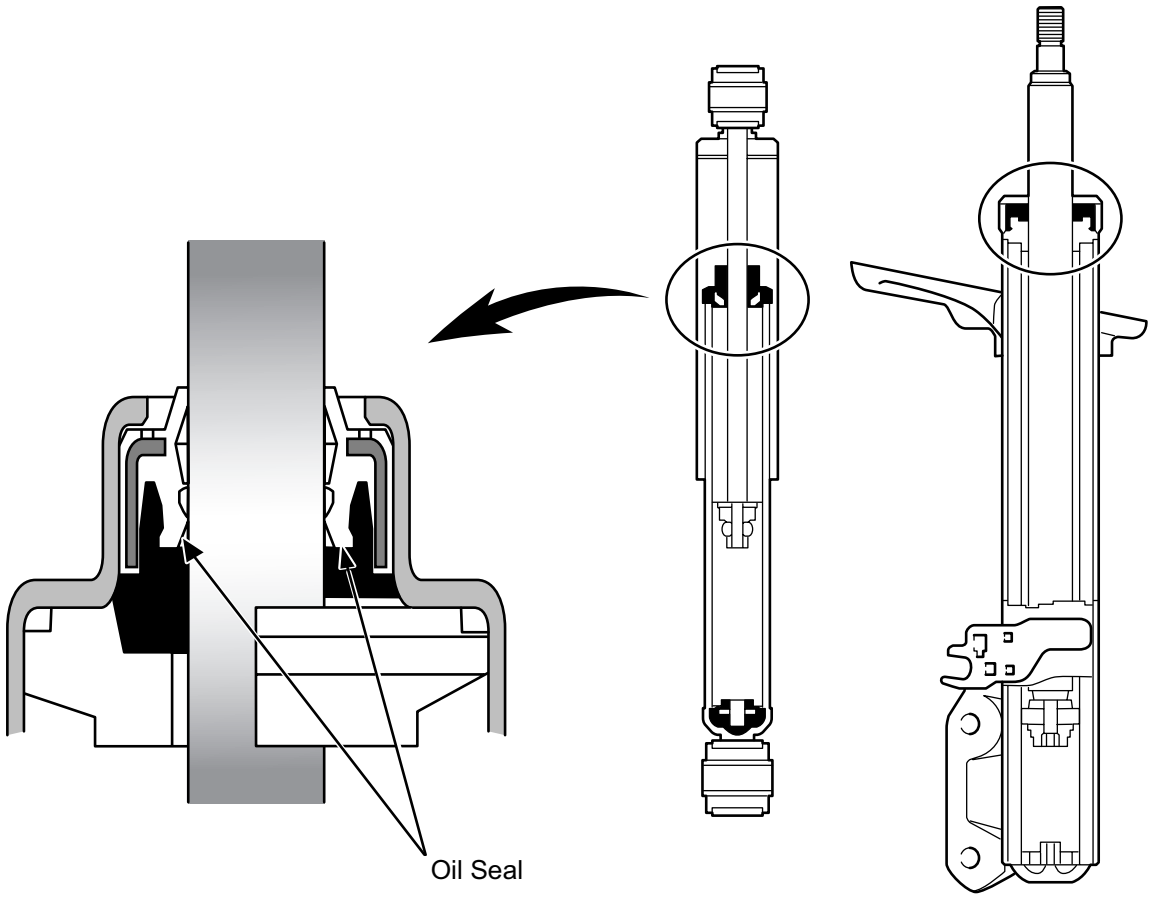
Typical structure of the piston valve is shown in Figure 1. The leaf valves, which make clearance for oil flow, are being fixed to the undersurface of piston, there are small slits called "orifice" on the surfaces of leaf valves. When the piston speed is low, the quantity of oil which passes the leaf valve is small. In this case, as shown in the left portion of Figure 1, the pressure of the upstream is low; therefore, this pressure cannot bend the leaf valve, and oil can pass only through the orifice. On the other hand, when the piston speed is high, the quantity of oil which passes the leaf valve is large. The quantity of oil which can pass through the orifice is limited; therefore, the pressure of the upstream becomes high. This pressure makes the leaf valve open as shown in the right portion of Figure 1 and oil passes through the clearance.

## 4.Function and Design Philosophy of Oil Seal

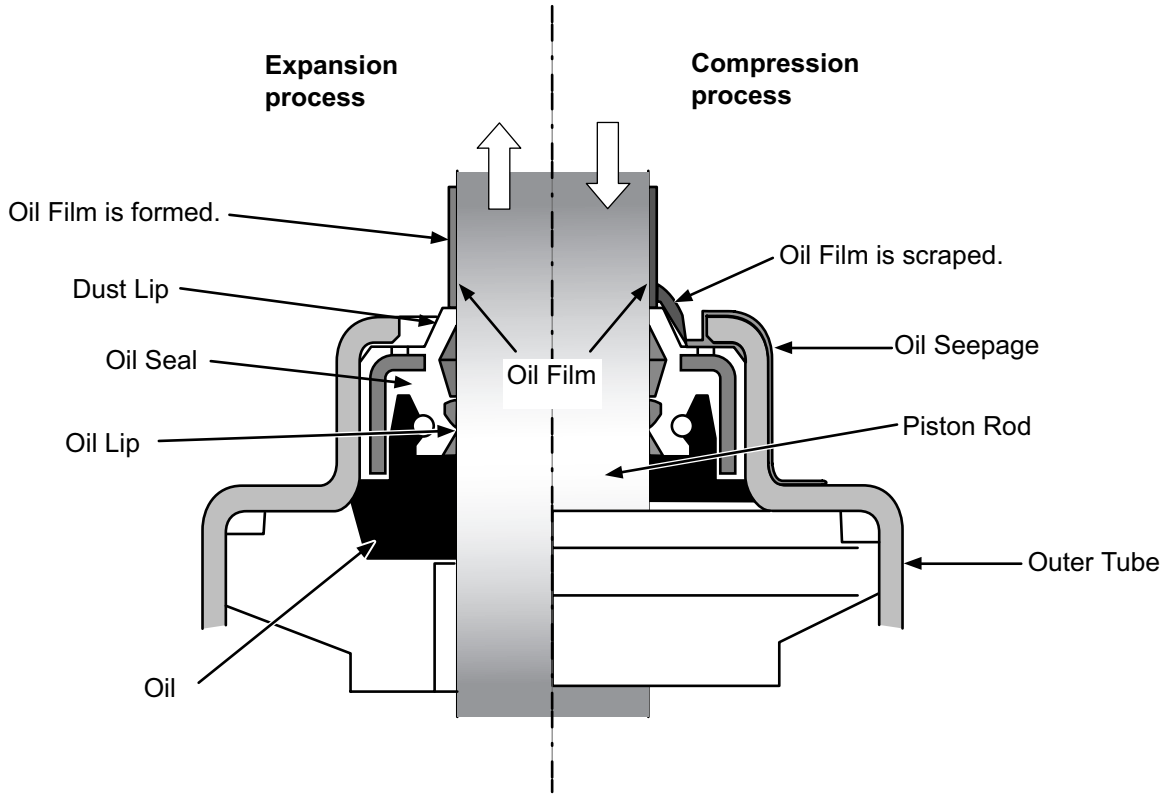
**1. Main Function of Oil Seal**




C147695E01

- Seals the oil in S/AB
- Prevents dust from entering
- Forms oil film between piston rod and oil seal (secure lubrication)

**2. Formation and Scraping of Oil Film**



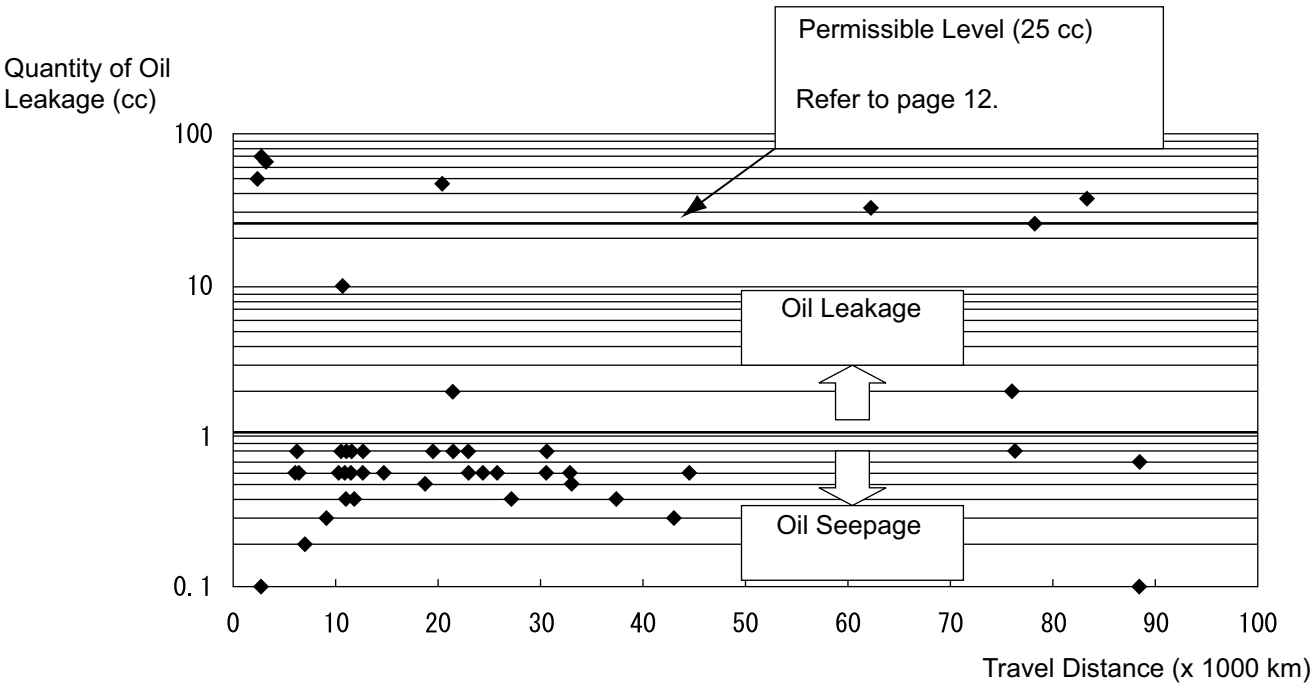

Formation and Scraping of Oil Film

Oil Film: Important factor influencing wear, durability and friction of oil seal.

C147696E01

- In order for oil seal to function normally for a long period of time, it is necessary to be formed the oil film on the surface of piston rod.
- This oil film is formed when the piston rod is pushed up. On the other hand, when the piston rod is pushed down, oil film is scraped by the dust lip and it may remain outside of oil seal. As the result of this, slight seepage can be seen on the outer tube; however, this is normal.

### 3. Result of Survey on Returned S/AB as Oil Leakage




Relationship between Oil Leakage Quantity and Travel Distance

H

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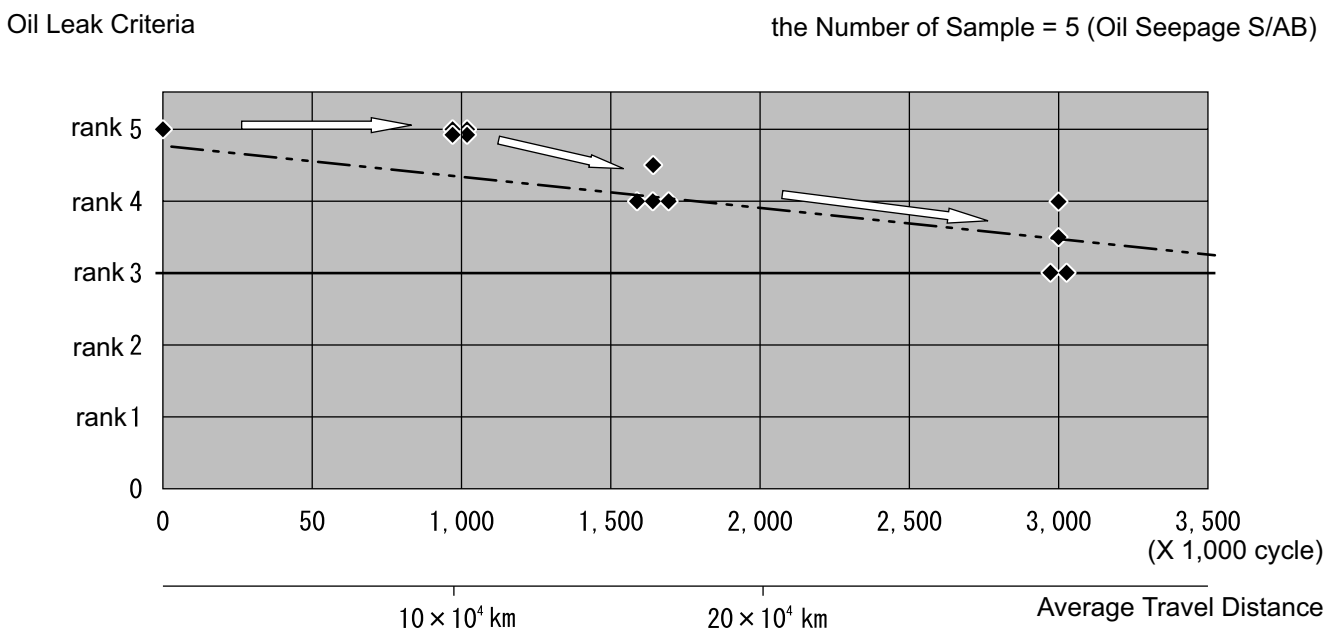
- Most of the returned S/AB were sent back due to oil seepage even though the oil seepage was within the permissible level.
- S/AB judged to be an oil seepage.
  (a) Quantity of oil decrease is below 1 cc.
  (b) Oil seepage has no relationship with travel distance.

**4. Durability Test Result on Returned S/AB as Oil Seepage**




Relationship between Oil Criteria and Sliding Motion

H

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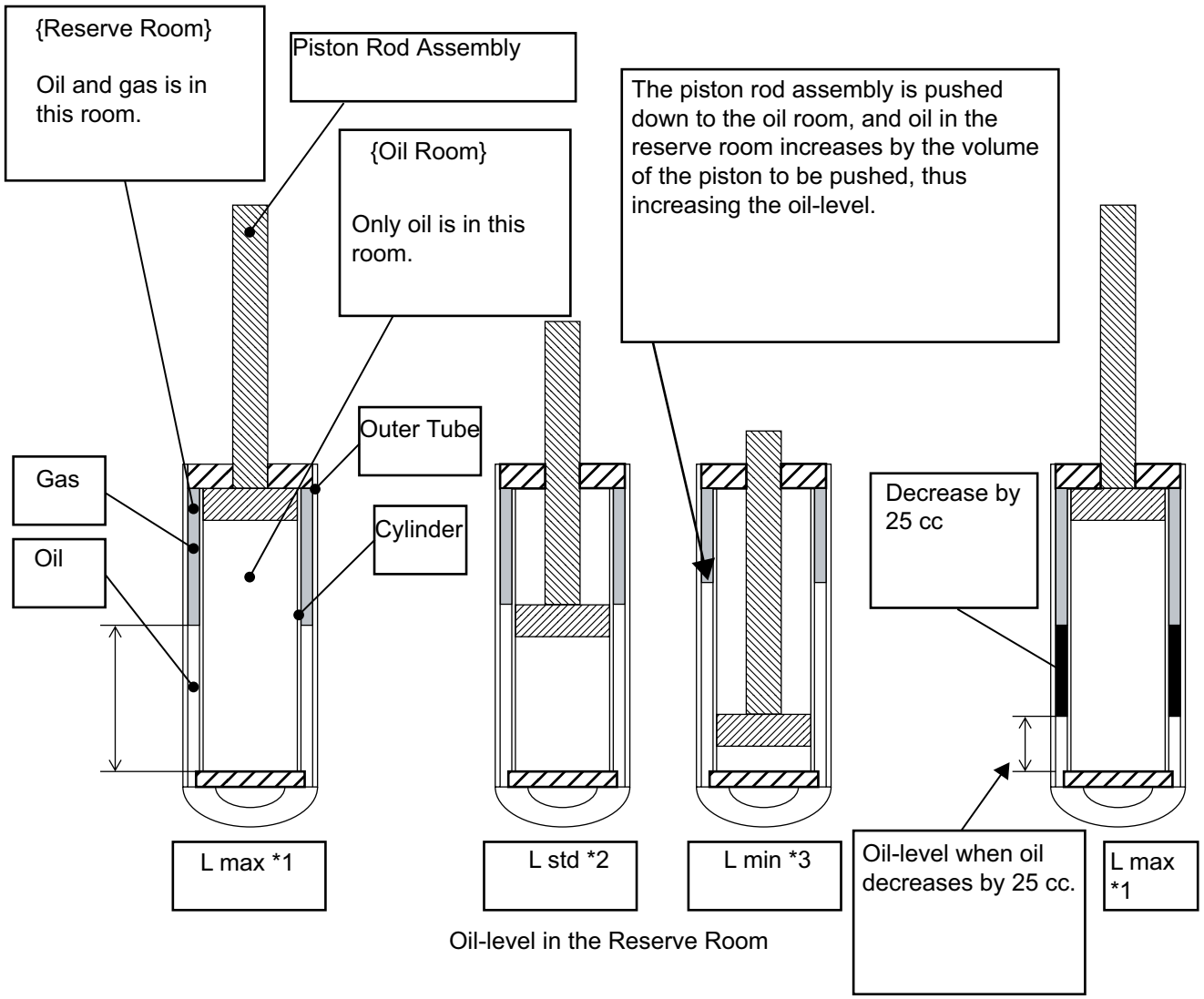
- Although a bench test of durability against sliding motion was performed on the returned S/AB as oil seepage, they did not reach "oil leakage level" even after driving of 200,000 km.
- After 3 millions cycles on the durability test, the quantity of oil decrease is 5 to 10 cc.

## 5.Influence of Oil Decrease




*1 L max: When S/AB is completely pushed up.

*2 L std: When vehicle is stopped (no load is applied).

*3 L min: When S/AB is completely pushed down.

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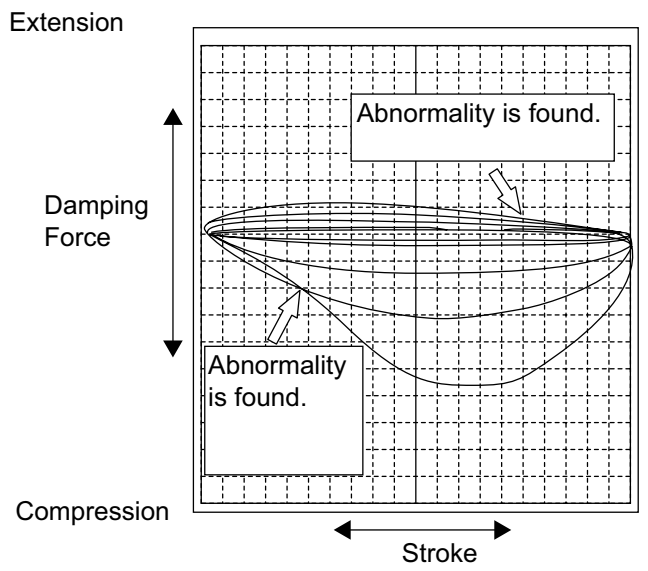
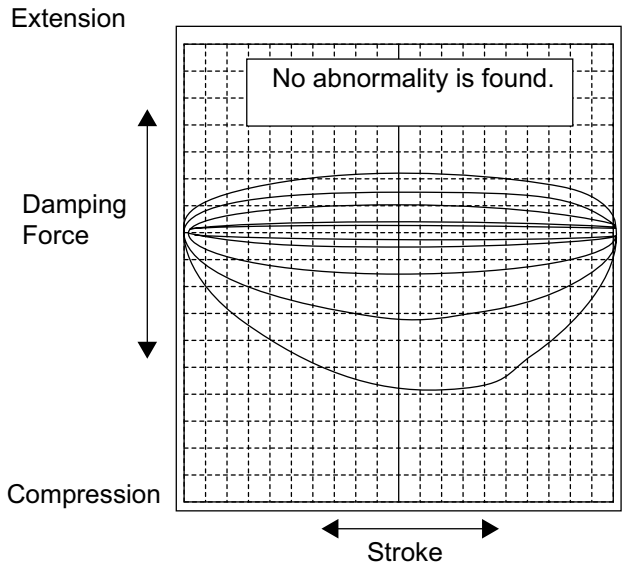



F-S Diagram when Oil Decreases by 55 cc.




F-S Diagram when Oil Decreases by 25 cc.

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- In the normal type of S/AB(Shock Absorber Type), quantity of oil is about 200 cc, and in strut type of S/AB, quantity of oil is about 300 cc.
- As shown in the illustration on page 12, damping force can be generated unless gas comes into the oil room from the bottom of reserve room at the time of stroking.
- The oil-level and oil quantity are determined for S/AB so that oil cannot enter the oil room even if oil decreases by 25 cc.
- As shown in the above illustration, when the decrease is over 25 cc, abnormality is found in the left F-S diagram. On the other hand, when the decrease is 25 cc, no abnormality is found in the right F-S diagram.