REMOVAL OF FRONT DIFFERENTIAL ASSEMBLY

⚠️ Stop the machine on level ground and install the safety bar on the frame. Lower the fork to the ground and stop the engine. Then apply the parking brake and put blocks under the wheels to prevent the machine from moving.

⚠️ Release the remaining pressure in the piping. For details, see REMOVAL OF RADIATOR ASSEMBLY.

• Jack up the axle, and set block 1 under the front frame.

• Loosen oil filler cap (1-1) slowly to release pressure inside cooling oil tank.

• Loosen mounting bolts (1-3) of tube (1-2) and set so that the oil inside the cooling oil tank does not flow out.

1. **Tires, wheels**
   Sling left and right tires and wheels (1) of front axle, then remove mounting nuts, and lift off.
   
   Tire, wheel: **683 kg (26.5-25 tire)**

2. **Drive shaft**
   1) Disconnect front drive shaft (2) from front axle.

   Front drive shaft: **40 kg**

   ★ Make match marks on the drive shaft and coupling.

   2) Remove flange bearing (2-1), and move front drive shaft towards right side.

3. **Draining oil**
   1) Set plugs (2-2), (3-1) immediately at bottom, then remove them and drain oil.

   Axle oil: **57 ℓ**
2) Remove drain plug (2-4) and drain oil from case.

Brake chamber: 18 ℓ (both sides)

4. Cover
   Remove cover (3), then remove O-ring (4).

5. Axle shaft
   Using forcing screws (Thread dia.=12mm, Pitch=1.75mm), pull out axle shaft (5) approx. 200 mm together with sun gear (6).

6. Slack adjuster
   1) Remove following hydraulic piping clamps.
      • Clamps for tube (7) between slack adjuster and axle.
        ★ Remove both the left and right clamps.
      • Clamp for tube (8) between slack adjuster and brake chamber.
   2) Remove mounting bolts of slack adjuster bracket (9), and insert block between slack adjuster and axle.
      ★ When removing the differential, set the bracket at a height where there is no interference.

7. Front brake cooling piping
   Remove front brake tube (9-1).
   ★ After disconnecting the piping, fit plugs to prevent the entry of dirt or dust.
8. Differential
1) Remove 2 mounting bolts of differential (10), and install guide bolts (Thread Dia.=14mm, Pitch=2mm, Length=50mm).
   ★ Screw in the thread of the guide bolts fully.
   ★ First, screw in the guide bolts, then remove the remaining mounting bolts.
2) Fit lifting tool ② to differential case (11).

3) Install forcing screws, and pull differential (10) along guide bolt to pull it out approx. 20 mm from axle housing.
   ★ Be careful not to damage the O-ring of the differential.
4) Install tools B and C to jack, and insert between differential and axle housing, then install differential (10) to tool B.
5) Adjust height of lifting tool and jack, and remove differential (10) slowly.

kg Differential: 235 kg

6) Operate jack, and pull differential out from chassis, then remove O-ring (13).
INSTALLATION OF FRONT DIFFERENTIAL ASSEMBLY

- Carry out installation in the reverse order to removal.

1. Tire mounting nut:
   \[ 470.7 \pm 49 \text{ Nm} \ (48.0 \pm 5.0 \text{ kgm}) \]

2. Fit flange bearing (2-1) temporarily.
   - Connect front drive shaft (2) to the differential and the center drive shaft ends.
   - Tighten flange bearing (2-1) fully.
     - When connecting the drive shaft, clean the mating surface of the spider and the coupling, then install.
   - Flange bearing mounting bolt:
     \[ 549.2 \pm 58.8 \text{ Nm} \ (56.0 \pm 6.0 \text{ kgm}) \]

3. Use a new part for the O-ring.

4. Adjust the lifting tool and the height of the jack for the differential, and assemble the differential along the guide bolt.
   - Fit the O-ring securely in the groove, and be careful that it does not get caught when installing.
   - When the clearance between axle housing (12) and differential (10) is approx. 20 mm, remove installation tool B and tighten the mounting bolts uniformly.
     - Differential mounting bolt:
       \[ 176.5 \pm 19.6 \text{ Nm} \ (18.0 \pm 2.0 \text{ kgm}) \]

5. Use a new part for the O-ring.
• **Refilling with oil**
  1) Tighten the drain plugs (2-2) and (3-1) and add oil through the level plug to the specified level.
  
  Set the machine with the drain plug immediately at the bottom, then add oil through the level plug.

  Axle oil: 57 ℓ

  2) Tighten drain plug (2-4).

  3) Tighten bolt (1-3) and secure tube (1-2) to cooling oil tank.

  4) Add brake cooling oil through oil filler (1-1) to the specified level.

  5) Add hydraulic oil through the oil filler of the hydraulic tank to the specified level.

• **Testing, adjusting brake**
  1) Bleed air from brake line and adjust brake.
  
  For details, see TESTING AND ADJUSTING.

  2) After completing all of the operations, check for any leakage of brake oil.
  
  For details, see TESTING AND ADJUSTING.

• **Bleeding air from brake cooling oil line**
  Bleed air from brake cooling oil line.
  
  For details, see TESTING AND ADJUSTING, Bleeding air from brake cooling oil line.
REMOVAL OF REAR DIFFERENTIAL ASSEMBLY

⚠️ Stop the machine on level ground and install the safety bar on the frame. Lower the fork to the ground and stop the engine. Then apply the parking brake and put blocks under the wheels to prevent the machine from moving.

⚠️ Release the remaining pressure in the piping. For details, see REMOVAL OF RADIATOR ASSEMBLY.

- Jack up the axle, and set block 1 under the rear frame.
- Loosen oil filler cap (1-1) slowly to release pressure inside cooling oil tank.
- Loosen mounting bolts (1-3) of tube (1-2) to bleed air inside the cooling oil tank and set so that oil inside cooling oil tank does not flow out.
- Remove drain plug (1-4) and drain oil from case.

Brake chamber: 18 ℓ (both sides)

1. **Tires, wheels**
   Sling left and right tires and wheels (1) of rear axle, then remove mounting nuts, and lift off.

   Tire, wheel: 683 kg (26.5-25 tire)

2. **Drive shaft**
   Disconnect rear drive shaft (2) from rear axle.

   Rear drive shaft: 19 kg
3. Brake piping
   1) Disconnect rear brake piping and hose (3) between brake valve and slack adjuster at slack adjuster end.
   2) Remove tubes (4) and (5) between slack adjuster and left and right wheel cylinders.
      ★ Always remove the brake tubes before removing the axle. There is danger that they may be crushed when the axle is lifted off.
      ★ After disconnecting the piping, fit plugs to prevent the entry of dirt or dust.

4. Rear brake cooling piping
   1) Disconnect rear brake hoses (5-1) at axle end.
   2) Remove tubes (5-2) and (5-3).
      ★ After disconnecting the piping, fit plugs to prevent the entry of dirt or dust.

5. Grease tubes
   Disconnect grease tubes (6) and (7) from rear axle support.

6. Rear axle support
   1) Secure axle support and rear axle with chain.
   2) Sling rear axle housing with nylon lifting tool, and remove both left and right mounting bolts (8).
      Rear axle, support: 1600kg
   3) Pull out rear axle and support together from chassis, then lower.
      ★ Maintain the balance of the axle when lowering it.
      ★ Remove the axle after removing the fuel tank.
      ★ For details, see REMOVAL OF FUEL TANK.
7. **Draining oil**
Set plugs (9-1) and (9-2) immediately at bottom, then remove them and drain oil.

![Axle oil: 57 ℓ](image)

8. **Cover**
Remove cover (9), then remove O-ring (10).

![5](image)

9. **Axle shaft**
Using forcing screws (Thread dia.=12mm, Pitch=1.75mm), pull out axle shaft (11) and sun gear (12) approx. 200 mm.

![6](image)

10. **Slack adjuster**
Remove cover (13) from axle, then remove slack adjuster (14) together with bracket.

![6](image)

11. **Rear differential**
Using forcing screws, lift off rear differential (15), then remove O-ring from rear differential.

![7](image)

Rear differential: **244 kg**
INSTALLATION OF REAR DIFFERENTIAL ASSEMBLY

• Carry out installation in the reverse order to removal.

   ※ 1
   Tire mounting nut: 
   470.7 ± 49 Nm {48.0 ± 5.0 kgm} 
   ★ Remove the block from under the rear frame.

   ※ 2
   ★ Clean the connections and mating surface of the drive shaft.
   Drive shaft mounting bolt: 
   112.8 ± 9.8 Nm {11.5 ± 1.0 kgm}

   ※ 3
   Axle support mounting bolt: 
   1029.7 ± 98.1 Nm {105.0 ± 10 kgm} 
   ★ After installing the rear axle, install the fuel tank.
   ★ For details of the installation of the fuel tank, see INSTALLATION OF FUEL TANK.

   ※ 4
   ★ When installing the rear axle to the chassis, be extremely careful not to damage the bushing and packing of the front support with the differential coupling.
   ★ Secure the rear axle and the support (rear end) with a chain, then install to the chassis.
   Rear axle front support portion: 
   Grease (G2-LI)

   ※ 5
   ★ Use a new part for the O-ring.

   ※ 6
   ★ When inserting axle shaft (11), rotate the differential coupling lightly by hand to install.
   Do not push it in by force.
Use a new part for the O-ring.

- Fit the O-ring securely in the groove, and be careful that it does not get caught when installing.

Differential mounting bolt:

- Thread tightener (LT-2)
- Differential mounting bolt: 176.5 ± 19.6 Nm (18.0 ± 2.0 kgm)

- Refilling with oil
  1) Tighten the drain plugs (9-1) and (9-2) and add oil through the level plug to the specified level.
  2) Set the machine with the drain plug immediately at the bottom, then add oil through the level plug.

Axle oil: 57 ℓ

2) Tighten drain plug (1-4).

3) Tighten bolt (1-3) and secure tube (1-2) to cooling oil tank.

4) Add brake cooling oil through oil filler (1-1) to the specified level.

5) Add hydraulic oil through the oil filler of the hydraulic tank to the specified level.

- Testing, adjusting brake
  1) Bleed air from brake line and adjust brake. For details, see TESTING AND ADJUSTING.
  2) After completing all of the operations, check for any leakage of brake oil. For details, see TESTING AND ADJUSTING.

- Bleeding air from brake cooling oil line
  Bleed air from brake cooling oil line. For details, see TESTING AND ADJUSTING, Bleeding air from brake cooling oil line.
DISASSEMBLY AND ASSEMBLY

DISASSEMBLY OF DIFFERENTIAL ASSEMBLY

1. Differential gear
   1) Remove ring gear adjustment bolt.
   2) Loosen adjustment ring lock bolt, and remove lock plate (2).
      ★ Rotate the adjustment ring, and separate the differential gear from the pinion gear.
   3) Remove bearing cap (2).
      ★ Check the match marks on the left and right bearing caps. Make new match marks if the old match marks cannot be seen.
   4) Remove adjustment ring (3) and bearing cup (4).

      5) Remove differential gear (5) from differential case.
      ★ The pilot bearing will hit the carrier, so tip it over slightly to the right when lifting it off.

      Differential gear assembly: 75 kg

2. Plain half
   1) Remove bearing (6).
   2) Remove plain half (7).
      ★ Check the match marks. Make new match marks if the old match marks cannot be seen.
3) Remove side gear (8), cross shaft (9), thrust washer (10), and pinion gear (11).

3. **Ring gear, flange half**
   1) Remove bearing (12).
   2) Remove mounting bolts, then remove ring gear (13) and flange half (14).

4. **Turning over**
   Turn over differential gear.

5. **Pinion gear**
   1) Loosen mounting bolts of coupling (15).
   ★ Leave the coupling temporarily fitted.
2) Remove pinion gear (17) from differential case (16).
   ※ Check the shim thickness and use as a guide when assembling.

6. **Pinion shaft**
   1) Using press, pull out pinion shaft (18).

2) Remove bearing cups (20) and (21) from cage (19).

3) Remove pilot bearing (22) and bearing (23) from pinion shaft (18).
   ※ Do not remove pilot bearing (22) and bearing (23) unless necessary.
   ※ Use the same procedure to disassemble the front differential.
ASSEMBLY OF DIFFERENTIAL ASSEMBLY

★ When replacing the pinion or ring gear, always replace them as a set, and be careful not to mix them with other sets. Replace the flange half and plain half also as a set.

1. **Pinion shaft**
   1) Press fit pilot bearing (22) to pinion shaft (18).
   2) Press fit bearing (23) to pinion shaft (18).
      ★ Press-fitting force for bearing (23), pilot bearing (22): 49 kN (5 ton)
   3) Press fit bearing cups (20) and (21) to cage (19).
      ★ Press-fitting force for bearing cup: 49 kN (5 ton)
      ★ Inside diameter of cage, outside diameter of cup: Axle oil
   4) Assemble cage (19) to pinion shaft (18), then assemble spacer (25).

2. **Adjusting preload**
   1) Press fit bearing (24) to pinion shaft (18).
      ★ Bearing portion: Axle oil
      ★ Coat the bearing portion fully with oil, and settle it before measuring.
      ★ Press force: 202 kN (20.6 ton)
      ★ Reading of spring balance: Max. 14.7 N (1.5 kg)
3) If the measured value is not within the standard value, replace bearings (23) and (24) and spacer (25) with new parts, then adjust again.
4) If the measured value is within the standard value, check that the end play of cage is also within the standard value.
   ★ End play: Max. 0.212 mm

3. Pinion gear
1) Press fit oil seal (27) and dust seal (27A) to cage (26).
   ★ Use new parts for the oil seal and dust seal, and be careful to install facing in the correct direction.
   - Lip of oil seal, lip of dust seal:
     Grease (G2-LI)
   - Press-fitting portion of oil seal, dust seal: Thread tightener (LT-2)

2) Install O-rings (26A) and (15A), then install cage (26) and coupling (15).
   - Coupling mounting bolt:
     926.7 ± 103 Nm (94.5 ± 10.5 kgm)

3) Assemble pinion gear assembly (17) to differential case (16) without installing shims.
   - Cage mounting bolt:
     176.5 ± 19.6 Nm (18.0 ± 2.0 kgm)
4) Install tool D to differential case (16).
5) Measure distance “L” from tool D to pinion gear, and calculate shim thickness.
   ★ When replacing the bearing, pinion gear, and ring gear, use the above procedure to adjust the shim.
   Shim thickness:
   Standard value – (L – thickness of tool)
   ★ Standard value: (243 + a) – (115 + b)

6) Assemble pinion gear (17) and shim to differential case (16), and tighten mounting bolts.
   Mounting bolt:
   Thread tightener (LT-2)

   176.5 ± 19.6 Nm (18.0 ± 2 kgm)

4. Ring gear
1) Knock pin (27) into flange half (14) so that it protrudes distance a from case.
   ★ a = 3.5 mm
2) Press fit bearing (12) to flange half (14).
3) Install flange half (14) to ring gear (13).
   Mounting bolt:
   Thread tightener (LT-2)

   279.5 ± 29.4 Nm (28.5 ± 3.0 kgm)
5. **Side gear**
   Install washer (28), and assemble side gear (8).
   ★ Insert the washer securely to the pin inside the case.
   🛠 Washer: Grease (G2-LI) (both faces)

6. **Pinion gear**
   Assemble pinion gear (11) and thrust washer (10) to cross shaft (9).
   ★ Align the stopper position of the thrust washer when assembling.
   🛠 Thrust washer (gear contact surface): Axle oil

7. **Plain half**
   1) Knock pin (27) into plain half (7) so that it protrudes distance \( a \) from plain half.
      ★ \( a = 3.5 \text{ mm} \)

   2) Install washer (28), and assemble side gear (8).
      ★ Insert the washer securely to the pin inside the case.
      🛠 Washer: Grease (G2-LI) (both faces)

   3) Press fit bearing (6) to plain half (7).
   4) Install plain half (7).
      ★ Insert cross shaft (9) securely in the groove of the case and plain half.
      ★ Check match marks, then set in position and install.
      🛠 Mounting bolt: Thread tightener (LT-2)
      🛠 Mounting bolt: 
      \( 176.5 \pm 19.6 \text{ Nm (18.0 \pm 2 kgm)} \)
8. Differential gear

1) Raise gear (5), and assemble bearing cup (4) to bearing, then install to case.

2) Align with thread of differential case (16), and install adjustment ring (3).

3) Align match mark and install bearing cap (2).
   ★ Be careful not to damage the thread of the cap.

9. Adjusting preload of bearing

1) Turn adjustment ring with a bar until ring gear contacts pinion gear, and adjust until there is no more backlash.
   ★ Rotate the bearing sufficiently to give complete contact between the bearing and other contact parts, then tap the ring gear with a copper hammer.
   ★ Coat the bearing well with oil.
   ★ If the adjustment ring on one side is loosened one turn, tighten the adjustment ring on the other side by one turn.

2) Install spring balance to ring gear, and measure free rotation torque.
   Free rotation torque:
   19.6 – 24.5 N (2.0 – 2.5 kg)
   ★ Target value: 24.5 N (2.5 kg)