SISU AXLES

# Maintenance Manual

## Hub Reduction in Axles:

## FRDP-14
## FRMP-14
## FRFP-14
## FRND-14

**FRDP = Single Drive Axle**
**FRMP = Foremost Tandem Drive Axle**
**FRFP = Tridem Drive Axle**
**FRND = Non-Drive Rigid Axle**

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*NOTE! This Manual is intended for use by experienced mechanics using safe procedures in properly equipped shops.*
*Safety precautions should always be followed such as wearing safety glasses, using adequate lifting aids, and using tools and equipment in good condition. Sisu Axles, Inc., its agents, associates or representatives are not responsible for damage or injury occurring while working on their components.*

# 1. GENERAL

In this manual, there are repair instructionjks for the hub reductions, which are used in
Sisu FRDP-14, FRMP-14 and FRFP-14 axles.
The wheel hub incorporates a planetary type hub reduction with 5 planet gears.
Hub repair can be performed in the vehicle or when the axle removed and taken to the workshop.

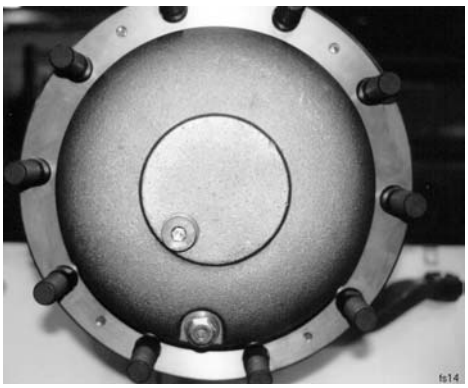
**Note!**

NOTE! Repair instructions for the drive gear and for the brakes are in separate manuals.

# 2. REPAIR

## 2.1 WHEEL HUBS

### 2.1.1 Removal

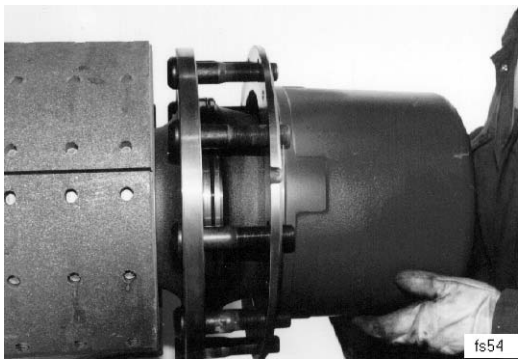



Picture 1. Wheel hub drain plug.

1. Lift axle up and support it on axle stands. Take off the wheel and tire assemblies.
2. Remove brake drum. Utilize pulling screws if necessary.
3. Remove drain plug (lower plug in Picture 1.) and drain oil from the wheel hub housing into a suitable container.

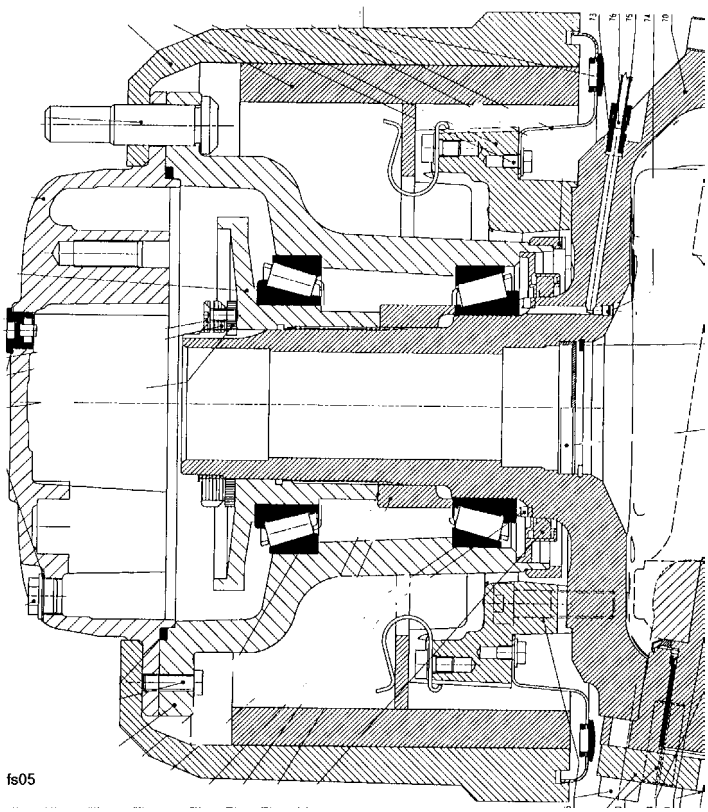

Picture 2. Unscrewing hub housing retaining screws.

4. Unscrew hub housing retaining screws (4 pcs, see Picture 2.) and remove hub housing (Picture 3.).



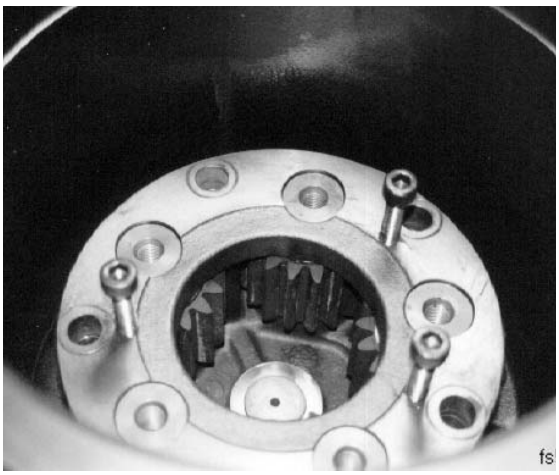

Picture 3. Hub housing removal.

☞ *NOTE. In non-*drive *F*RND-14 *axles, there are no moving planetary gear parts inside. The ring gear hub (Item 12 in picture 10.) is used without the ring gear and wheel hub removal and installation as well bearing adjustment are the same in all axle types. Oil filling of the wheel hub is the same in all axles.*




Picture 4. Wheel hub of a non-drive axle in sectional view

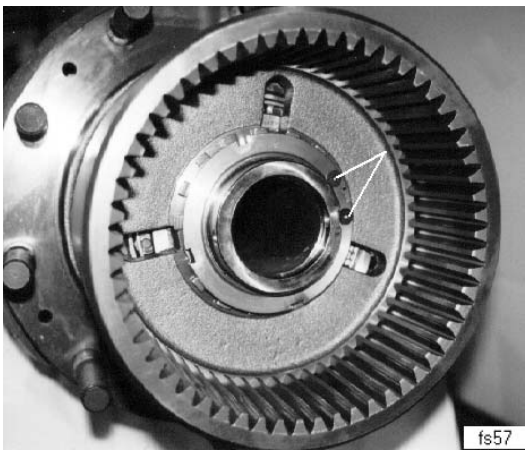
5. Remove the planet carrier cover (Item 22 in Picture 10.) by unscrewing planet carrier cover retaining screws and by using pulling screws (M10).




Picture 5. Using planet carrier cover pulling screws.

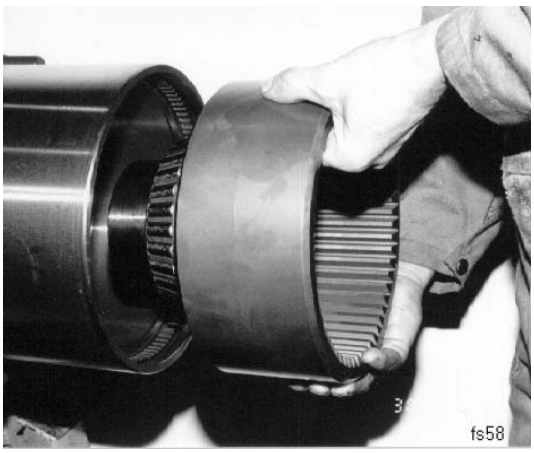

Picture 6. Planet gear shafts removing with a special tool.

6. Pull out the planet gears and take care to contain the bearing needles and spacers which are loose in the planet gears. If necessary pull out the planet gear axle shafts (Picture 6.), perform it with a special tool 7543-049-05.
7. Remove the sun gear circlip (Item 20 in Picture 10.) and take the sun gear (Item 19 in Picture 10.) off the half shaft. Remove also the circlip below the gear (Item 18 in Picture 10.)




Picture 7. Bearing adjustment nut lock screws.

8. Remove the locking screws (Picture 7.) from the bearing adjustment nut. Remove the nut with the special tool 7143 024 020. Remove the lock plate (Item 14 in Picture 10.).



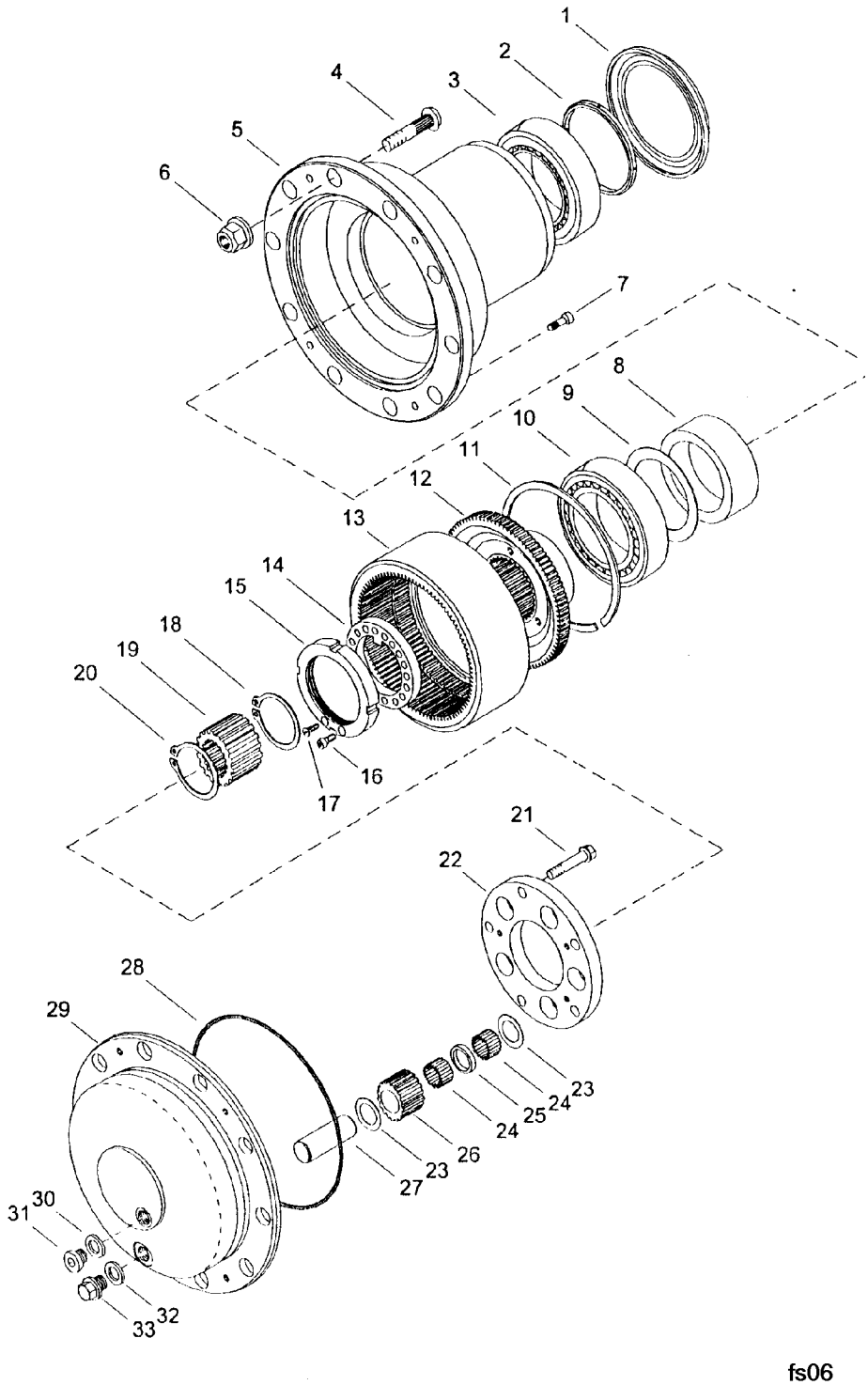

Picture 8. Removing the ring gear and the ring gear hub.

9. Remove the ring gear and the ring gear hub from the axle tube (Picture 8.). The outer bearing will follow the ring gear hub. To make removal easier, support the wheel hub.

After removing the planetary ring gear and its hub, you can remove the wheel hub. The inner wheel bearing and the hub seal can now be removed. If bearing replacement is required remove the bearing cups from the hub with a soft drift.


Picture 9. Retaining ring removal.

Remove the retaining ring. Remove the ring gear from the ring gear hub by tapping lightly with a soft metal hammer.

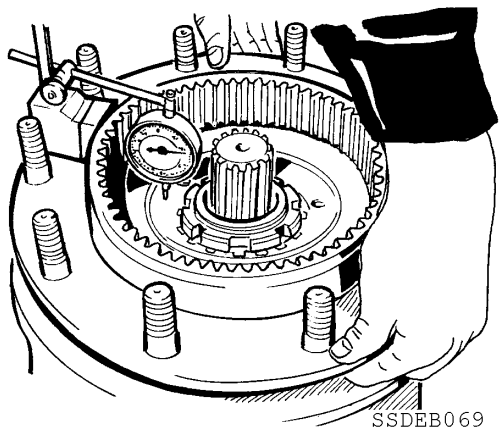



Picture 10. Exploded view of wheel hub assembly.

## 2.2 Assembly:

Inspect the wheel hub carefully before assembly. Always install a new wheel hub seal (Item 1 in picture 10.). Replace any bearings which have any defects such as scratches, worn spots or discolouring. Ensure that bearing cups are tight in their seats. If cups are loose in the hub, the hub must be replaced. Inspect the planetary ring gear and its mounting in the hub. If any defects are found in the ring gear, it must be replaced.

Using a shop press, install the bearing cups in the wheel hub. Lubricate the seal and the bearing with grease. Install the inner bearing cone and the wheel hub seal into the wheel hub.




Picture 11. Checking of the wheel hub bearing clearance

### 2.2.1 Wheel hub bearing adjustment:

1. Lift the wheel hub onto the steering knuckle. Install the lubricated outer hub bearing.
2. Install the locking plate (Item 14 in Picture 10.) and bearing adjusting nut and tighten slightly by wrench No. 7543-050-020. Adjust the wheel hub bearing as follows:
3. Tighten the adjusting nut to 1000 Nm [738 lb-ft] torque while rotating the hub. Then, tighten the nut so that it can be locked in this position with two lock screws (The longer screw shall be inserted into the hole of the nut, which is aligned with a bore in the locking plate 14 in Picture 10.).
4. Attach a dial gauge by its magnetic holder to the hub, and place the tip of the gauge against the ring gear hub. Move the hub in the direction of the axle and read the bearing clearance on the dial.The correct clearance is -0,05 ... 0,05 mm. Adjust the clearance, if necessary, by changing the shim plates. Thicker plates increase the clearance.
5. Use Loctite locking liquid and tighten the lock screws to 12 Nm [9 lb-ft] torque with a torque wrench.

**Available shims for hub bearing adjustment:**

| | |
|---|---|
| 590731-09520 | (0.20 mm) |
| 590731-09530 | (0,30 mm) |
| 590731-09550 | (0.50 mm) |
| 590732-09510 | (1.00 mm) |

### 2.2.2 Drive shaft spline inspection and installation:

Inspect the drive shaft splines and associated sun gears prior to installation. Pay special attention to the condition of the sun gear teeth (Item 19 in picture 10.). If cracks or other defects are found, the sun gear has to be replaced. Install the lower circlip (Item 18 in Picture 10.) on the half shaft groove and the sun gear the chamfered side of the teeth outwards. Lock the sun gear in place with the circlip (Item 20 in Picture 10.).

If excessive clearance is found between the drive shaft splines and the sun gear, the sun gear and/or the drive shaft complete or the outer end have to be replaced.

## 2.3 Assembly of planet carrier

(See Picture 10.):

Inspect all planetary gear components and discard all excessively worn or damaged parts. Insert needle bearings (24) and spacers (25) between the bearings and other spacers (23) outside of the planet gears. Use grease to make assembly easier and to ensure lubrication at startup.

Picture 12.Positioning of the planet gear shafts

1. Press the planet gear shafts (27) to the hub housing by using a workshop press and a special guiding tool 7543-049-06 and tool 7543-049-030 for positioning the planet gear shafts. Use planet carrier cover plate retaining screws to fix the guide tool. Use a special tool 7543-049-02 (support plate) under the hub housing to prevent the hub housing rolling while pressing the planet gear shafts.

2. Place planetary gears with thrust washers (23) onto the planet gear shafts. Install the planet gears so that the chamfered sides of the teeth point out to the wheel hub to make hub housing installation easier. Install the planet carrier cover (22). Use Loctite locking liquid on threads and tighten the planet carrier cover retaining screws manually or by using a slow speed screw machine to 180 Nm [130 lb-ft] torque.

Picture 13.Installation of the planet gear shafts.

☞*NOTE! When installing planet gear shafts, chamfers must be directed out so, that installation of the planet carrier half* (Item 22 in picture10.) *is possible. There is a special tool* -positioning tool, *part no. 7543-049*-030 *available but if not, the planet carrier half can be used as a guide tool when turned up side down*.

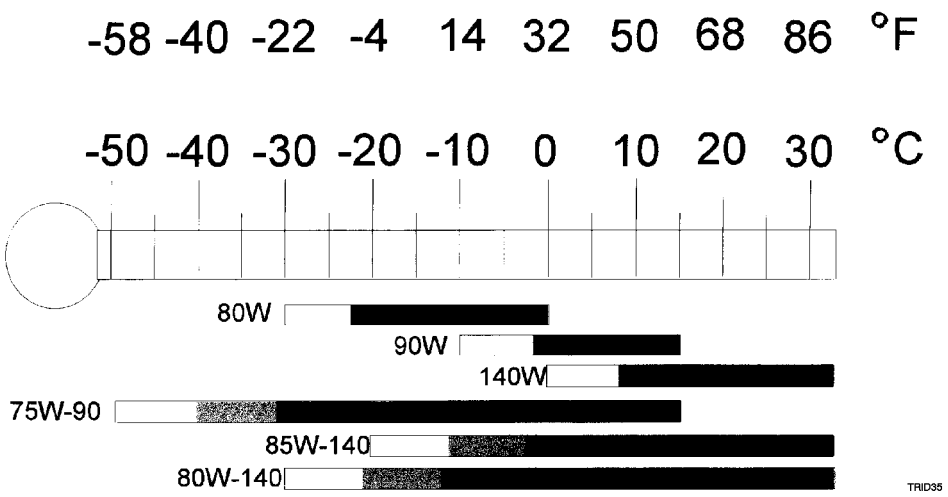
## 2.4 Installation of planetary gear hub

(See Picture 10.):

Install the assembled planetary gear hub. Replace always the o-ring (28) before hub installation. Rotate the hub housing back and forth a little so that all the gears engage allowing you to slide the hub housing in to place. Tighten the hub housing retaining screws (7) to 40 Nm [30 lb-ft] torque. Always replace seal rings (30 and 32) when re-installing the plugs.

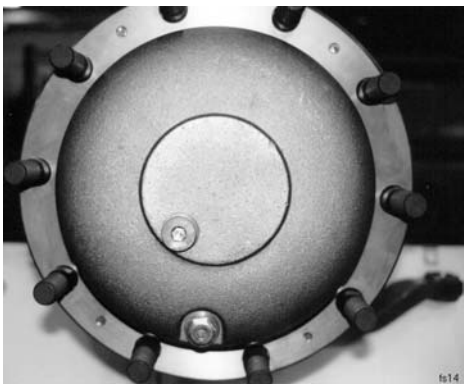
# 3 LUBRICATION

Grease quality for grease lubricationNLGI 2 - Mobil Grease MP or comparable
Drive gear oil quality API GL - 5; use of the synthetic oil is permitted too.
Viscosity according to prevailing ambient
temperature as shown on the accompanying table




Picture 14. Oil grades in various ambient operation temperatures

## 3.1 Planetary wheel hub oils



Picture15. Wheel hub housing oil level plug (upper one).

1. Rotate the wheel hub until the oil drain plug is in most low position.
2. Oil level in the wheel hub housing must be at the level of the check plug opening.
3. Fill approx. 1,4 liter (3 U.S. pints) recommended oil. Check the differential oil level afterwards.
4. Tighten oil level plug and oil drain plug to 50...70 Nm [37...52 lb-ft] torque

### 3.1.1 Filing volume

| | | |
|---|---|---|
| Planetary wheel hubs, each | 1,4 liters | 3 pints |
| Non driven wheel hubs, each | 1,8 litres | 3,8 pints |

# 4 SPECIAL TOOLS

| | |
|---|---|
| Adjustment wrench for wheel hub bearing | 7543-050-020 |
| Puller for planet gear axle shafts | 7 543- 049-05 |
| Guide plate for installation of the planet gear axle shafts | 7 543-049-06 |
| Support plate under the hub housing when using workshop press | 7 543-049-02 |
| Guiding tool for planetary axles | 7543-049-030 |

# 5 TECHNICAL DATA

| | |
|---|---|
| Axle housing | Fabricated of pressed steel plate |
| Planetary wheel hub gears | 5 planetary gear design, ratio 3.64: 1 |
| Clearance of wheel hub bearing | -0,05 ... 0,05 mm [-0.002 ... 0.002 in] |

# 6 TORQUE VALUES

| Description | Nm | Lb-ft |
|---|---|---|
| Wheel nuts | 550 - 650 | 406 - 480 |
| Wheel hub oil level and drain plugs | 50 - 70 | 37 -52 |

Other values: See respective instructions