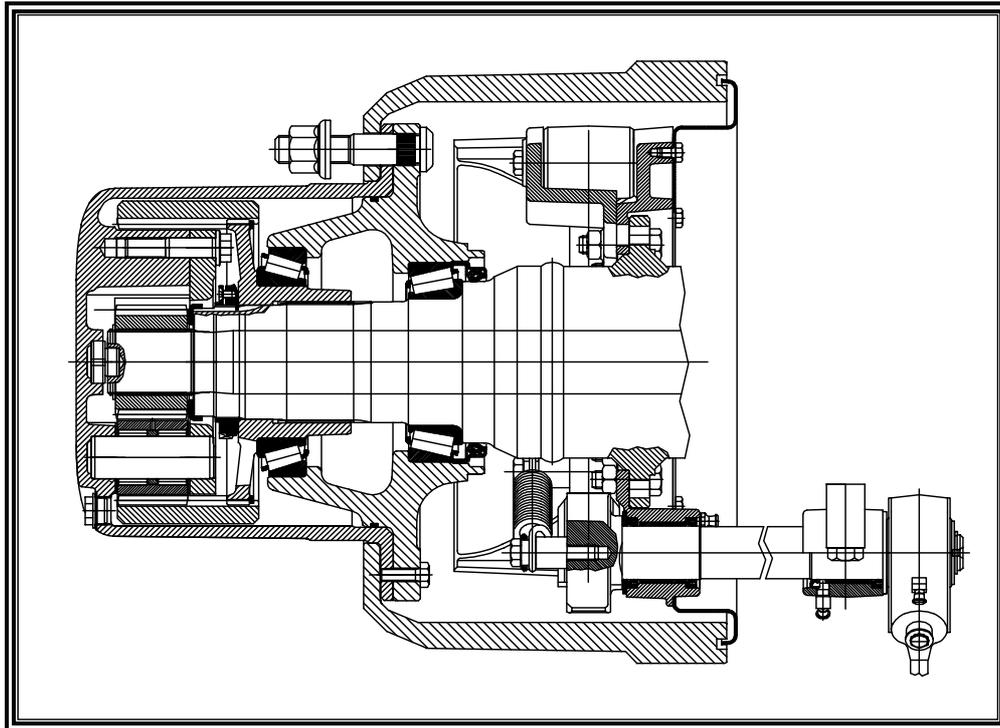




**SISU** Axles

# Maintenance Manual



## **Sisu Rigid Rear Axles with *Sisu Compact Hubs***

**FRDP Single Drive,  
FRMP Foremost Tandem Drive &  
FRFP Tridem Drive Axles**

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REPAIR INSTRUCTIONS FOR  
SISU FRDP SINGLE DRIVE, FRDP REAR TANDEM DRIVE,  
FRMP FOREMOST TANDEM DRIVE & FRFP TRIDEM DRIVE AXLES  
WITH SISU COMPACT WHEEL HUBS

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WITH SISU *COMPACT WHEEL HUBS*

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

#### AXLE DESIGN

The primary reduction takes place in the bevel gear section of the carrier which is located in the middle of the axle housing.

From the carrier, the power is transferred through axle shafts into the wheel hubs where five planetary gears work as secondary reduction. Wheel hubs are compact type so that the cast iron hub housing has built-in planetary gears without separate planetary gear assembly.

The sun gear in the planetary wheel hub is splined to the outer end of the axle shaft. The planetary carrier drives the wheel hub through teeth on its exterior and is turned by the sun gear through the five planetary gears.

The carrier section with the axle differential is lubricated by oil in the axle and carrier housings.

FRDP axles are used either as the rear axle of the FR2P tandem or in single drive applications.

In tandem drive use the SISU FR2P tandem drive axle consists of FRMP foremost tandem axle and FRDP rearmost tandem axle.

FR3P tridem axle consists of three separate axles. The foremost axle is FRFP, the second FRMP and the third FRDP.

#### TANDEM

The propeller shaft flange of the foremost tandem axle is installed on the drive gear input shaft and it drives the spider of the inter-axle differential through its splines. This always rotates when the propeller shaft is rotating. The inter-axle differential divides the power between the forward and the rear axles of the tandem. Power to the foremost tandem axle is transmitted through the front side gear of the inter-axle differential with splines on which a spur gear is installed. The spur gear drives another spur gear which is installed on the splines of axle pinion gear transmitting power to the primary reduction of the foremost tandem axle. Another side gear of the inter-axle differential drives the shaft from which the power is transmitted to the rearmost tandem axle either through the optional drive release coupling or directly to the output shaft. This optional drive release coupling makes the SISU FR2P tandem unique.

#### TRIDEM

The planetary gear inter axle differential of the foremost tridem axle divides 30.5 % of the power from the transmission to the foremost tridem axle and the rest 69.5 % is divided even to the second and third axles by the inter axle differential of the middlemost axle.

#### 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.

## AXLE REPAIR

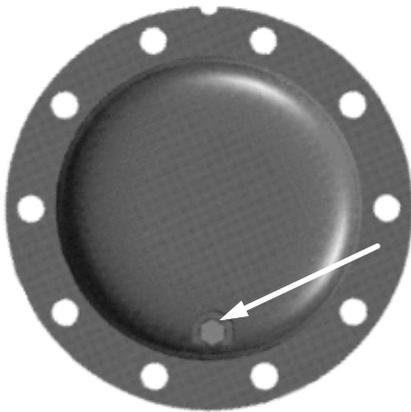
### WHEEL HUBS

#### Removal

Lift axle up and support it on axle stands. Take off the wheel and tire assemblies.

Remove brake drum. Utilize pulling screws if necessary.

Remove drain plug (arrow in Picture 1) and drain oil from the wheel hub housing into a suitable container.

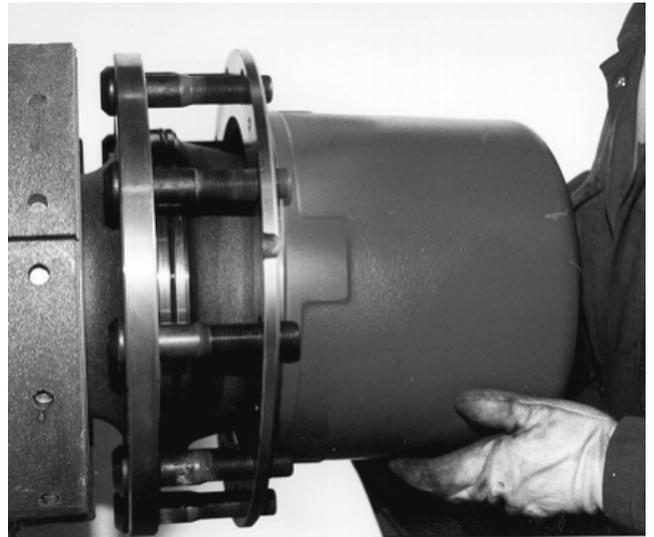


**Picture 1.** Wheel hub drain plug.

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

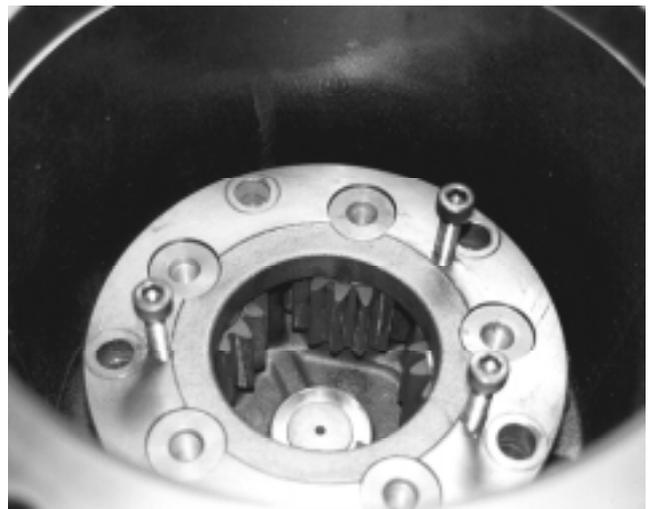


**Picture 2.** Unscrewing hub housing retaining screws.



**Picture 3.** Hub housing removal.

Remove the planet carrier (Item 23 in picture No. 9) by unscrewing planet carrier retaining screws and by using pulling screws (M10) (Picture 4).



**Picture 4.** Using planet carrier pulling screws.

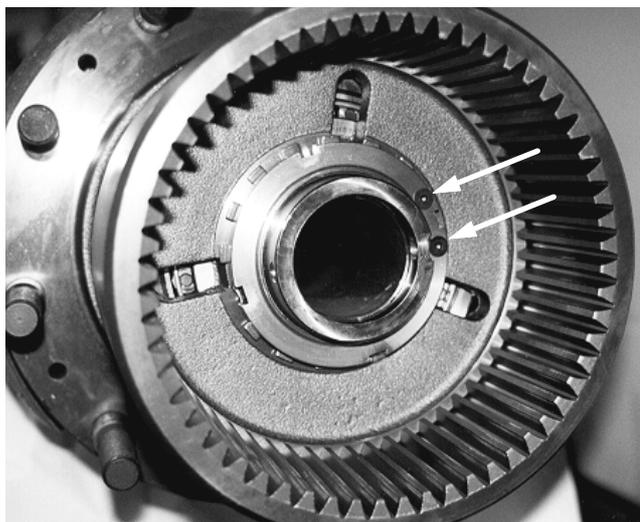
Pull out the planet gears and take care to contain the bearing needles and spacers which are loose in the planet gears. Do not lose the axle shaft thrust bearing (Item 29 in picture No. 9). If necessary pull out the planet gear axle shafts (Picture 5) by using a **special tool 7 543 049 05**.



**Picture 5.** Planet gear shafts removing with a special tool.

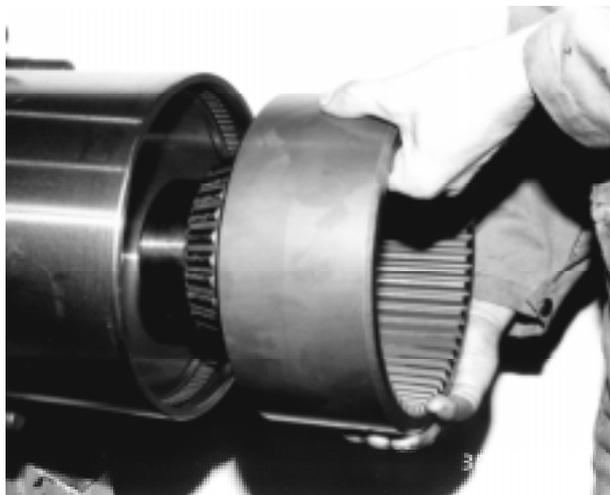
Pull the axle shaft with sun gear out of the axle housing. Remove the protection plate (Item No. 18 in picture No. 9) under the sun gear on the axle threads.

Remove the lock screws (Picture 6) from the bearing adjustment nut and straighten the lock plate (Item No. 15 in picture No. 9) tab in the groove of the nut. Remove the nut with the special tool 7143 024 020. Remove the lock plate.



**Picture 6.** Bearing adjustment nut lock screws.

Remove the ring gear and the ring gear hub from the axle tube (Picture 7). The outer bearing will follow the ring gear hub. To make removal easier, support the wheel hub.



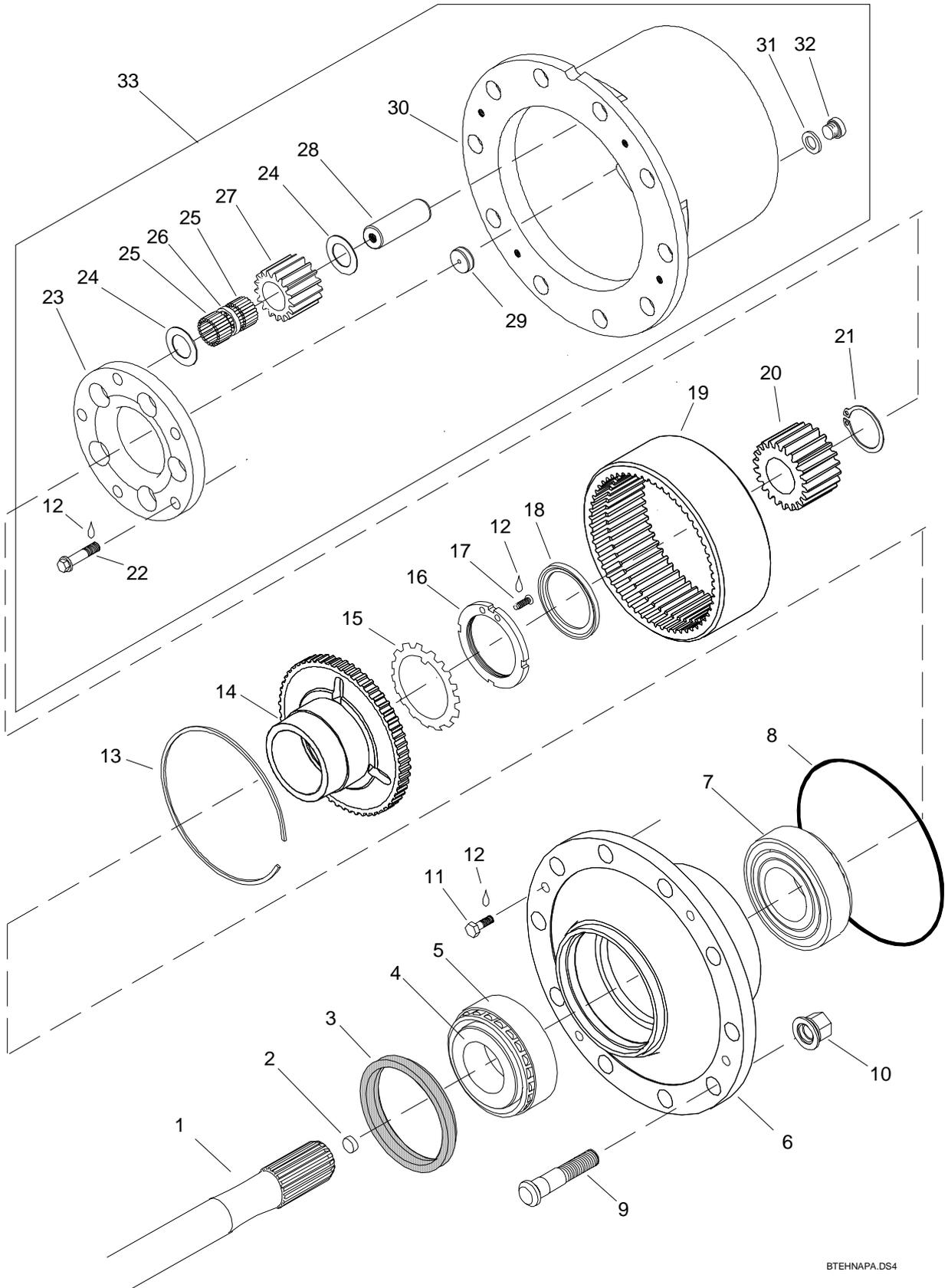
**Picture 7.** Removing the ring gear and the ring gear hub.

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.

Remove the retaining ring (Picture 8). Remove the ring gear from the ring gear hub by tapping lightly with a soft metal hammer.



**Picture 8.** Retaining ring removal.



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**Picture 9.** Exploded view of wheel hub assembly.

### Assembly:

Inspect the wheel hub carefully before assembly. Always install a new wheel hub seal. Replace any bearings which have any defects such as scratches, worn spots or discoloring. 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 in the wheel hub.

### Wheel hub bearing adjustment:

(Older design with sheet metal lock plate with locking tabs)

1. Lift the wheel hub onto the axle tube. Install the lubricated outer hub bearing.
2. Install the lock plate and bearing adjusting nut and tighten slightly by wrench No. 7143 024 020. Adjust the wheel hub bearing as follows:
3. Tighten the adjusting nut to 200 Nm [147 lb-ft] torque while rotating the hub. Then, loosen the nut by 1 locking tab places (approx. 19°) and lock the nut in this position with two lock screws and by bending a lock plate tab into the nut groove. Use Loctite locking liquid and tighten the lock screws to 12 Nm [9 lb-ft] torque with a torque wrench.

### Note!

**Instructions for the new design of the wheel hub adjusting nut and lock plate from December 1997:**  
(Thicker lock plate with holes.)

Tighten the adjusting nut (599-290-8004) with tool No. 7543-050-020 to 500 Nm [370 lb-ft] torque while rotating the hub. Then loosen the nut about 1/4...1/2 turns and tighten the nut to 250 Nm [185 lb-ft] torque while rotating the hub again.

Then loosen the nut only so that the longer one of the lock screws can be installed in one of the two thread holes (M8) so that the tip of the longer lock screw goes to the a hole in the lock plate.

Use Loctite locking liquid and tighten the lock screws to 12 Nm [9 lb-ft] torque.

Check the correct bearing clearance (0...0.05 mm) with a dial gauge by moving the hub in the direction of the axle spindle while rotating the hub. Repeat the adjustment if necessary.

### Axle shaft inspection and installation:

Inspect the axle shafts and associated sun gears prior to installation. Pay special attention to the condition of the sun gear teeth (Item 20 in Picture 9). If cracks or other defects are found, the sun gear **has to be replaced**. Install the chamfered side of the teeth outwards and lock the sun gear in place with retainer ring.

If excessive clearance is found between the axle shaft splines and the sun gear, the sun gear and/or the axle shaft **have to be replaced**.

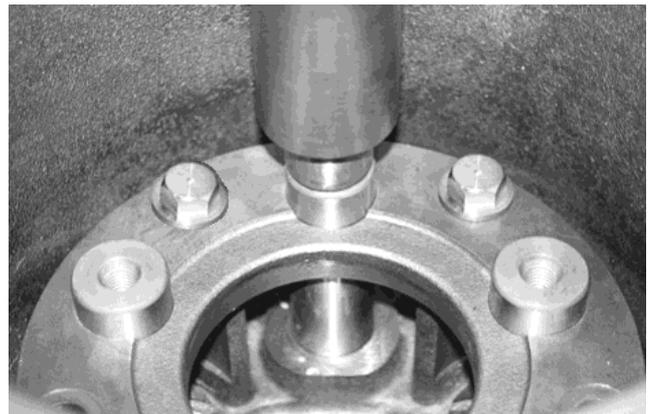
After the wheel bearing is adjusted, install the protection plate (Item 18 in Picture 9) on the shaft or the axle tube threads and ensure correct installation. Install the axle shaft.

### Assembly of planet carrier

(See Picture 9)

Inspect all planetary gear components and discard all excessively worn or damaged parts. Insert bearing needles (25) and spacers (26) to the planet gears. Use grease to make assembly easier and to ensure lubrication at startup.

Press the planet gear shafts to the hub housing by using a workshop press and a **special guiding tool 7 543 049 06** (Picture 10). Use planet carrier fixing screws to fix the guide tool. Use a **special tool 7 543 049 02** (support plate) under the hub housing to prevent the hub housing rolling while pressing the planet gear shafts. Press also new thrust bearing (29) if necessary.



**Picture 10.** Installation the planet gear shafts.

Place planetary gears with thrust washers (24) 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 (23) by using a workshop press and a suitable bush. Use Loctite locking liquid on threads and tighten the planet carrier retaining screws manually or by using a slow speed tightener to 180 Nm [130 lb-ft] torque.

#### Installation of planet carrier

(See Picture 9)

Install the assembled hub housing. Make sure that the sun gear thrust bearing (29) is properly seated in the casing (Use grease to hold it if necessary). 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 (11) to 40 Nm [30 lb-ft] torque. Always install a new O-Ring (8) and seal rings (31).

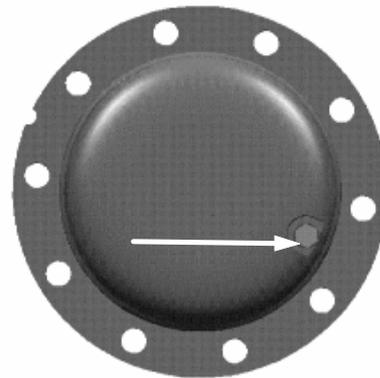
#### OIL CHECKS AND OIL CHANGES

#### Planetary wheel hub oils

Rotate the wheel hub until the oil plug is in the "four o'clock" position.

Oil level in the wheel hub housing must be at the level of the check plug opening (arrow in Picture 11).

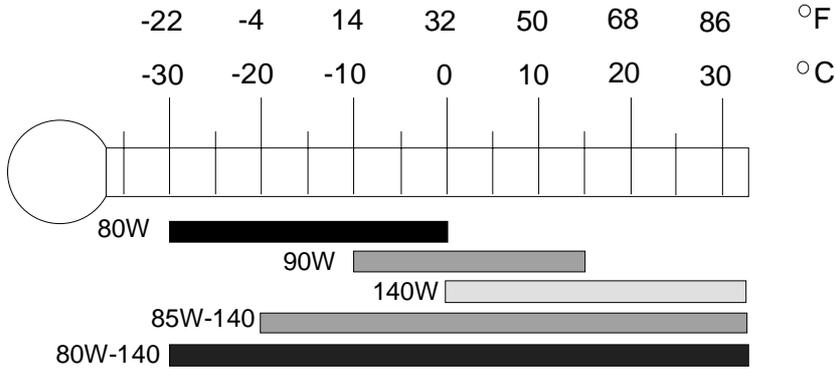
Fill approx. 1 liter (2 U.S. pints) recommended oil. Check the differential oil level afterwards.



Picture 11. Wheel hub housing oil level.

**LUBRICATION**

Axle oil quality API GL - 5  
 Viscosity according to prevailing ambient  
 temperature as shown on the accompanying table



**Oil volumes**

Filling volumes -

	Metric	U.S.
Planetary wheel hubs, each	1 ltrs	2 pints

**SERVICE AND MAINTENANCE RECOMMENDATIONS:**

**First Service at 10.000 km or 1 month**

- Change the oils
- Check and adjust if necessary the wheel hub bearings
- Check the overall condition of the axle (possible oil leak etc.)

**Maintenance interval 60.000 km or 12 months**

- Perform all above points
- Check the thickness of the brake linings
- Check the adjustment and the proper operation of the slack adjusters

The grease lubrication according to the vehicle's standard schedule.



### SPECIAL TOOLS

Adjustment wrench for wheel hub bearing nut 099-290-8003 up to serial No.72041 (10/97)	7143 024 020
Adjustment wrench for the new design of the wheel hub adjusting nut 599-290-8004 from serial No. 72042 (11/97)	7543 050 020
Puller for planet gear axle shafts	7543 049 05
Guide plate for installation of the planet gear axle shafts	7543 049 06
Support plate under the hub housing when using workshop press	7543 049 02

### TORQUE VALUES

Description	Nm	Lb-ft
Wheel nuts	550	406
Carrier housing to axle housing cap screws	240	177
Wheel hub oil level and drain plugs	50-70	37-52
Other values: See respective instructions		

### TECHNICAL DATA

Axle housing	Fabricated of pressed steel plate in both standard and heavy duty models
Planetary wheel hub gears	5 planetary gear design, ratio 3.64 : 1
Clearance of wheel hub bearing	0 - 0.050 mm [0 - 0.002 in]