

SERVICE MANUAL - WHEEL ENDS

Single Drive Axles



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The description, testing procedures, and specifications contained in this parts / service publication were current at time of writing. This manual will not be updated. If in doubt about any aspect of maintenance or servicing of the axle please contact the vehicle builder or our service department directly.

SPICER® products are subject to continuous development and we reserve the right to modify procedures and to make changes in specifications at any time without prior notice and without incurring in any obligation.

The recommendations of the vehicle manufacturer should be considered as the primary source of service information regarding this **SPICER**® product. This manual is intended to be used as a supplement to such information.

Any references to brand names in this publication are made simply as an example of the types of tools and materials recommended for use and, as such, should not be considered as an endorsement.

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Important Notice

This symbol is used throughout this manual to call attention to procedures where carelessness or failure to follow specific instructions may result in personal injury and/or component damage.

Departure from the instructions, choice of tools, materials and recommended parts mentioned in this publication may jeopardize the personal safety of the service technician or vehicle operator.



Always use genuine Dana® Spicer® replacement parts.



WARNING: Failure to follow indicated procedures creates a high risk of personal injury to the servicing technician.



CAUTION: Failure to follow indicated procedures may cause component damage or malfunction.



IMPORTANT: Highly recommended procedures for proper service of this unit.

NOTE: Additional service information is not covered in the service procedures.

TIP: Helpful removal and installation procedures to aid in the service of this unit.



OEM: Refer to the OEM vehicle specifications

Always use genuine Dana® Spicer® replacement parts.



CAUTION: Welding or machining on any axle component is prohibited unless noted otherwise in this document or other Dana® Spicer® service literature.

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End Play Verification Procedure



IMPORTANT: this procedure applies to wheel ends equipped with “unitized bearings” and “bearing insert units”.



IMPORTANT:

-Vehicles with annual operating mileage lower than 80 000km (50 000 miles), this procedure must be done once every year.
-Vehicles with annual mileage greater than 80 000km (50 000 miles), this procedure must be done every 80 000km (50 000 miles) or once every six months, whichever is earlier.
-In addition, it is recommended to perform this procedure when the brakes, or any other wheel end component is serviced.

1. Raise the vehicle so that the rear axle is off the ground and support raised vehicle with safety stands. Follow procedures & Health and Safety instructions from vehicle service manual.
2. This procedure can be applied to a vehicle with the wheel whether fitted or not. If the wheel is fitted, check that it is mounted correctly, with wheel nuts tightened to specification and that it can rotate freely. Refer to vehicle service manual.
3. Rotate the wheel or hub several revolutions in each direction to seat the wheel end bearings.
4. Use a dial indicator with magnetic base. Attach the base firmly to the axle housing, and reference the dial indicator probe perpendicular against the inboard side of the brake disc.
5. Set the dial indicator to zero.



IMPORTANT: once the dial indicator is set to zero, do not rotate the wheel or hub, and do not disturb the dial indicator.

6. With one operator on the outboard end, hold the tire or hub at the three and nine o'clock positions and push the tire or hub straight IN. Now another operator is to note the dial indicator reading. Make sure to note only end play reading and not any deflections due to suspension movement. Then pull the tire or hub straight OUT. Note the dial indicator reading. The difference between both readings is the end play on that side.
7. Repeat the above measurements until two consecutive and consistent end play readings are obtained.
8. Verification criteria for **NEW** bearings:
 - If end play is 0mm, ok, go to step 10.
 - If end play is greater than 0mm, proceed to retighten the spindle nut, refer to “Hub removal” and “Hub assembly” sections. Then repeat the “End Play Verification Procedure” and if end play is still greater than 0mm it is a symptom that the hub is damaged, replace the complete wheel hub assembly (hub+unitized bearing or hub+bearing insert unit).
9. Verification criteria for **USED** bearings:
 - If end play is from 0 to 0.05mm: Ok, go to step 10.
 - If end play is from 0.05 to 0.2mm: proceed to retighten the spindle nut, refer to “Hub removal” and “Hub assembly” sections. Then repeat the “End Play Verification Procedure” and if end play is still greater than 0.05mm, replace bearing.
 - If end play is greater than 0.2mm: replace bearing.



CAUTION: after replacing a bearing, repeat “End Play Verification Procedure” and apply criteria for NEW bearings (point 8).



CAUTION: for “bearing insert unit” only, when replacing the bearing following “Bearing Insert Unit Replacement” section, take special attention to the extraction force criterion stated there to decide if hub must also be replaced.

10. Repeat the “End Play Verification Procedure” on the rest of the wheels.

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Non Unitized Wheel End Adjustment

1. Identify the wheel nut system being installed. Three systems are available:
 - Three piece Dowel-type wheel nut system - Fig. 1
 - Three piece Tang-type wheel nut system - Fig. 2
 - Four piece Tang/Dowel-type wheel nut system - Fig. 3



WARNING: Do not mix spindle nuts and lock washers from different systems. Mixing spindle nuts and lock washers can cause wheel separation.

NOTE: The lock washer for a four piece tang/dowel-type wheel nut system is thinner than the lock washer for a three piece tang-type wheel nut system and is not designed to bear against the inner nut.

2. Inspect the spindle and nut threads for corrosion and clean thoroughly or replace as required.

NOTE: Proper assembly and adjustment is not possible if the spindle or nut threads are corroded.

- Inspect the tang-type washer (if used). Replace the washer if the tangs are broken, cracked, or damaged.

3. Install the hub and drum on the spindle with care to prevent damage or distortion to the wheel seal.



CAUTION: A wheel dolly is recommended during installation to make sure that the wheel seal is not damaged by the weight of the hub and drum. Never support the hub on the spindle with just the inner bearing and seal. This can damage the seal and cause premature failure.

- Completely fill the hub cavity between the inner and outer bearing races with the same lubricant used in the axle sump.

NOTE: Lubricate only with **clean** axle lubricant of the same type used in the axle sump. Do not pack the bearings with grease before installation. Grease will prevent the proper circulation of axle lubricant and may cause wheel seal failure.

4. Install the outer bearing on the spindle.
 - Install the inner nut on the spindle.
 - Tighten the inner nut to 200 lbs-ft. (271 N•m) while rotating the wheel hub.

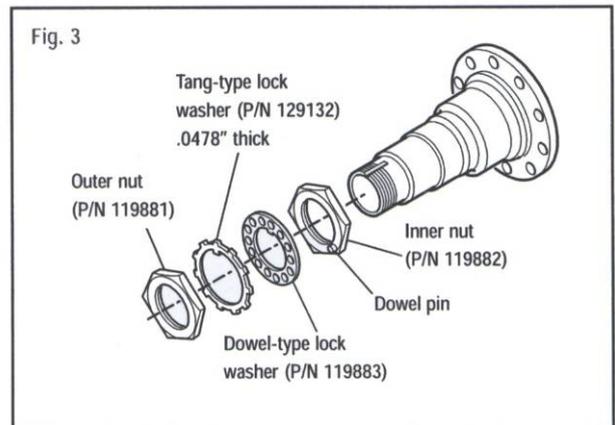
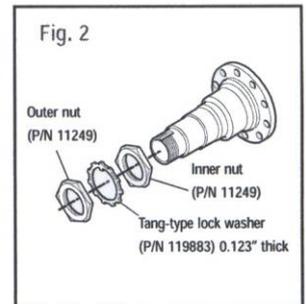
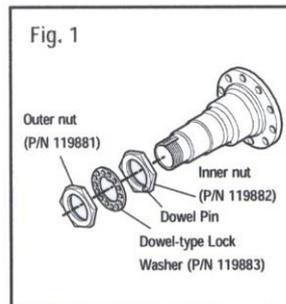


CAUTION: Never use an impact wrench to adjust wheel bearings. A torque wrench is required to assure that the nuts are properly tightened.

5. Back-off the inner nut one full turn. Rotate the wheel hub.
6. Re-tighten the inner nut to 100 lbs-ft. (135 N•m) while rotating the wheel hub.
7. Back-off the inner nut **45°** to **60°** of a full turn.

NOTE: This adjustment procedure allows the wheel to rotate freely with 0.001" - 0.005" (0.025 mm - 0.127 mm) end play.

8. Install the correct lock washer for the wheel nut system being used.



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Three Piece Dowel-Type Lock Washer System (Fig. 1)

- Install the dowel-type lock washer on the spindle.

NOTE: If the dowel pin and washer are not aligned, remove washer, turn it over and reinstall. If required, **loosen** the inner nut just enough for alignment.



IMPORTANT: Never tighten the inner nut for alignment. This can preload the bearing and cause premature failure.

- Install the outer nut on the spindle and tighten to 350 lbs-ft. (475 N•m).
- Verify end-play (see End Play Verification Procedure).
- Go to Step 9.

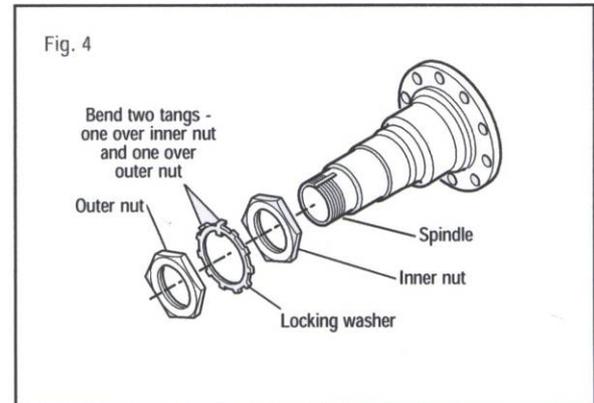
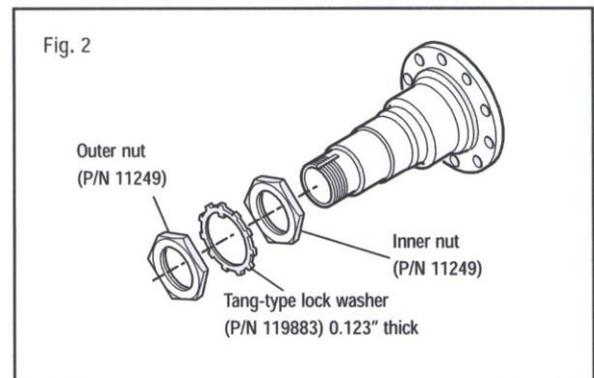
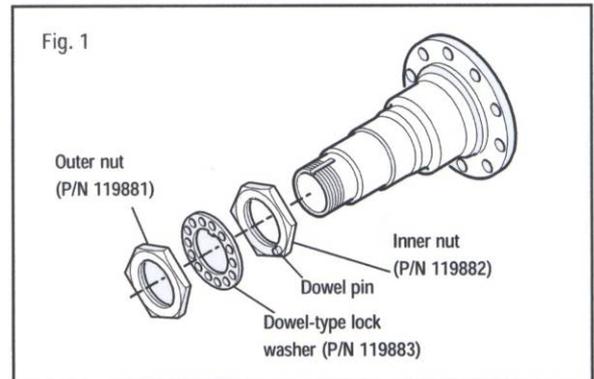
Three Piece Tang-Type Lock Washer System (Fig. 2 and 4)

- Install the tang-type lock washer on the spindle.



IMPORTANT: Never tighten the inner nut for alignment. This can preload the bearing and cause premature failure.

- Install the outer nut on the spindle and tighten to 250 lbs-ft. (339 N•m).
- Verify end-play (see End Play Verification Procedure).
- After verifying end play, secure wheel nuts by bending one of the locking washer tangs over the outer wheel nut and another tang over the inner wheel nut as shown in Fig. 4.
- Go to Step 9.



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Four Piece Tang/Dowel-Type Lock Washer System (Fig. 3 and 5)

- First, install the dowel-type lock washer on the spindle.

NOTE: If the dowel pin and washer are not aligned, remove washer, turn it over and reinstall. If required, **loosen** the inner nut just enough for alignment.



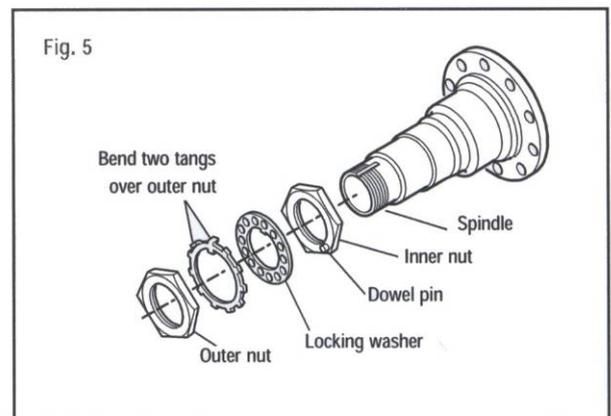
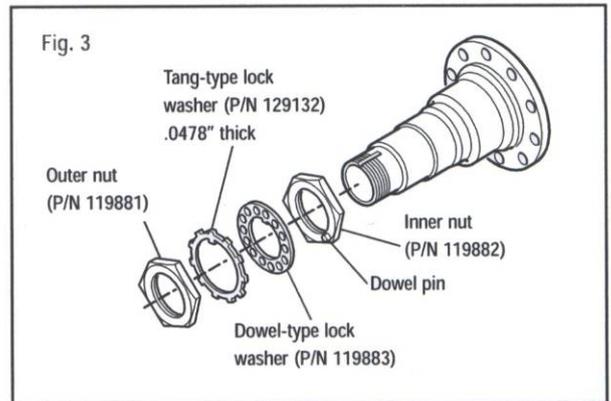
IMPORTANT: Never tighten the inner nut for alignment. This can preload the bearing and cause premature failure.

- Install the Tang-type lock washer on the spindle.
- Install the outer nut on the spindle and tighten to 250 lbs-ft. (339 N•m).
- Verify end-play (see End Play Verification Procedure).
- After verifying end play, secure outer nut by bending two opposing (180° apart) tangs of the locking washer over the outer nut as shown in Fig. 5.

9. Install:

- New gasket or sealant at axle shaft flange
- Axle shaft
- Axle flange nuts and tighten to specified torque. See fastener torque specifications on Torque Chart.

10. Lubricate axle wheel ends (see Wheel End Lubrication Procedure).

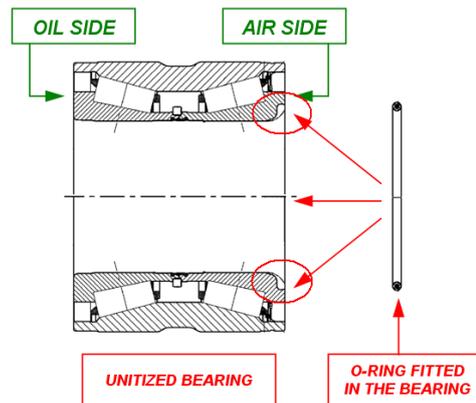
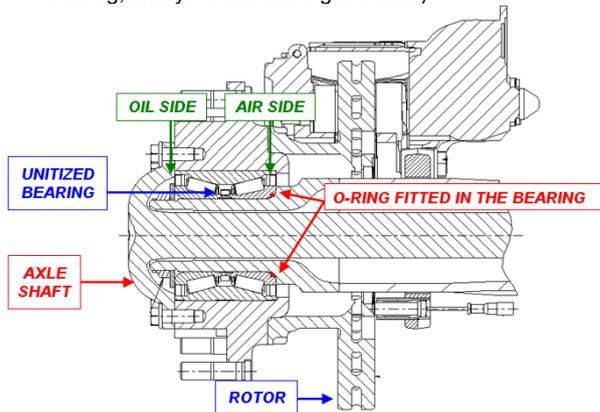


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Unitized Bearing Wheel End Adjustment

1. Make sure that all parts are clean before the assembly process.
2. Place the bearing against the hub. Identify the correct orientation as shown on the diagrams (the o-ring of the bearing, always in the bearing shoulder).



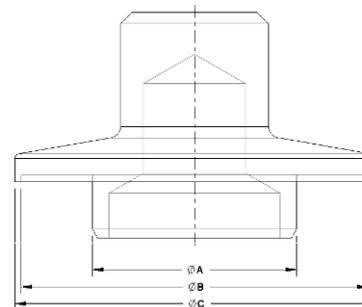
CAUTION: Incorrect orientation of the bearing in the hub may cause oil leakage.

3. Fit Unitised Bearing into the hub by using a press, (necessary force is between 29 and 43kN [2.96 and 4.38ton]), until bearing faces hub inner diameter shoulder. Keep pressing until reaching 80kN [8ton] of axial force. For assembly or disassembly, press only the outer cone using the proper tool. (See picture and chart).

CAUTION: Never press the inner cone as this could cause damage to the bearing.

4. Fit the Rotor to the Hub (see below bolt chart).

Bolt	Standard	Max. Torque (Nm)	Min. Torque (Nm)
M12 x 1.5	Din-En-Iso-4762	120	107
M12 x 1.75	Une-En-1662	132	117
M14 x 1.5	Une-En-1662	216	193
M16 x 1.5	Din-En-Iso-4762	305	273



Tool	Dia A	Dia B	Dia C
67 Bearing	66.9 – 66.7	108.5	112
78 Bearing	77,9 - 77,7	122.5	128
82 Bearing	81,9 - 81,7	131,5	138
90 Bearing	89,9 - 89,7	152,5	158

NOTE: Din-En-Iso-4762 are Allen and Une-En-1662 are hexagonal flanged bolts, 10.9, 6g, phosphated.

5. Fit "O-ring" on the bearing groove if supplied as separate component.



Bearing oil side. There isn't any place to fit the o-ring.



Bearing air side. It can be seen the o-ring (brown component) installed



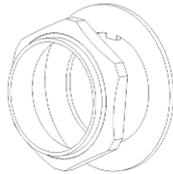
CAUTION: In spares the o-ring can be provided as separate component to be assembled on the bearing groove or already assembled in the bearing groove.

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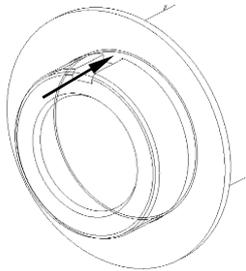
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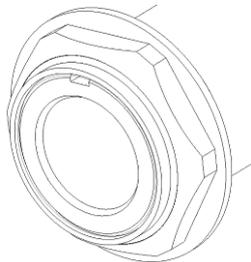
- Apply anticorrosive grease onto the Spindle bearing diameter. Grease shall be applied between spindle O-ring and bearing shoulder area. In case of 90mm ID bearing, apply grease in all bearing contact race.
 - Optimol past T White (Castrol), (Ref. 613402).
 - Molycote TP 42 (Dow Corning)
 - Altemp Q NB 50 (Klüber)
 - Nomydol VI 1200 BF (Reiner/Fuchs)
- Fit the Rotor & Hub Set onto the Spindle.
- Design corresponding to Staked Nut + Tang Washer.



- Assemble tang washer onto the spindle guided by the key way.



- Assemble new spindle nut and tighten it to initial torque as follows:

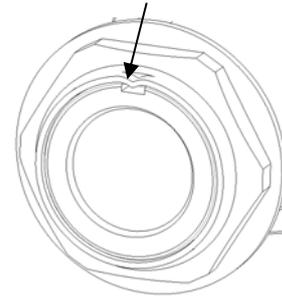


NUT SIZE	MAX. TORQUE (Nm)	MIN. TORQUE (Nm)
M75 x 1.5	250	225
M86 x 2.0	250	225

- Spin Rotor & Hub set 10 revolutions.
- Tighten nut up to final torque values showed in the chart below:

NUT SIZE	FINAL TORQUE (Nm)
M75 x 1.5	900 - 1000
M86 x 2.0	900 - 1000

- Using a suitable chisel or punch stake the nut into the key way as indicated below.



- Apply loctite 518 between the axle shafts and the Hubs. Fit the axle shafts, (see Torque Chart below)

BOLT	MAX. TORQUE (Nm)	MIN. TORQUE (Nm)
M12x1.75	136	124
M16x2	346	314

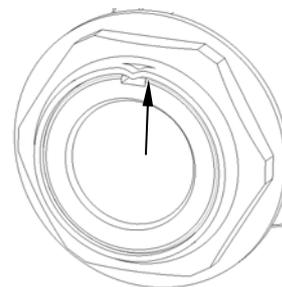
NOTE: Verbus Ripp, 10.9, 6g, phosphated.

- Fit the Brake Caliper to the Axle, (see Torque Chart below)

BOLT	STANDARD	MAX. TORQUE (Nm)	MIN. TORQUE (Nm)
M14 x 1.5	Une-En-1662	215	192
M16 x 1.5	Une-En-1662	327	292
M18 x 1.5	Une-En-1662	463	413
M20 x 1.5	Une-En-1662	533	475

NOTE: Une-En-1662 are exagonal flanged bolts, 10.9, 6g, phosphated.

CAUTION: When disassembling bend out the staked area of the nut fully so as not to damage the threads when removing the nut.



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Bearing Insert Unit Replacement

A. IDENTIFICATION:

This type of wheel bearing is assembled on 22.5" wheel hubs with following markings:
-10005143 and/or 10005144 on the hub inner side and/or perimeter.



B. HUB REMOVAL:

IMPORTANT: As the wheel end is disassembled, set all parts aside for thorough cleaning and inspection. Careful inspection will help determine whether parts should be reused or replaced. In many cases, the causes of pre-mature wear or drive axle failure will also be revealed.

1. Raise the vehicle and remove wheel and tire, following procedures & Health and Safety instructions from vehicle service manual.
2. Remove brake caliper.
3. Loosen and remove axle shaft bolts, and remove axle shaft.

TIP: oil from the axle differential may spill.

4. Remove the staking from the spindle nut using a suitable tool (eg. small chisel, ...).



CAUTION: bend out the staked area of the nut fully so as not to damage the threads when removing the nut. Also care should be taken not to drive the tool in deeper than the staked area of the nut as this could damage the threads of the nut or the spindle.

5. Loosen and remove spindle nut.
6. Remove washer.
7. Remove hub & brake disc assembly.
8. Loosen and remove brake disc bolts, and remove brake disc.

C. BEARING REMOVAL:

1. Place the hub on a flat surface.



CAUTION: care should be taken to not damage any of the hub machined surfaces.

2. Remove the center clip using a suitable tool (eg. small chisel, flat screw driver, ...).



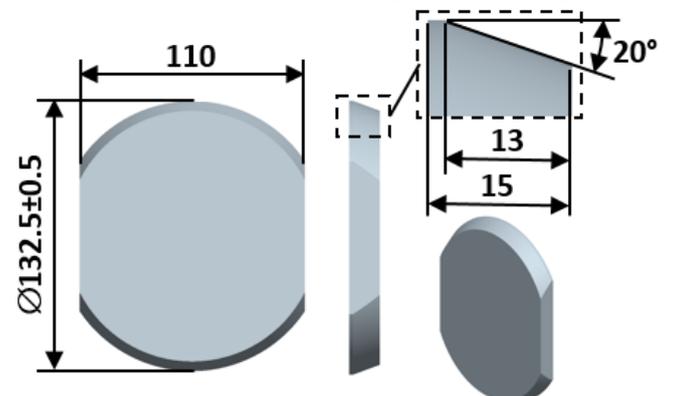
3. Remove first inner bearing cone and seal, using a pin punch and a hammer.



4. Flip the hub and use the same procedure to remove the second bearing cone and seal.



5. To remove the two outer bearing cups from the hub, use a hydraulic press and a proper pushing tool (see drawing below).



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- Place the hub under the press on a flat surface.
- Place the pushing tool leaning on the flat surface of the bearing cup.



- Activate the press until bearing cup is removed from the hub.



IMPORTANT: check the force exerted by the press to remove the bearing cup. If the force is lower than 10kN [1ton=1000kgf], the hub can NOT be reused, it must be discarded and replaced by a new complete hub & bearing assembly.

- Flip the hub and use the same procedure (steps 7 and 8) to remove the second bearing cup. Check again the extraction force.

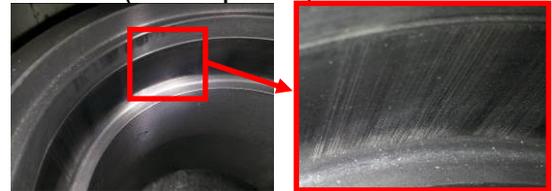


D. HUB INSPECTION:

- Clean inner surfaces of the hub.



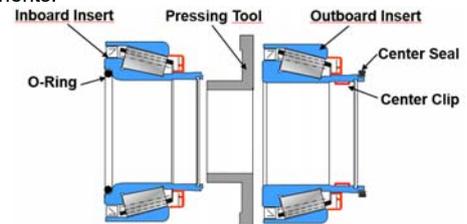
IMPORTANT: check carefully the cylindrical and flat surfaces on the hub where the bearing cups are fitted. If the surfaces show any circumferential scratches, grooves, notches, visible steps or pitting, is a symptom that the bearing cup has rotated relative to the hub and the hub is damaged. In this case hub can NOT be reused, it must be discarded and replaced by a new complete hub & bearing assembly. Longitudinal marks due to assembly and disassembly of the cup are allowed (see next pictures).



E. BEARING ASSEMBLY:

IMPORTANT: only in the case that hub can be reused, follow next steps. If hub can not be reused, order a complete hub & bearing assembly at an official dealer and go to step F.

- Bearing repair kit (also called Repair Insert Unit or Pre-Assembled Matched Unit) consists on the following components:

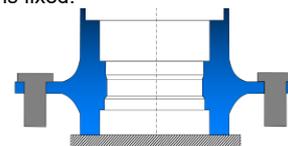


CAUTION: each insert is fully greased and sealed, do not remove any seal or cover.

CAUTION: to assembly the two bearing inserts, use a hydraulic press and the pressing tool supplied with the kit.

CAUTION: clean thoroughly hub inner surfaces before start bearing assembly.

- Place the hub under the press on a flat surface, with the outboard side (the side where the wheel and axle shaft are fixed) facing down. Support the hub on the flat surface where the axle shaft is fixed:



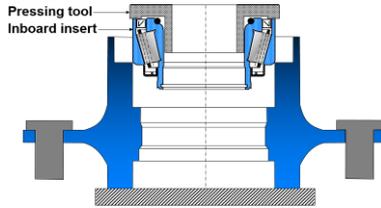
- Remove the o-ring from the inboard insert and keep it in a safe and clean place to avoid any damage to the component.

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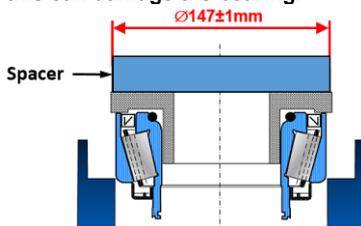
- Place the inboard insert over the hub. Then place the pressing tool over the insert.



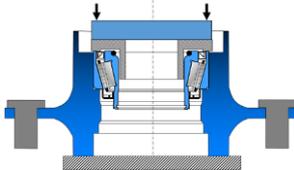
CAUTION:

-Check that all components (hub, bearing insert, pressing tool, spacer and press) are perfectly aligned to ensure correct assembly).

-Use always the pressing tool supplied with the kit, and apply the force of the press on the perimeter of the pressing tool to ensure that load is exerted on the outer cup. If necessary, use a spacer with a diameter of 147mm. Never apply load to the inner cone as this can damage the bearing.



- Activate the press until the bearing is fully inserted in the hub.



CAUTION:

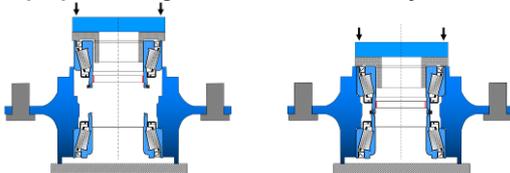
-Insertion force must be on the range from 30 to 50kN [3 to 5ton]. If 50kN [5ton] are reached without movement, recheck that all components are perfectly aligned.

-Apply load until 100kN [10ton], are reached.

- Flip the hub and use the same procedure (steps 4 and 5) to install the outboard insert.



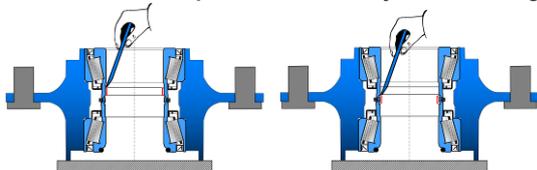
CAUTION: check that the center seal is correctly placed on its housing. This will avoid any damage to the component and will ensure a proper sealing function after assembly.



- Push the center clip, using a soft tool, until a click is heard, indicating that is correctly placed on its housing.



CAUTION: The center clip must rotate freely in its housing.



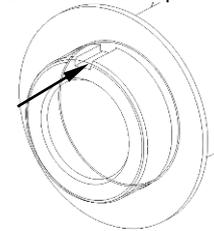
F. HUB ASSEMBLY:

- Fit the brake disc to the hub. Bolts are ISO 4762 (hexagonal socket or "Allen" type), class 10.9, M16x1.5x75-6g zinc phosphated. Apply **290+/-15 Nm** torque.
- Before installing the hub & brake disc assembly in the axle, clean the spindle and apply anticorrosive grease in all surfaces contacting the bearing. Grease to be used:
 - Optimol past T White (Castrol), (Ref. 613402).
 - Molycote TP 42 (Dow Corning).
 - Altemp Q NB 50 (Klüber).
 - Nomynol VI 1200 BF (Reiner/Fuchs).
- Also apply grease to the o-ring and place it in its groove on the bearing, located on the air side (brake disc side).

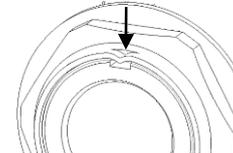


CAUTION: check that the o-ring is correctly placed.

- Fit the hub & brake disc assembly onto the spindle.
- Assemble "tang washer" onto the spindle guided by the keyway.



- Assemble new spindle nut (M90x2) and tighten it to an initial torque of **225Nm min. / 250Nm max.**
- Spin brake disc & rotor set 10 revolutions.
- Tighten spindle nut up to **975Nm min. / 1000Nm max.**
- Verify end play, refer to "End Play Verification Procedure" section of this document (apply criteria for NEW bearings).
- Using a suitable chisel or punch stake the spindle nut into the keyway as indicated below.



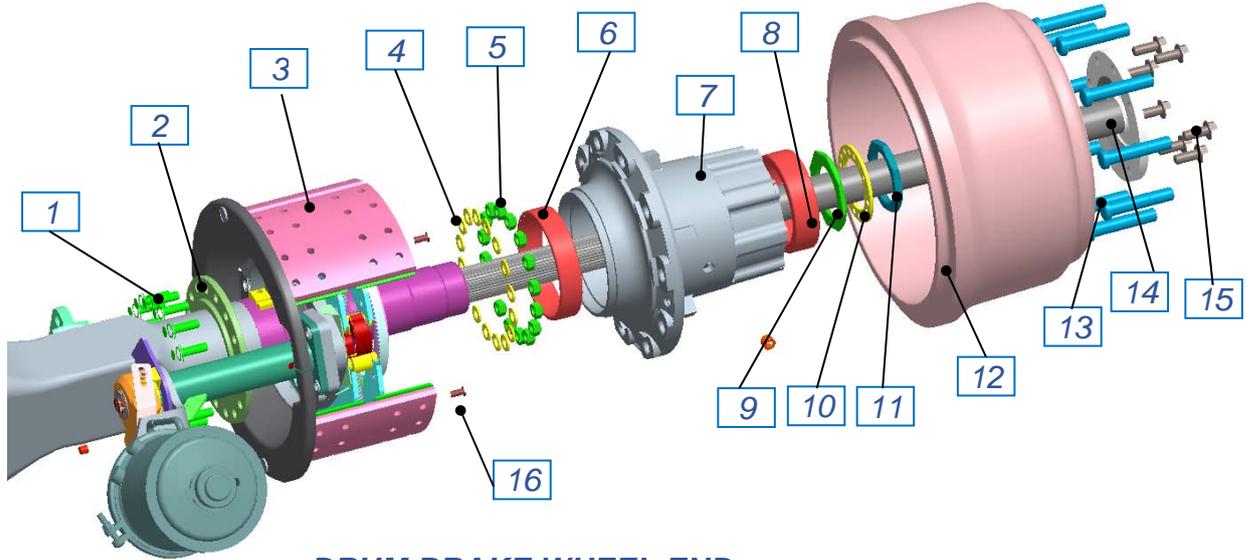
- Apply sealant Loctite 518 to the mating surfaces of the axle shaft and the hub.
- Fit the axle shaft to the hub. Bolts are EN 1662 (hexagonal head with flange), class 10.9, self-locking M16x1.5x40-4h zinc phosphated. Apply **320+/-15Nm** torque.
- Fit the brake caliper to the axle. Bolts are EN 1662 (hexagonal head with flange), class 10.9, M18x1.5x65-6g zinc phosphate. Apply **438+/-25Nm**.
- Fit wheel and tire, refer to vehicle service manual.

SERVICE MANUAL - WHEEL ENDS

Single Drive Axles



Exploded views. Tightening torque specifications.



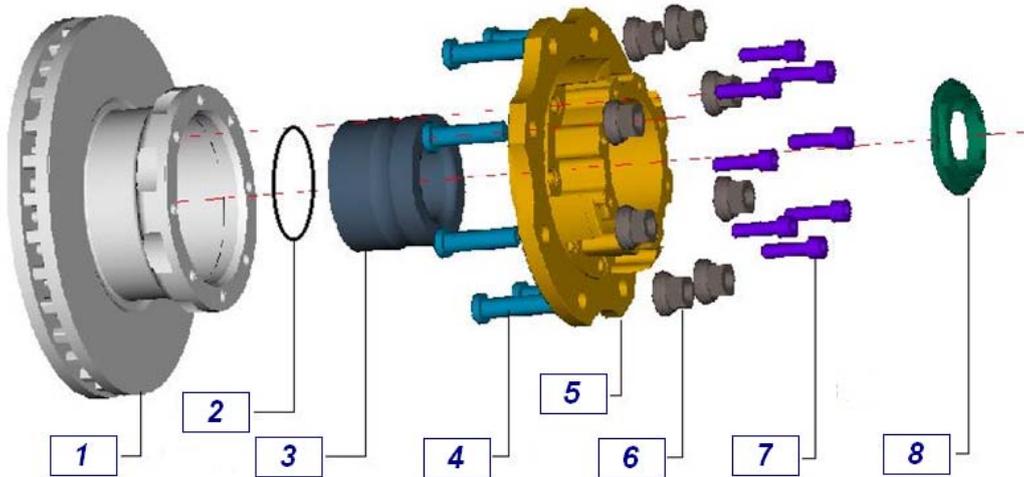
DRUM BRAKE WHEEL END

- | | |
|------------------------------|----------------------|
| 1. Bolt | 9. Inner nut |
| 2. Axle housing brake flange | 10. Lock washer |
| 3. Brake | 11. Outer nut |
| 4. Washer | 12. Drum |
| 5. Brake nut | 13. Wheel bolt |
| 6. Inner bearing | 14. Axle shaft |
| 7. Hub | 15. Axle shaft bolts |
| 8. Outer bearing | 16. Hub-drum bolts |

Item	Description	Tightening torque	
1	Brake plate stud 5/8-18 UNF 3A	192-215 Lbs-ft	260-292 Nm
	Brake plate stud M16x1.5	175-200 Lbs ft	237-271 Nm
9	Inner nut	200 Lbs-ft + back off 360°	271 Nm + back off 360°
		100 Lbs-ft + back off 45-60°	135 Nm + back off 45-60°
11	Outer nut 2,5-16 UN-3B / 3,25-12 UN-3B	350 Lbs-ft Three Piece Dowel-Type Lock Washer System	475 Nm Three Piece Dowel-Type Lock Washer System
	Outer nut 3,375-12 UN-2B	250 Lbs-ft Three Piece Tang-Type Lock Washer System // Four Piece Tang-Dowel-Type Lock Washer System	339 Nm Three Piece Tang-Type Lock Washer System // Four Piece Tang-Dowel-Type Lock Washer System
13	Wheel bolt- nut M18x1.5	263-290 Lbs-ft	356-394 N·m
	Wheel bolt- nut M20x1.5	285-315 Lbs-ft	386-427 N·m
	Wheel bolt- nut M22x1.5	475-525 Lbs-ft	644-712 N·m
15	Axle shaft stud M12x1.75	91-100 Lbs-ft	123-136 N·m
	Axle shaft stud M16x2	232-255 Lbs-ft	315-346 N·m
16	Hub -drum bolts M10x1.5	36-40 Lbs-ft	48-54 N·m

SERVICE MANUAL - WHEEL ENDS

Single Drive Axles



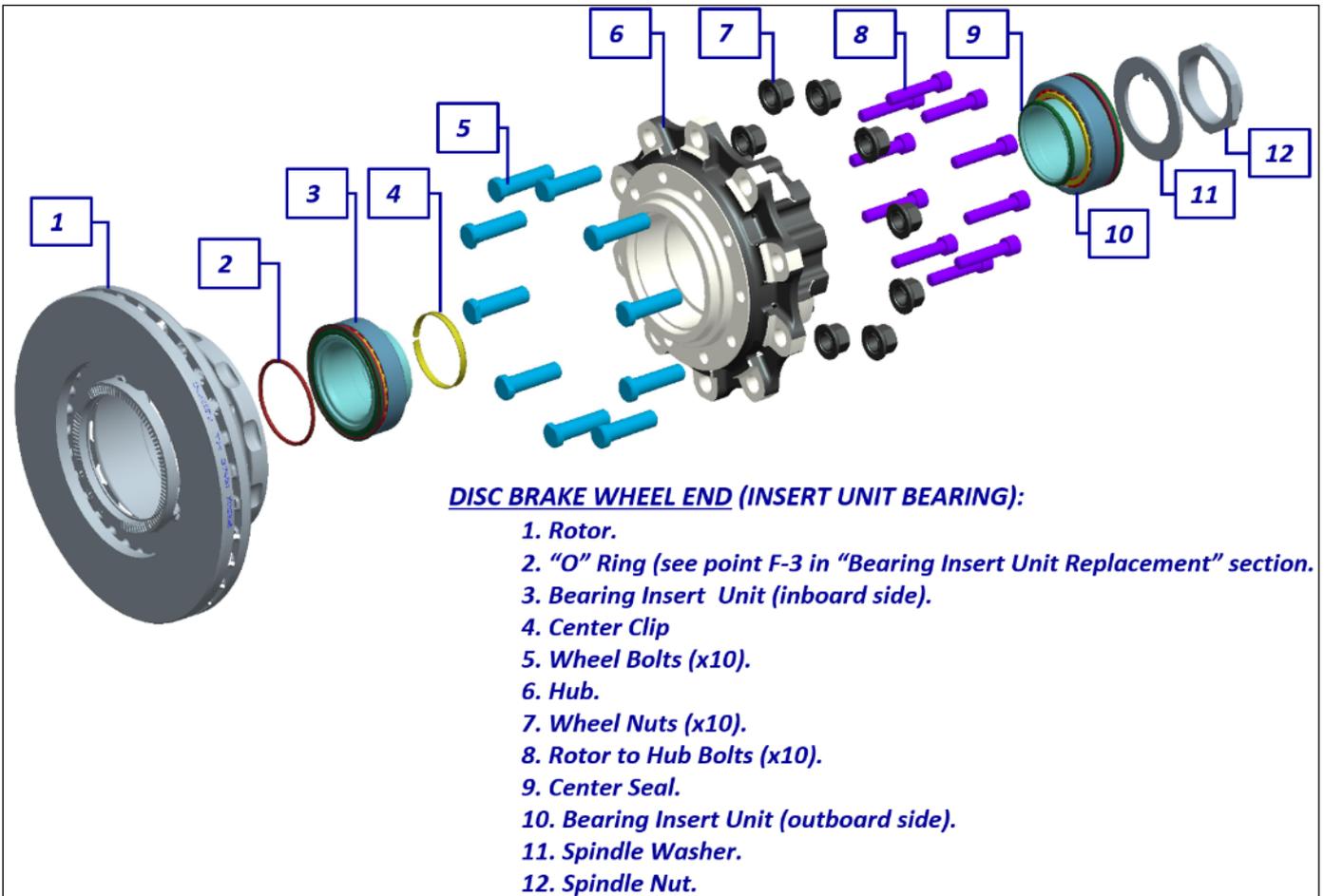
DISC BRAKE WHEEL END (UNITIZED BEARING)

1. Rotor
2. "O" Ring (See "5" in Unitized Bearing Wheel End Adjustment Section)
3. Hub Unit Bearing
4. Wheel Bolt
5. Hub
6. Wheel Nut
7. Rotor to Hub Bolt
8. Spindle Nut

Item	Description	Tightening torque	
4-6	Wheel bolt- nut M18x1.5	263-290 Lbs-ft	356-394 Nm
	Wheel bolt- nut M20x1.5	285-315 Lbs-ft	386-427 Nm
	Wheel bolt- nut M22x1.5	475-525 Lbs-ft	644-712 Nm
7	Rotor to hub bolt M12x1.75	87-97 Lbs-ft	117-132 Nm
	Rotor to hub bolt M14x1.5	142-159 Lbs-ft	193-216 Nm
	Rotor to hub bolt M16x1.5	201-225 Lbs-ft	273-305 Nm
8	Spindle nut M75x1.5	664-737 Lbs-ft	900-1000 Nm
	Spindle nut M86x2	664-737 Lbs-ft	900-1000 Nm

SERVICE MANUAL - WHEEL ENDS

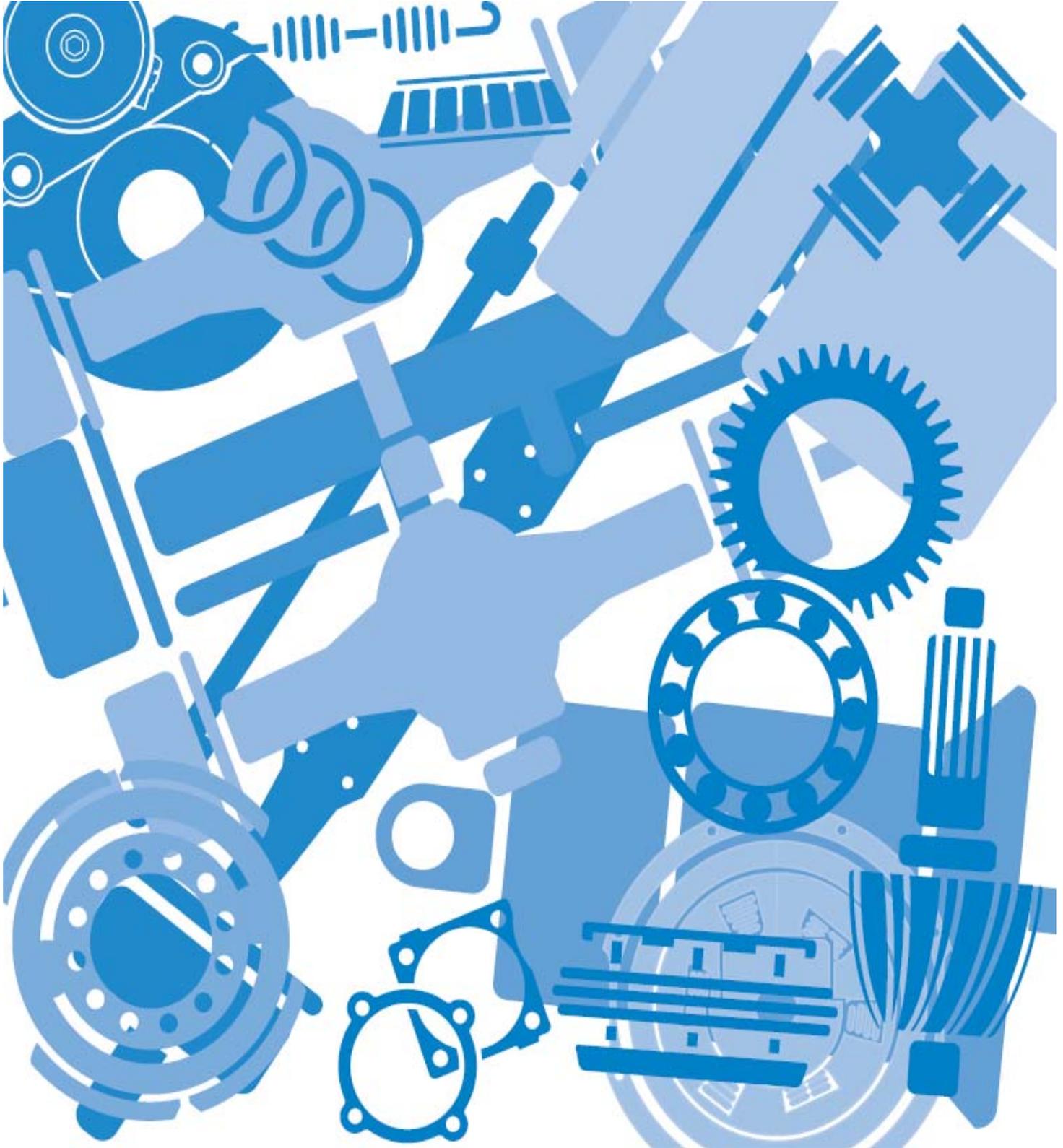
Single Drive Axles



Item	Description	Tightening torque	
5-7	Wheel bolt- nut M22x1.5	475-525 Lbs-ft	644-712 Nm
8	Rotor to hub bolt M16x1.5	201-225 Lbs-ft	273-305 Nm
12	Spindle nut M90x2	719-737 Lbs-ft	975-1000 Nm

SERVICE MANUAL - WHEEL ENDS

Single Drive Axles



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