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Features and specifications are subject to change without notice.
Planetary Final Drive Service Manual

Introduction

This manual is a step-by-step guide to the disassembly and assembly of the S12 Series Torque-Hub® units. It is designed for the customer or mechanic who is repairing this particular Torque-Hub® model.

Users of this manual should note that each part mentioned is followed by an identification number enclosed in parentheses. These part numbers may be referred to in the Parts List and Assembly Drawing sections of this manual.

Specialized tools used to assemble this unit are noted in the assembly procedures and diagrammed in the Assembly Tools section.

Users should familiarize themselves with the procedures for roll and leak testing, as well as bolt tightening and torquing found on the following three pages before starting any repairs.

Standard safety practices should be followed during the disassembly and assembly procedures described. Safety glasses and safety shoes should be worn, and heavy, heat resistant gloves should be used when handling heated components. Be especially alert when you see the word CAUTION. This indicates that a particular operation could cause personal injury if not performed properly or if certain safety procedures are not followed. The word NOTE is used to bring attention to certain procedures or helpful hints that will aid in the disassembly and assembly process.
Planetary Final Drive Service Manual

Roll and Leak Test

Torque-Hub® units should always be roll and leak tested before disassembly (if possible) and after assembly to make sure the unit’s gears, bearings, and seals are working properly. The following information briefly outlines what to look for when performing these tests.

The Roll Test

The purpose of the roll test is to determine if the unit’s gears are rotating consistently, easily and properly. To perform a roll test, use the recommended tool from table below (or something equivalent) to apply constant rotational force to the input of the gearbox. If more drag is felt in the gears only at certain points, then the gears are not rolling consistently and easily and should be examined for improper installation or defects. Some gear packages roll with more difficulty than others. Do not be concerned if the gears in the unit seem to roll hard as long as they roll with consistency. Rotate the gearbox both clockwise and counterclockwise the same number of turns as the ratio of the unit. The gearbox ratio is the same number as the last three numbers on the ID tag.

<table>
<thead>
<tr>
<th>Model code</th>
<th>Roll Test Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>S12Ax44xx</td>
<td>T223989</td>
</tr>
<tr>
<td>S12Ax55xx</td>
<td>T224477</td>
</tr>
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</table>

Continued on Next Page
The purpose of a leak test is to make sure the unit is airtight. To perform a leak test use the leak test fixture from the table below. If the tool is not available, the gearbox must be sealed to perform the test. This can be accomplished by assembling the sealed input device onto the gearbox at the input end and replace one of the oil plugs with an air chuck. DO NOT EXCEED 10 PSI PRESSURE DURING THE LEAK TEST. Higher pressure will create a false sealing effect in assemblies with lip-seals. The unit has a leak if the pressure gauge reading on your leak check fitting starts to fall after the gearbox has been pressurized and allowed to equalize. Leaks will most likely occur at the pipe plugs, the main seal or wherever o-rings or gaskets are located. The exact location of a leak can usually be detected by brushing a soap and water solution around the main seal and where the o-rings or gaskets meet on the exterior of the unit and then checking for air bubbles. If a leak is detected in a seal, o-ring, gasket, the part must be replaced and the unit rechecked. Leak test at 10 psi for 20 minutes.

<table>
<thead>
<tr>
<th>Model code</th>
<th>Leak Test Tool</th>
</tr>
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<tr>
<td>S12Ax44xx</td>
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<tr>
<td>S12Ax55xx</td>
<td>T173814</td>
</tr>
</tbody>
</table>
Planetary Final Drive Service Manual
Tightening and Torquing Bolts

If an air impact wrench is used to tighten bolts, extreme care should be taken to ensure the bolts are not tightened beyond their specified torque. The following steps describe how to tighten and torque bolts or socket head cap screws in a bolt circle.

1. Tighten (but do not torque) bolt “A” until snug.
2. Go to the opposite side of the bolt circle and tighten bolt “B” until equally snug.
3. Crisscross around the bolt circle and tighten the remaining bolts.
4. Use a torque wrench to apply the specified torque to bolt “A”.
5. Using the same sequence, crisscross around the bolt circle and apply an equal torque to the remaining bolts.
Planetary Final Drive Service Manual

Lubrication Information

General Properties:

The lubricant used in most Torque-Hub® drives should be petroleum based gear fluid containing anti-oxidation, anti-foaming and extreme pressure additives. The lubricant should have a minimum viscosity index of 95cst and maintain a minimum viscosity of 40cst under normal operating conditions. Some applications require special considerations; consult the machine manufacturer and Oerlikon Fairfield for more additional information.

The table below lists the recommended viscosities for various ambient operating temperatures. These recommendations are based on temperature rise of 50° to 100°F at normal operating conditions.

<table>
<thead>
<tr>
<th>Ambient Temperature</th>
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<th>AGMA Lubricate Number</th>
<th>ISO Index</th>
<th>AGMA Lubricate Number</th>
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<tr>
<td>-40° to -5° F(1)</td>
<td>VG100</td>
<td>3EP</td>
<td>VG100</td>
<td>3EP</td>
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<tr>
<td>-5° to 40° F</td>
<td>VG150</td>
<td>4EP</td>
<td>VG100</td>
<td>3EP</td>
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<tr>
<td>105° to 150° F(2)</td>
<td>VG460</td>
<td>7EP</td>
<td>VG320</td>
<td>6EP</td>
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</table>

Footnotes

1. For operation in this ambient temperature range, synthetic oil is recommended with a pour point of 10°F lower than the minimum ambient temperature.
2. For operation in this ambient temperature range, synthetic oil is recommended for proper lubricant life at elevated temperatures.
**Maintenance**

Oil amounts for each series of Torque-Hub® drives are indicated in the appropriate series literature. An initial oil change should be made after the first 50 hours of operation. Subsequent oil changes should be made at 1,000 hour intervals or annually, whichever comes first.

Oil temperatures should be not higher than 160° to 180°F for continuous operation, and no higher than 200°F for intermittent operation. For special applications, high horsepower, high speeds or wide temperature changes, please consult Oerlikon Fairfield.

**Oil Fill Level**

When the Torque-Hub® unit is mounted horizontally, unless otherwise specified, the gearbox should be filled half-full of oil. Consult the appropriate series literature for approximate fill volumes. Vertically mounted Torque-Hub® units may require special lubrication procedures. Please contact Oerlikon Fairfield for vertically mounted applications.
DISASSEMBLY
Planetary Final Drive Service Manual
Main Disassembly

NOTE: Figure 1 refers to SAE “C” motor mount

NOTE: Figure 2 refers to SAE “D” motor mount

Continued on Next Page
1. Perform roll check and leak check prior to disassembling the unit.

2. Remove the magnetic Pipe Plug (20) from Input Cover (17) and drain the oil out of the gearbox.

   **NOTE:** Record the condition and volume of the oil.

3. Remove four of Shoulder Bolts (18) followed by sixteen of Hexagonal Bolts (15) from Cover Subassembly.

4. Lift the Cover Subassembly off of the unit.

   **NOTE:** For 29 and 40 to 1 ratios only.

5. Remove Sun Gear (27) from Input Carrier Subassembly.

6. Remove Input Carrier Subassembly off of the unit.

   **NOTE:** Figure 1 refers to 29 and 40 : 1 Ratios

*Continued on Next Page*
**NOTE:** Figure 2 refers to 20 : 1 Ratio

7. Remove two Thrust Washers (10) and a Thrust Bearing (9) from the hub of Input Carrier Subassembly.

8. Remove the Sun Gear (4) from Output Carrier Subassembly.

9. Lift out the Ring Gear (2) from Housing Spindle Subassembly.

10. Remove Output Carrier Subassembly from the unit from the Housing Spindle Subassembly.

11. Remove O-Ring (5) from groove of the Housing Spindle Subassembly.

*This concludes the Main Disassembly.*
Planetary Final Drive Service Manual

Cover Disassembly

**NOTE:** Figure 1 refers to SAE “C” motor mount

**NOTE:** Figure 2 refers to SAE “D” motor mount

Continued on Next Page
1. Remove the O-Ring (5) from counter-bore in Cover (17) and Discard O-Ring.
2. Remove two Thrust Washers (10) and Thrust Bearing (9) from Cover (17).
3. Remove Thrust Washer (8) from the Cover (17).
4. Remove Thrust Washer (19) from counter-bore in Cover (17).

**NOTE:** For SAE "C" cover skip steps 5 and 6.

5. Remove Adaptor Mount (29) from Cover (17).
6. Remove O-Ring (28) from pilot on Adaptor Mount (29) and discard it.

This concludes the Cover Disassembly.
1. Unbend tang of Tanged lock-Washer (6N) from the Bearing Nut (6P) and remove Bearing Nut (6P) and Tanged Lock-Washer (6N) from the Planet Shaft (6E).

2. Remove Planet Shaft (6E) from the Carrier (6A).

3. Remove Lock Pin (6Q) from slot of Carrier (6A).

4. Slide out Planet Gear Subassembly from the window of the Carrier (6A).

5. Remove Thrust Washer (6B) from counter-bore in Carrier (6A).

6. Remove both Bearing Cones (6D) from bore of Planet Gear (6F).

7. Remove both Bearing Cups (6C) from bore of Planet Gear (6F) with a punch.

8. Remove Thrust Spacer (6U) from the bore of Planet Gear (6F).

**CAUTION:** Safety glasses must be worn during these next steps.

9. Remove Internal Retaining Ring (6T) from groove in Planet Gear (6F).

10. Repeat Steps 1 through 10 for remaining two Planet Gears (6F).

This concludes the Output Carrier Disassembly.
1. Unbend tang of Tanged Lock-Washer (3H) from the Bearing Nut (3G) and remove Bearing Nut (3G) and Tanged Lock-Washer (3H) from the Planet Shaft (3E).

2. Remove Planet Shaft (3E) from the Carrier (3A).

3. Remove Lock Pin (3D) from slot of Carrier (3A).

4. Slide out Planet Gear Subassembly from the window of the Carrier (3A).

5. Remove Thrust Washer (3B) from window of Carrier (3A).

**NOTE:** Bearing (3C) is a matched assembly and must be kept as a set.

6. Remove both Bearing Cones (3C) from bore of Planet Gear (3F).

**NOTE:** Do not remove the bearing cups or retaining ring unless replacing the bearing. The bearing cones must be driven out with a punch, the retaining ring/spacer must be cut out.

7. Remove Retaining Ring (3C) from internal groove of Planet Gear (3F).

8. Repeat Steps 1 through 10 for remaining two Planet Gears (3F).

See next page for 20:1 Input Carrier Disassembly

This concludes the Input Carrier Disassembly 29 & 40 TO 1.
1. Unbend tang of Tanged Lock-Washer (3H) from the Bearing Nut (3G) and remove Bearing Nut (3G) and Tanged Lock-Washer (3H) from the Planet Shaft (3E).

2. Remove Planet Shaft (3E) from the Carrier (3A).

3. Remove Lock Pin (3D) from slot of Carrier (3A).

4. Slide out Planet Gear Subassembly from the window of the Carrier (3A).

5. Remove Thrust Washer (3B) from window of Carrier (3A).

   **NOTE:** Bearing (3C) is a matched assembly and must be kept as a set.

6. Remove both Bearing Cones (3C) from bore of Planet Gear (3F).

   **NOTE:** Do not remove the bearing cups or retaining ring unless replacing the bearing. The bearing cones must be driven out with a punch, the retaining ring/spacer must be cut out.

7. Remove Retaining Ring (3C) from internal groove of Planet Gear (3F).

8. Repeat Steps 1 through 10 for remaining two Planet Gears (3F).

**Continued on Next Page**
CAUTION: Safety glasses must be worn during these next steps.

9. Remove Retaining Ring (11) from Coupling (12). Slide coupling from Sun Gear (3J).

10. Remove Retaining Ring (25) from Coupling (12).

11. Remove Sun Gear (3J) from Carrier (3A) through one of the planet carrier windows.

This concludes the Input Carrier Disassembly 20 TO 1.
Set the unit on bench such that Housing (1G) small diameter end is facing down.
CAUTION: Safety glasses must be worn during these next steps.

2 Remove Retaining Ring (1I) from the groove of Spindle (1A).

3 Remove Thrust Washer (1H) from the Spindle (1A).

4 Remove two Pipe Plugs (1P) from the Housing (1G).

5 Remove Pipe Plug (1Q) from Housing (1G).

6 Turn the unit over and carefully place the unit on a support base until the Shaft (1A) rests on it. Ensure there is enough gap to lower the Housing (1G) down.

7 Use a dead blow hammer on the Housing (1G) flange to drive the inboard Bearing Cone (1D) off the Spindle (1A).

8 Lift the Spindle (1A) out of the Housing (1G).

9 Remove Lip Seal (1B) from the Housing (1G).

10 Using a hammer and punch drive the inboard Bearing Cup (1C) out of Housing (1G). Be careful not to damage counter bore in the Housing (1G).

11 Turn the Housing (1G) over and drive the outboard Bearing Cup (1E) out of the Housing (1G). Be careful not to damage the counter-bore in the housing.

12 Remove Bearing Cone (1F) from the Spindle (1A).

This concludes the Housing-Spindle Disassembly.
ASSEMBLY
Planetary Final Drive Service Manual
Cover Subassembly

NOTE: Figure 1 refers to SAE “C” motor mount cover.

NOTE: Figure 2 refers to SAE “D” motor mount cover.

Continued on Next Page
1. Install Pipe Plug (20) onto Cover (17).

2. Grease and Install O-Ring (5) into groove on Cover (17). Ensure that O-Ring is fully seated against the inner diameter.

3. Grease and install Thrust Washer (10) onto Cover (17).

4. Grease and install Bearing (9) on top of Thrust Washer (10).

5. Grease and install Thrust Washer (10) on top of Bearing (9).

6. Grease and install Thrust Washer (19) onto Cover (17). The grease should hold washer in place for assembly.

7. Grease and install Thrust Washer (8) onto Cover (17).

   **NOTE:** For SAE “D” motor mount cover.

8. Grease and install O-Ring (28) onto Cover (17).

9. Install Adaptor Mount (29) onto the Cover (17).

   **This concludes the Cover Subassembly.**
**CAUTION:** Safety glasses must be worn during these next steps.

**NOTE:** Bearing (3C) is a matched set and must stay as a set.

1. Place Planet Gear (3F) with part number up onto press table. Install Internal Retaining Ring (3C) into the groove of Planet Gear (3F).

2. Use tool T147846 and Install both the Bearing Cups (3C) with wide face outside into bore of the Planet Gear (3F). Ensure that the Bearing Cups (3C) has seated fully against the Retaining Ring (3C).

3. Install Bearing Cone (3C) into Bearing Cup (3C) then install the cone spacer. Install the second Bearing Cone in to the opposite of the Planet Gear (3F).

4. Apply grease and install Thrust Washer (3B) into the counter-bore in Carrier (3A) planet gear window.

5. Slide Planet Gear (3F) assembly into planet window of Carrier (3A) with part number facing up.

**Continued on Next Page**
6. Align planet shaft bore in Planet Gear (3F) with Thrust Washer (3B) bore and Carrier (3A) planet shaft bore.

7. Install Planet Shaft (3E) through the large diameter in the Carrier (3A) hole and through Planet Gear (3F) bearing inner race by aligning the lock pin slot in both the Carrier (3A) and Planet Shaft (3E).

8. Install Lock Pin (3D) into lock pin slot in Carrier (3A) and Planet Shaft (3E).

9. Install Tanged Lock-Washer (3H) onto Planet Shaft (3E).

10. Clean Planet Shaft (3E) and Bearing Nut (3G) threads using ethanol. Apply Loctite 263 to the Bearing Nut (3G) and planet shaft threads. Using tool T-223131, tighten Bearing Nut (3G) to 125 ft-lbs.

11. Bend tang of Tanged Lock-Washer (3H) into Bearing Nut (3G) slot.

12. Repeat steps 2 through 12 for the remaining Planet Gears (3F).

This concludes the Input Carrier Subassembly 29 & 40 to 1
1. Install Sun Gear (3J) through a planet gear window in the carrier and to the center of the Carrier (3A).

**CAUTION:** Safety glasses must be worn during these next steps.

**NOTE:** Bearing (3C) is a matched set and must stay as a set.

2. Place Planet Gear (3F) with part number up onto press table. Install Internal Retaining Ring (3C) into the groove of Planet Gear (3F).

3. Use tool T147846 and install both the Bearing Cups (3C) with wide face outside into bore of the Planet Gear (3F). Ensure that the Bearing Cups (3C) has seated fully against the Retaining Ring (3C).

4. Install Bearing Cone (3C) into Bearing Cup (3C) then install the cone spacer. Install the second Bearing Cone in to the opposite of the Planet Gear (3F).

5. Apply grease and install Thrust Washer (3B) into the counter-bore in Carrier (3A) planet gear window.

6. Slide Planet Gear (3F) assembly into planet window of Carrier (3A) with part number facing up.

**Continued on Next Page**
7. Align planet shaft bore in Planet Gear (3F) with Thrust Washer (3B) bore and Carrier (3A) planet shaft bore.

8. Install Planet Shaft (3E) through the large diameter in the Carrier (3A) hole and through Planet Gear (3F) bearing inner race by aligning the lock pin slot in both the Carrier (3A) and Planet Shaft (3E).

9. Install Lock Pin (3D) into lock pin slot in Carrier (3A) and Planet Shaft (3E).

10. Install Tanged Lock-Washer (3H) onto Planet Shaft (3E).

11. Clean Planet Shaft (3E) and Bearing Nut (3G) threads using ethanol. Apply Loctite 263 to the Bearing Nut (3G) and planet shaft threads. Using tool T-223131, tighten Bearing Nut (3G) to 125 ft-lbs.

12. Bend tang of Tanged Lock-Washer (3H) into Bearing Nut (3G) slot.

13. Repeat steps 2 through 12 for the remaining Planet Gears (3F).


15. Install Retaining Ring (11) onto Coupling (12).

This concludes the Input Carrier Subassembly 20 to 1
CAUTION: Safety glasses must be worn during these next steps.

1. Install Internal Retaining Ring (6T) into Planet Gear (6F) bore.
2. Place Spacer (6U) against Retaining Ring (6T) in deep end of Planet Gear (6F).
3. Press first Bearing Cup (6C) against Spacer (6U) using tool T158150.
4. Press second Bearing Cup (6C) against Retaining Ring (6T) using tool T158150.
5. Place Bearing Cones (6D) into Bearing Cups (6C).
6. Grease Thrust Washer (6B) into counter bore of Carrier (6A).
7. Place Planet Gear (6F) assembly into Carrier (6A).
8. Push Planet Shaft (6E) through Carrier (6A) and Planet Gear (6F) assembly.
9. Place Lock Pin (6Q) into slot in Carrier (6A) and Planet Shaft (6E).
10. Place Lock Washer (6N) on Planet Shaft (6E).

Continued on Next Page
11. Clean Planet Shaft (6E) and Locknut (6P) threads using ethanol. Apply Loctite 263 to the Bearing Nut (6P) and planet shaft threads.

12. Tighten Bearing Nut (6P) and tap end of Planet Shaft (6E) to make sure Bearings (6D) are properly seated. Measure Rolling torque of Planet Gear (6F) using Fish Scale. Using tool T-119240 tighten Bearing Nut (6P) until a torque of 1.5 – 2 lbs is attained when rolling the Planet Gear (6F).


14. Repeat Steps 1 through 13 for remaining Planet Gears (6F).

This concludes the Output Carrier Subassembly.
1. Install Pipe Plug (1Q, 1P) into Housing (1G) using Thread Sealant.

2. Press Bearing Cone (1F) onto Output Shaft (1A) using pressing tool T136184.

3. Press Bearing Cup (1E) into Housing (1G) using pressing tool T154563. Make sure the cup is pressed in squarely and to the housing counter-bore.

4. Turn Housing (1G) over and press Bearing Cup (1C) into Housing (1G) using pressing tool T139345. Make sure the cup is pressed in squarely and to the housing counter-bore.

5. Lower Housing (1G) onto Output Shaft (1A).

6. Press Bearing Cone (1D) onto Output Shaft (1A) using pressing tool T158049. Rotate Housing (1G) while pressing the Cone (1D). Stop pressing when Cone (1D) is snug against the Cup (1C).

**CAUTION:** Safety glasses must be worn during these next steps.

7. Place Thrust Washer (1H) on top of Bearing Cone (1D). Install Retaining Ring (1I) onto Output Shaft (1A) using retaining ring pliers. Make sure Retaining Ring (1I) is completely seated in the groove of the output shaft.

8. Tap on end of Output Shaft (1A) to remove the bearing preload.

9. Oil inside of Lip Seal (1B). Turn Housing (1G) over and install the Seal into Hub using pressing tool T137786. The Lip Seal (1B) should flush with Housing (1G) face.

This concludes the Housing-Spindle Subassembly.
**Planetary Final Drive Service Manual**

**Main Assembly**

**NOTE:** Figure 1 refers to 20 : 1 Ratio

**NOTE:** Figure 2 refers to 29 and 40 : 1 Ratio

Continued on Next Page
1. With Housing Spindle Subassembly standing on the Output Shaft (1A), mark the four counter-bore holes. Grease and install O-Ring (5) into Housing (1G).

2. Lower Output Carrier Subassembly into Housing (1G) and onto Output Shaft (1A).

3. Install Ring gear (2) into Housing (1G), and align the hole marked “X” with a counter bore in Housing (1G).

4. Place Sun Gear (4) into mesh with Planet Gear (6F).

5. Install Thrust Washer (10), Thrust Bearing (9) and second Thrust Washer (10) onto hub of Input Carrier (3A). Use grease to hold them in place.

6. Lower Input Carrier Subassembly onto splines of Sun Gear (4) and into mesh with Ring Gear (2).

**NOTE:** For 29 and 40 :1 ratios only.

7. Install Sun Gear (27) onto Input Carrier Subassembly.

**NOTE:** Figure 1 refers to SAE “C” motor mount

Continued on Next Page
**NOTE:** Figure 2 refers to SAE “D” motor mount

8. Install Cover Subassembly onto the Ring Gear (2).

9. Install four Shoulder Bolts (18) with Flat Washers (22) and Lock Washers (14) in these bolts by hand, then torque to 35 – 45 ft-lbs.

10. Install sixteen Hexagonal Head Bolts (15) with Lock Washers (14) into Housing (1G). Torque Bolts to 100 – 110 ft-lbs.

11. Install Pipe Plugs (20) onto Cover using thread sealant.

12. Roll check unit for one output revolution in each direction.

13. Air check unit for leaks.

**This concludes the Main assembly.**
Planetary Final Drive Service Manual
Assembly Drawing

29 AND 40 TO 1 RATIOS

20 TO 1 RATIO
## Planetary Final Drive Repair Instructions

### Parts List

<table>
<thead>
<tr>
<th>Number</th>
<th>Qty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>1</td>
<td>OUTPUT SHAFT</td>
</tr>
<tr>
<td>1B</td>
<td>1</td>
<td>LIP SEAL</td>
</tr>
<tr>
<td>1C</td>
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</tr>
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<td>PIPE PLUG</td>
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<td>26</td>
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<td>27</td>
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<td>SUN GEAR</td>
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<td>28</td>
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**PARTS: Title:**

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**DRAWING:**

- One - 4 1/2 x 11 - HON - DRAW
- Rework - WC
- W/O - WC
- M.T. - WC
- NO.

**NOTES:**

- Dimensions of 4 1/2 - HON. DO NOT MAX
- Tooling cup assurance
- Force required to the cutting force
- Corrective action to the cutting tool
- One - 4 1/2 x 11 - HON - DRAW

**DIAGRAM:**

- Dimensions: 4 1/2 - HON. DO NOT MAX
- Tooling cup assurance
- Force required to the cutting force
- Corrective action to the cutting tool
- One - 4 1/2 x 11 - HON - DRAW
T22025 - LEAK TEST TOOL
Planetary Final Drive Repair Instructions

Contact Information

With over 80 years of experience, Fairfield Manufacturing has become the largest U.S. non-captive producer of gears, custom gear assemblies, planetary final drives, and related gear products. Fairfield Manufacturing, headquartered in Lafayette, Indiana, is distinguished by our extensive design, manufacturing, and applications engineering capabilities. Our 500,000 square foot plant is a modern, fully equipped manufacturing facility that includes a full service heat treat department.

Our philosophy of synchronous engineering is a partnership that matches our best and brightest people with your people to evaluate your unique requirements, and develop products and assemblies that meet your needs.

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