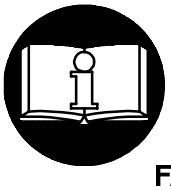
03540028

Form P7120
Edition 3
August, 1997

# MAINTENANCE SECTION COVERING TUBE NUT ATTACHMENT for SERIES D TORQUE CONTROL WRENCHES

## WHEN THIS MODULE IS USED WITH AN AIR POWERED TOOL

**⚠ WARNING**



**IMPORTANT SAFETY INFORMATION ENCLOSED.**
**READ THIS MANUAL BEFORE OPERATING TOOL.**
**IT IS THE RESPONSIBILITY OF THE EMPLOYER TO PLACE THE INFORMATION IN THIS MANUAL INTO THE HANDS OF THE OPERATOR.**
**FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.**

### PLACING TOOL IN SERVICE

- Always operate, inspect and maintain this tool in accordance with all regulations (local, state, federal and country), that may apply to hand held/hand operated pneumatic tools.
- For safety, top performance, and maximum durability of parts, operate this tool at 90 psig (6.2 bar/620 kPa) maximum air pressure at the inlet with 3/8" (10 mm) inside diameter air supply hose.
- Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.
- Do not use damaged, frayed or deteriorated air hoses and fittings.
- Be sure all hoses and fittings are the correct size and are tightly secured.
- Always use clean, dry air at 90 psig maximum air pressure. Dust, corrosive fumes and/or excessive moisture can ruin the motor of an air tool.
- Do not lubricate tools with flammable or volatile liquids such as kerosene, diesel or jet fuel.
- Do not remove any labels. Replace any damaged label.

### USING THE TOOL

- Always wear eye protection when operating or performing maintenance on this tool.
- Always wear hearing protection when operating this tool.
- Keep hands, loose clothing and long hair away from rotating end of tool.
- Note the position of the reversing lever before operating the tool so as to be aware of the direction of rotation when operating the throttle.
- Anticipate and be alert for sudden changes in motion during start up and operation of any power tool.
- Keep body stance balanced and firm. Do not overreach when operating this tool. High reaction torques can occur at or below the recommended air pressure.
- Tool shaft may continue to rotate briefly after throttle is released.
- Air powered tools can vibrate in use. Vibration, repetitive motions or uncomfortable positions may be harmful to your hands and arms. Stop using any tool if discomfort, tingling feeling or pain occurs. Seek medical advice before resuming use.
- Use accessories recommended by Ingersoll-Rand.
- Use only impact sockets and accessories. Do not use hand (chrome) sockets or accessories.
- This tool is not designed for working in explosive atmospheres.
- This tool is not insulated against electric shock.

*(Continued on page 6-2)*

**NOTICE**

**The use of other than genuine Ingersoll-Rand replacement parts may result in safety hazards, decreased tool performance, and increased maintenance, and may invalidate all warranties.**

**Repairs should be made only by authorized trained personnel. Consult your nearest Ingersoll-Rand Authorized Servicenter.**

**Refer All Communications to the Nearest Ingersoll-Rand Office or Distributor.**

**Printed in U.S.A.**

INGERSOLL-RAND®
PROFESSIONAL TOOLS

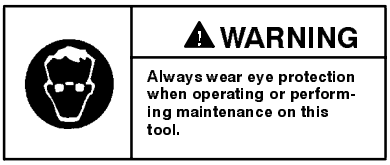
**⚠ WARNING**

**FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.**

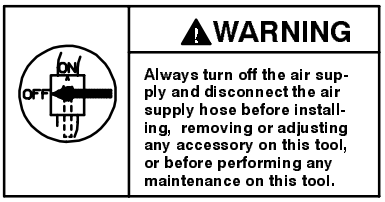
## USING THE TOOL *(Continued)*

- Do not remove the Inlet Plug without first disconnecting the live air supply.
- Whenever the Angle Head is installed or repositioned, the Throttle Lever must be positioned so that reaction torque will not tend to retain the throttle in the "ON" position.
- When installing or removing the output device on a tool, ALWAYS hold the tool by the hex on the Gear Case while tightening the Coupling Nut. NEVER grasp the composite tool body or handle in vise jaws to restrain the tightening torque of the Coupling Nut. Such practice will result in damage to the tool.
- Do not use power units and gear trains that exceed the capability of the output device.
- The Tube Nut Attachment has an opening on the front side for construction and application purposes. DO NOT, under any circumstance place your fingers in this opening.
- The Torque Reaction Bar must be positioned against a positive stop. Do not use the Bar as a dead handle and take all precautions to make certain the operator's hand cannot be pinched between the Bar and a solid object.
- When operated continuously for long periods of time, Series D Nutrunners may become hot at the spindle end of the tool. Take all precautions necessary to avoid skin contact with the hot surfaces. Prolonged contact may result in burns.
- All Series D Torque Control Wrenches and Nutrunners with reverse capability have rotational arrows molded into the housing in the area of the reversing mechanism. When the direction switching device is positioned nearest the molded circular arrow with an "F" in the center, spindle rotation will be forward or clockwise direction. When the direction switching device is positioned nearest the molded circular arrow with an "R" in the center, spindle rotation will be reverse or counterclockwise direction.

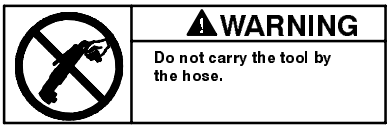
## *WARNING LABEL IDENTIFICATION*



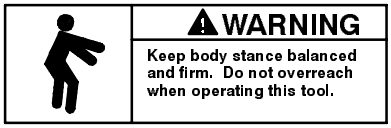


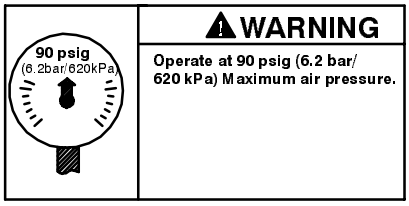


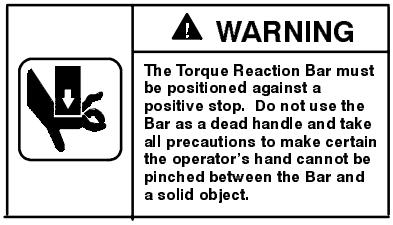






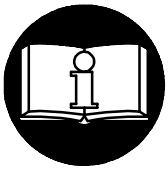


# WHEN THIS MODULE IS USED WITH AN ELECTRIC POWERED TOOL

**⚠ WARNING**



**IMPORTANT SAFETY INFORMATION ENCLOSED.**
**READ ALL THESE INSTRUCTIONS BEFORE PLACING TOOL IN SERVICE OR OPERATING THIS TOOL AND SAVE THESE INSTRUCTIONS.**
**IT IS THE RESPONSIBILITY OF THE EMPLOYER TO PLACE THE INFORMATION IN THIS MANUAL INTO THE HANDS OF THE OPERATOR.**
**FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.**

**Disconnect the Power Cord from the receptacle before performing any maintenance on this tool.**

**This symbol is to alert the user and service personnel to the presence of uninsulated dangerous voltage that will cause a risk of electric shock.**

**This symbol is to alert the user and service personnel to the presence of important operating instructions that must be read and understood to prevent personal injury, electrical shock or damage to the equipment.**

**WHEN USING ELECTRIC TOOLS, BASIC SAFETY PRECAUTIONS SHOULD ALWAYS BE FOLLOWED TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK AND PERSONAL INJURY, INCLUDING THE FOLLOWING.**

## PLACING TOOL IN SERVICE

- **Use only with Series TMAD Controllers.**
- **Always operate, inspect and maintain this tool in accordance with all regulations (local, state, federal and country), that may apply to hand held/hand operated electric tools.**
- **Inspect tool cords periodically and if damaged, have them repaired by an authorized service facility.**
- **Do not remove any labels. Replace any damaged label.**

## USING THE TOOL

- **Always wear eye protection when operating or performing maintenance on this tool.**
- **Power tools can vibrate in use. Vibration, repetitive motions, or uncomfortable positions may be harmful to your hands and arms. Stop using any tool if discomfort, tingling feeling or pain occurs. Seek medical advice before resuming use.**
- **Guard Against Electric Shock.** Prevent body contact with earthed or grounded surfaces. For example; pipes, radiators, ranges, refrigerator enclosures.
- **Don't abuse Cord.** Never carry tool by cord or yank it to disconnect from receptacle. Keep cord from heat, oil, and sharp edges.
- **Keep work area clean.** Cluttered areas and benches invite injuries.
- **Consider work area environment.** Don't expose power tools and chargers to water. Keep work area well lighted. Do not use tool in explosive or flammable atmospheres.
- **Keep bystanders and children away.** Do not permit unauthorized personnel to operate this tool, or touch tool or cord.
- **Store idle tools.** When not in use, tools should be stored in a dry, high or locked up place, out of reach of children.
- **Don't force tool.** It will do the job better and more safely at the rate for which it was intended.
- **Use the right tool.** Do not force a small tool or Jattachment to do the job of a heavy–duty tool.
- **Do not use a tool for a purpose for which it is not intended.** Example: Do not use a screwdriver as a drill.
- **Dress properly.** Do not wear loose clothing or Jjewelry. They can be caught in moving parts. Rubber gloves and non–skid footwear are recommended when working outdoors. Wear protective hair covering to contain long hair.
- **Secure work.** Use clamps or a vise to hold work. Operators often need both hands to perform job functions.
- **Don't overreach.** Keep proper footing, balance, and a firm grip on the tool at all times.
- **Maintain tools with care.** Keep tools clean for better and safer performance. Follow instructions for lubricating and changing accessories. Inspect tool cords periodically and if damaged, have them repaired by an authorized service facility. Inspect extension cords periodically and replace if damaged. Keep handles dry, clean, and free from oil and grease.
- **Remove adjusting keys and wrenches.** Form habit of checking to see that keys and adjusting wrenches are removed from tool before turning it on.
- **Avoid unintentional starting.** Don't carry tool with finger on switch.

*(Continued on page 6–4)*

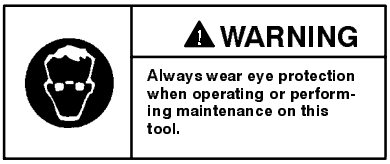
**⚠ WARNING**

**FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.**

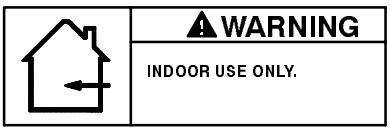
## USING THE TOOL *(Continued)*

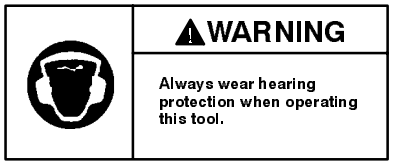
- **Do not drop or abuse the tool.**
- **Whenever a tool is not being used, position the Power Switch to the "OFF" position and unplug the power cord.**
- **Stay alert.** Watch what you are doing. Use common sense. Do not operate tool when you are tired.
- **Check damaged parts.** Before further use of the tool, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, binding of moving parts, breakage of parts, mounting, and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced by an authorized service center unless otherwise indicated elsewhere in this operation manual.
- **Have defective switches replaced by an authorized service center.**
- **Do not use the tool if the switch does not turn it on and off.**
- **Whenever the Angle Head is installed or repositioned, the Throttle Lever must be positioned so that reaction torque will not tend to retain the throttle in the "ON" position.**
- **When installing or removing the output device on a tool, ALWAYS hold the tool by the hex on the Gear Case while tightening the Coupling Nut. NEVER grasp the composite tool body or handle in vise jaws to restrain the tightening torque of the Coupling Nut. Such practice will result in damage to the tool.**
- **Do not use power units and gear trains that exceed the capability of the output device.**
- **The Tube Nut Attachment has an opening on the front side for construction and application purposes. DO NOT, under any circumstance place your fingers in this opening.**
- **The Torque Reaction Bar must be positioned against a positive stop. Do not use the Bar as a dead handle and take all precautions to make certain the operator's hand cannot be pinched between the Bar and a solid object.**
- **When operated continuously for long periods of time, Series D Nutrunners may become hot at the spindle end of the tool. Take all precautions necessary to avoid skin contact with the hot surfaces. Prolonged contact may result in burns.**
- **All Series D Torque Control Wrenches and Nutrunners with reverse capability have rotational arrows molded into the housing in the area of the reversing mechanism. When the direction switching device is positioned nearest the molded circular arrow with an "F" in the center, spindle rotation will be forward or clockwise direction. When the direction switching device is positioned nearest the molded circular arrow with an "R" in the center, spindle rotation will be reverse or counterclockwise direction.**

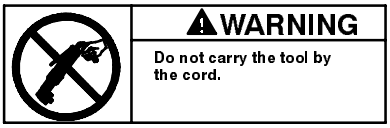
## *WARNING LABEL IDENTIFICATION*

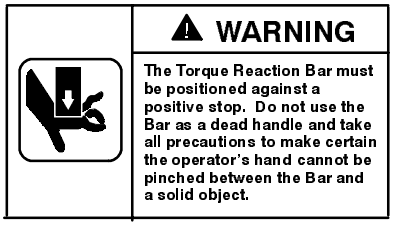


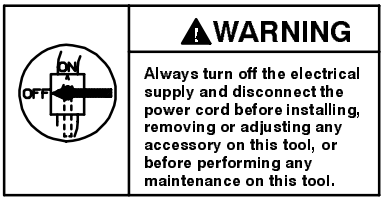




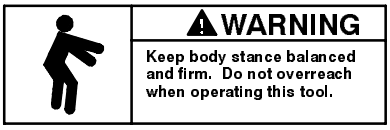







## LUBRICATION

**Ingersoll–Rand No. 90**
**Ingersoll–Rand No. 67**

**Whenever a Tube Nut Attachment is disassembled for overhaul or replacement of parts,** lubricate all parts lightly with Ingersoll–Rand No. 90 high performance grease.

**After each 30 hours of operation,** inject 0.5 cc of Ingersoll–Rand No. 90 high performance grease into the grease fitting on the Tube Nut Attachments with two gear stages and 1 cc into the grease fitting of Tube Nut Attachments with more than two gear stages.

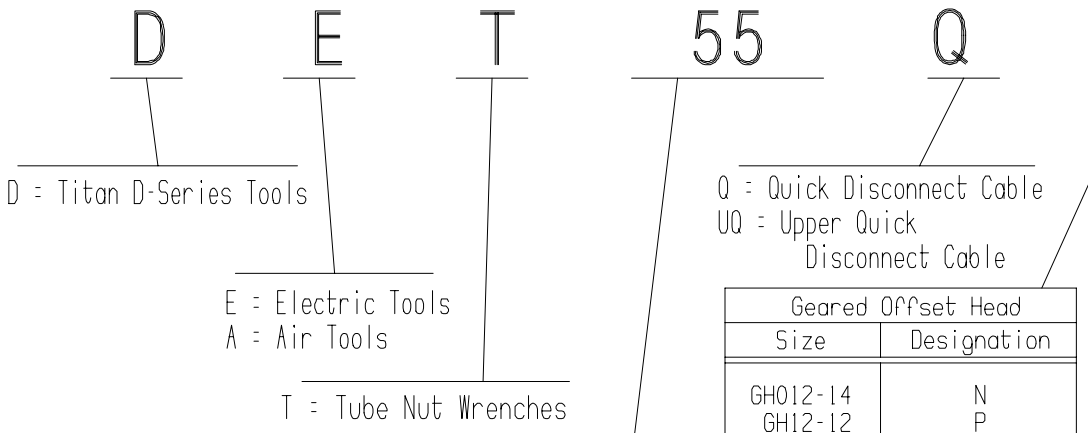
**Whenever an Angle Attachment is disassembled for overhaul or replacement of parts,** apply 6 cc to 10 cc of Ingersoll–Rand No. 67 Grease to the Bevel Pinion And Bevel Gear in the Angle Attachment.

**After each eight hours of operation,** inject 1 to 2 cc of Ingersoll Rand No. 67 Grease into the Grease Fitting in the Angle Housing Assembly.

**⚠ WARNING**

**Too much lubricant may result in torque reduction or malfunctioning of the ratcheting mechanism in the Tube Nut Attachment.**

# SERIES D TUBE NUT WRENCH SELECTION GUIDE




| * Gear Case Size Designation | | |
|---|---|---|
| 40 Series Electric | 120 Series Electric | 40 Series Air |
| 8 | 55 | 9 |
| 15 | 70 | 14 |
| 23 | 90 | 25 |
| 31 | 120 | 35 |
| 40 | | 40 |

* Torque Output Will Vary According To Attachment. Contact I-R For Specific Recommendations.

Example: DC Tool With Tube Nut Head
90 Nm Gearing Std. Tool Configuration
GH34-21-AF19M GOH
Model Number = DET90XM

| Geared Offset Head | |
|---|---|
| Size | Designation |
| GH012-14 | N |
| GH12-12 | P |
| GH14-12 | Q |
| GH12-14 | R |
| GH14-14 | S |
| GH16-14 | T |
| GH32-16 | U |
| GH34-16 | V |
| GH32-21 | W |
| GH34-21 | X |
| GH52-21 | Y |
| GH54-21 | Z |

| Socket Drive Inch | |
|---|---|
| Size | Designation |
| 1/4 (AF8S) | AA |
| 5/16 (AF10S) | BB |
| 3/8 (AF12S) | CC |
| 7/16 (AF14S) | DD |
| 1/2 (AF16S) | EE |
| 9/16 (AF18S) | FF |
| 5/8 (AF20S) | GG |
| 11/16 (AF22S) | HH |
| 3/4 (AF24S) | JJ |
| 13/16 (AF26S) | KK |
| 7/8 (AF28S) | LL |
| 15/16 (AF30S) | MM |
| 1 (AF32S) | NN |
| 1-1/16 (AF34S) | PP |
| 1-1/8 (AF36S) | QQ |

| Output Drive | |
|---|---|
| Size | Designation |
| Square Drive | |
| 1/4 | S4 |
| 3/8 | S6 |
| 1/2 | S8 |
| Hex Bit | |
| 1/4 | H4 |

| Socket Drive Metric | |
|---|---|
| Size | Designation |
| 8 mm (AF8M) | A |
| 9 mm (AF9M) | B |
| 10 mm (AF10M) | C |
| 11 mm (AF11M) | D |
| 12 mm (AF12M) | E |
| 13 mm (AF13M) | F |
| 14 mm (AF14M) | G |
| 15 mm (AF15M) | H |
| 16 mm (AF16M) | J |
| 17 mm (AF17M) | K |
| 18 mm (AF18M) | L |
| 19 mm (AF19M) | M |
| 20 mm (AF20M) | N |
| 21 mm (AF21M) | P |
| 22 mm (AF22M) | Q |
| 23 mm (AF23M) | R |
| 24 mm (AF24M) | S |
| 25 mm (AF25M) | T |
| 26 mm (AF26M) | U |
| 27 mm (AF27M) | V |



(Dwg. TPD1847)

# PLACING IN SERVICE

## INSTALLATION

**⚠ WARNING**

**It is extremely important that the Tube Nut Attachment not be used at a torque higher than that listed as maximum allowable. See the specification table below.**

It is possible that the power unit which drives the tool, is capable of producing a higher torque than the maximum allowable for either or both the Angle Head and the Tube Nut Attachment. Always check the maximum allowable torque for the Tube Nut Attachment and the Angle Head. See the specification table below.

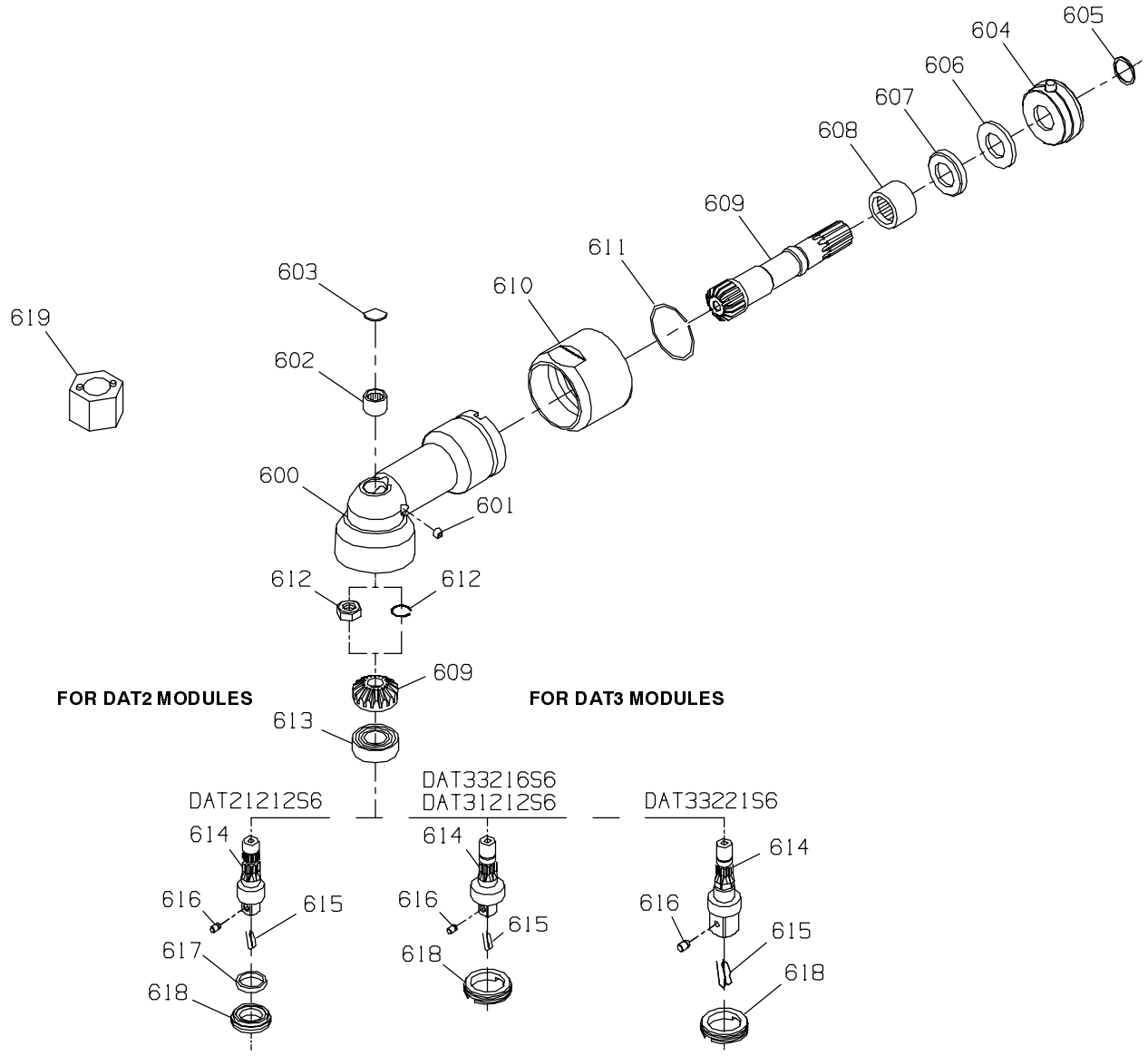
## SPECIFICATION TABLE

| Tube Nut Attachment Model | Max. Output Torque Nm | Angle Head Model | Max. Output Torque Nm | Coupling Nut Nm |
|---|---|---|---|---|
| GH12–12, GH14–12 | 18 | | | |
| GH12–14, GH14–14, GH16–14 | 22 | | | |
| GH32–16, GH34–16 | 32 | | | |
| GH32–21, GH34–21 | 86 | | | |
| | | DAT2 | 30 | 34 |
| | | DAT3 | 40 | 34 |

**⚠ WARNING**

**When it is necessary to hold the tool in a vise, always position the hex on the Gear Case in the vise jaws. Never grip the composite tool body or handle in vise jaws, this will result in damage to the tool and create the danger of electric shock in electrically powered tools.**

# SERIES DAT2 AND DAT3 TUBE NUT WRENCH ANGLE HEADS




(Dwg. TPB1004)

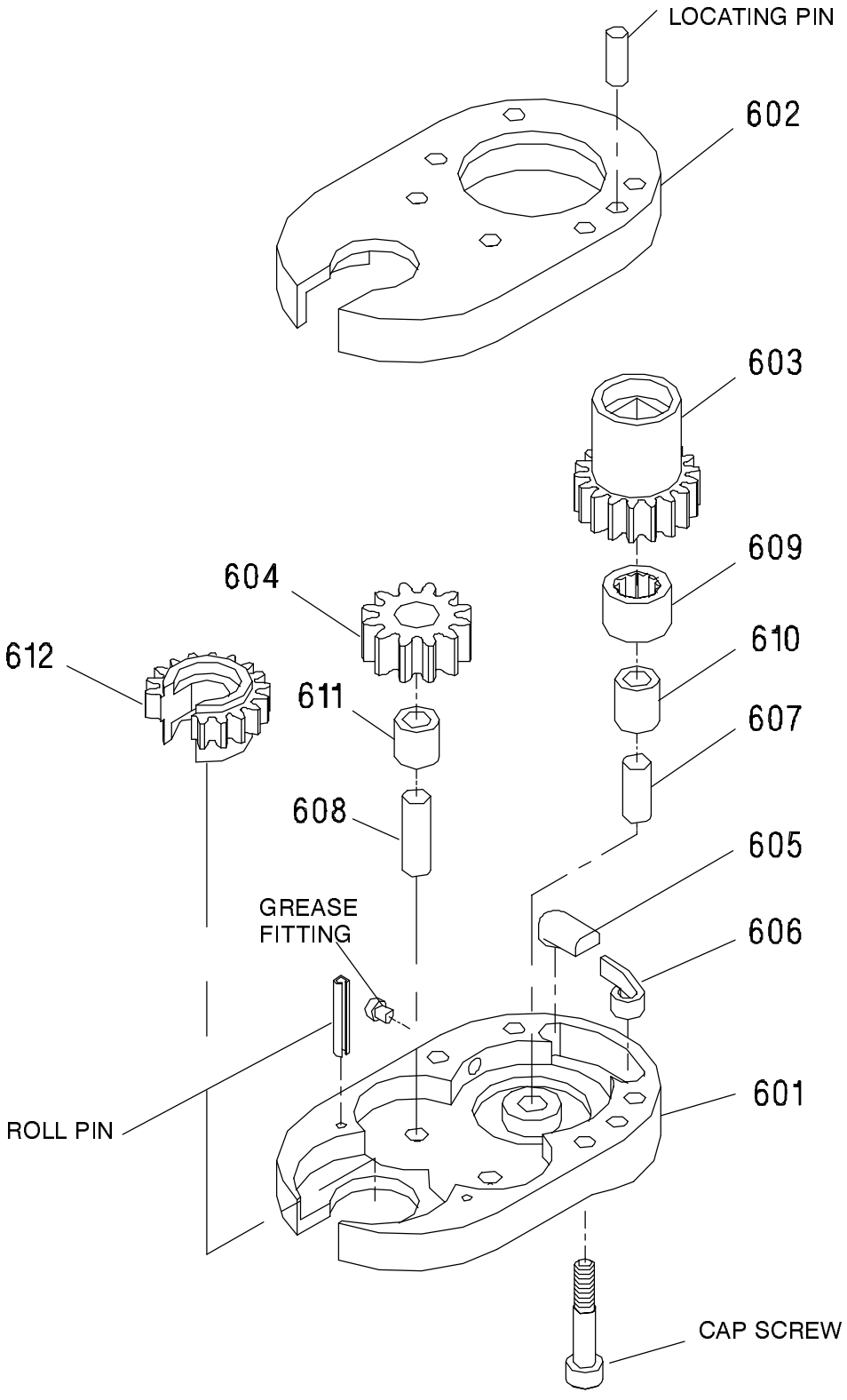
| | | PART NUMBER FOR ORDERING ↓ | ↓ |
|---|---|---|---|
| | Angle Head Module | DAT21212S6 | DAT31212S6 |
| 600 | Angle Housing Assembly | DAT21212–B550 | DAT31212–A550 |
| 601 | Grease Fitting | D0F9–879 | D0F9–879 |
| 602 | Upper Spindle Bearing | 120A4–603 | 8SA32–603 |
| 603 | Angle Housing Cap | ------- | 8SA32–110 |
| 604 | Housing Orientation Ring | DAA2–A682 | DAA2–A682 |
| 605 | Orientation Ring Retainer | 182A53–689 | 182A53–689 |
| 606 | Thrust Bearing | R1610–105 | R1610–105 |
| 607 | Thrust Washer | 182A53–554 | 182A53–554 |
| 608 | Bevel Pinion Bearing | R1410–593 | 182A53–606 |
| 609 | Bevel Gear Set | DAA2–A552 | DAA3–A552 |
| 610 | Coupling Nut | DAA2–27 | DAA2–27 |
| 611 | Coupling Nut Retainer | DAA2–29 | DAA2–29 |
| 612 | Bevel Gear Retainer | 120A4–578 | 8SA32–578 |
| 613 | Lower Spindle Bearing | 6L2D–59 | 8SA32–593 |
| 614 | Spindle Assembly | 6L2D–A607 | DAA3–P507–3/8 |
| 615 | Spring | 401–718 | 401–718 |
| 616 | Retaining Pin | 5020–716 | 5020–716 |
| 617 | Spindle Seal | 6L2D–720 | -------- |
| 618 | Spindle Bearing Cap | 6L2D–531 | 8SA32–531 |
| 619 | Spindle Bearing Cap Wrench | 141A12–26 | 8SA32–26 |
| * | Tube Nut Warning Label | DAT40–98 | DAT40–98 |

* Not illustrated.

| | | PART NUMBER FOR ORDERING ↓ | ↓ |
|---|---|---|---|
| | Angle Head Module | DAT33216S6 | DAT33221S6 |
| 600 | Angle Housing Assembly | DAT33216–A550 | DAT33221–A550 |
| 601 | Grease Fitting | D0F9–879 | D0F9–879 |
| 602 | Upper Spindle Bearing | 8SA32–603 | 8SA32–603 |
| 603 | Angle Housing Cap | 8SA32–110 | 8SA32–110 |
| 604 | Housing Orientation Ring | DAA2–A682 | DAA2–A682 |
| 605 | Orientation Ring Retainer | 182A53–689 | 182A53–689 |
| 606 | Thrust Bearing | R1610–105 | R1610–105 |
| 607 | Thrust Washer | 182A53–554 | 182A53–554 |
| 608 | Bevel Pinion Bearing | 8SA32–606 | 8SA32–606 |
| 609 | Bevel Gear Set | DAA3–A552 | DAA3–A552 |
| 610 | Coupling Nut | DAA2–27 | DAA2–27 |
| 611 | Coupling Nut Retainer | DAA2–29 | DAA2–29 |
| 612 | Bevel Gear Retainer | 8SA32–578 | 8SA32–578 |
| 613 | Lower Spindle Bearing | 8SA32–593 | 8SA32–593 |
| 614 | Spindle Assembly | DAA3–P507–3/8 | DAA3–P507–3/8 |
| 615 | Spring | 401–718 | 5UHD–718 |
| 616 | Retaining Pin | 5020–716 | 804–716 |
| 617 | Spindle Seal | --------- | --------- |
| 618 | Spindle Bearing Cap | 8SA32–531 | 8SA32–531 |
| 619 | Spindle Bearing Cap Wrench | 8SA32–26 | 8SA32–26 |
| * | Tube Nut Warning Label | DAT40–98 | DAT40–98 |

* Not illustrated.

## SERIES GH12 TUBE NUT ATTACHMENT



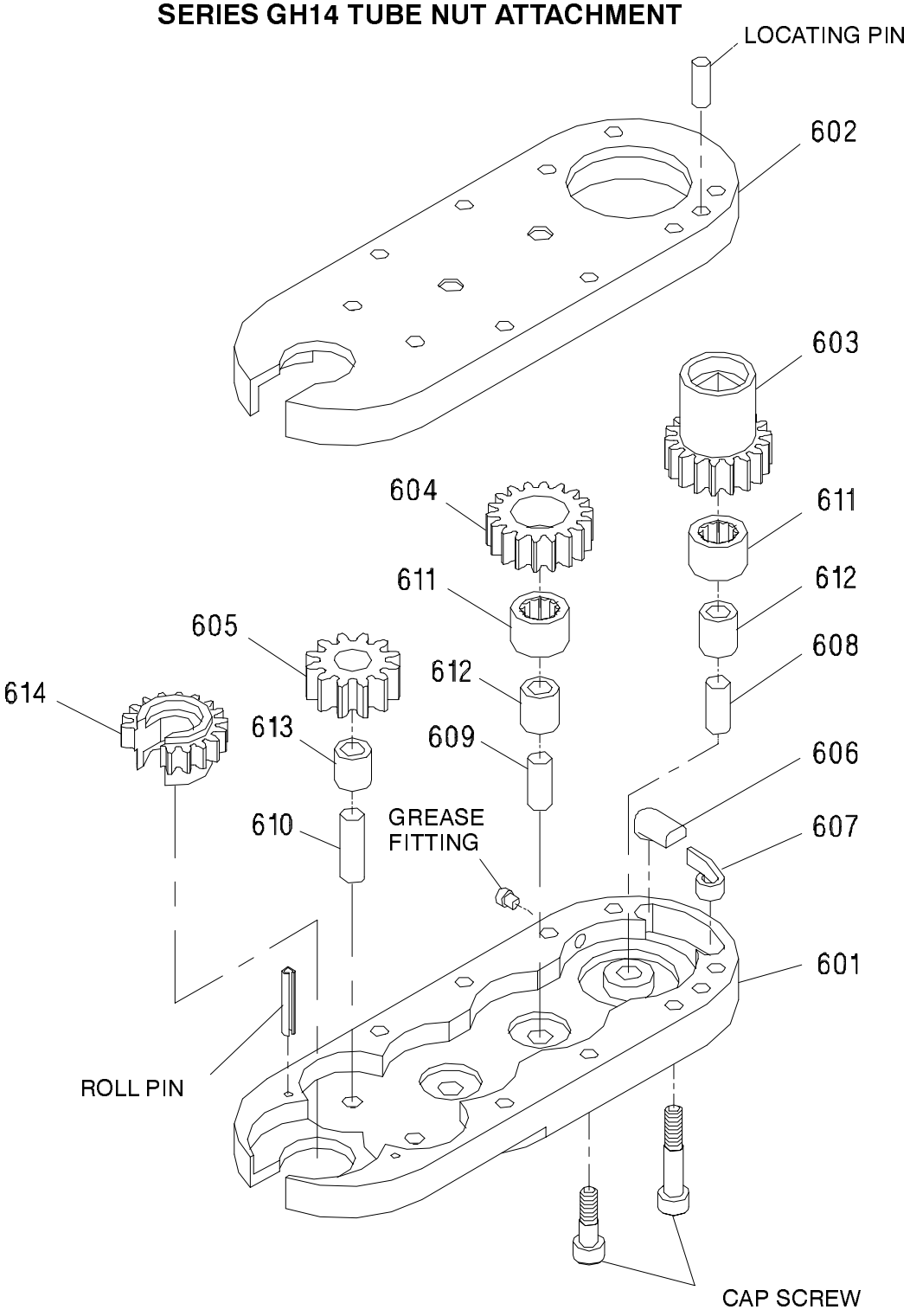

**(Dwg. TPC642)**

PART NUMBER FOR ORDERING

| | | SERIES GH12-12 | SERIES GH12-14 |
|---|---|---|---|
| | Tube Nut Attachment | | |
| | with 8 mm Hex. Socket | GH12-12-AF08M | GH12-14-AFO8M |
| | with 10 mm Hex. Socket | GH12-12-AF10M | GH12-14-AF10M |
| | with 11 mm Hex. Socket | GH12-12-AF11M | GH12-14-AF11M |
| | with 12 mm Hex. Socket | GH12-12-AF12M | GH12-14-AF12M |
| | with 5/16 in. Hex. Socket | GH12-12-AF10S | GH12-14-AF10S |
| | with 3/8 in. Hex. Socket | GH12-12-AF12S | GH12-14-AF12S |
| | with 7/16 in. Hex. Socket | GH12-12-AF14S | GH12-14-AF14S |
| | with 1/2 in. Hex. Socket | GH12-12-AF16S | GH12-14-AF16S |
| 601 | Lower Housing | 70127502 | 70123502 |
| 602 | Upper Housing | 70123501 | 70123501 |
| 603 | Input Spindle Gear | 70901509 | 70901509 |
| 604 | Idler Gear | 70903508 | 70903508 |
| 606 | Spring | 70908526 | 70908526 |
| 607 | Shaft | 70905502 | 70905502 |
| 608 | Shaft | 70905522 | 70905516 |
| 609 | Needle Bearing | 42110004 | 42110004 |
| 610 | Bearing Race | 43610001 | 43610001 |
| 611 | Bushing | 70908529 | 70908529 |
| * | Screw Kit (Includes screws, pins, and grease fittings) | 80143201 | 80123201 |
| 612 | Hex. Drive Socket - 8 mm | 70904707 | 70904570 |
| 612 | Hex. Drive Socket - 10 mm | 70904708 | 70904571 |
| 612 | Hex. Drive Socket - 11 mm | 70904709 | 70904572 |
| 612 | Hex. Drive Socket - 12 mm | 70904710 | 70904578 |
| 612 | Hex. Drive Socket - 5/16 in. | 70904851 | 70904859 |
| 612 | Hex. Drive Socket - 3/8 In. | 70904852 | 70904759 |
| 612 | Hex. Drive Socket - 7/16 in. | 70904853 | 70904752 |
| 612 | Hex. Drive Socket - 1/2 in. | 70904854 | 70904860 |

* Not illustrated.

## SERIES GH14 TUBE NUT ATTACHMENT



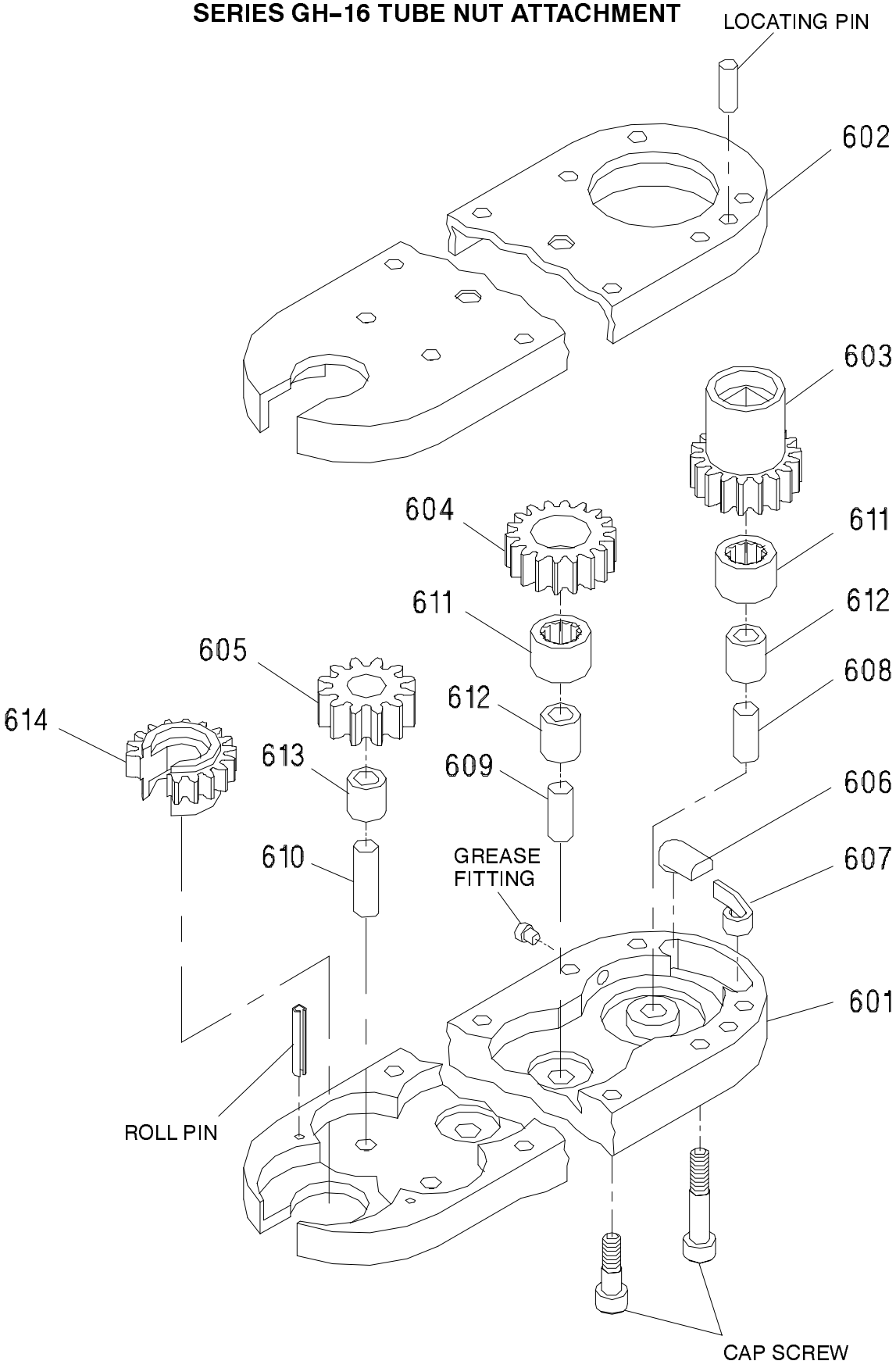

**(Dwg. TPC643)**

PART NUMBER FOR ORDERING

| | | SERIES GH14-12 | SERIES GH14-14 |
|---|---|---|---|
| | Tube Nut Attachment | | |
| | with 8 mm Hex. Socket | GH14-12-AF08M | GH14-14-AFO8M |
| | with 10 mm Hex. Socket | GH14-12-AF10M | GH14-14-AF10M |
| | with 11 mm Hex. Socket | GH14-12-AF11M | GH14-14-AF11M |
| | with 12 mm Hex. Socket | GH14-12-AF12M | GH14-14-AF12M |
| | with 5/16 in. Hex. Socket | GH14-12-AF10S | GH14-14-AF10S |
| | with 3/8 in. Hex. Socket | GH14-12-AF12S | GH14-14-AF12S |
| | with 7/16 in. Hex. Socket | GH14-12-AF14S | GH14-14-AF14S |
| | with 1/2 in. Hex. Socket | GH14-12-AF16S | GH14-14-AF16S |
| 601 | Lower Housing | 70147502 | 70143502 |
| 602 | Upper Housing | 70143501 | 70143501 |
| 603 | Input Spindle Gear | 70901509 | 70901509 |
| 604 | Gear | 70903501 | 70903501 |
| 605 | Idler Gear | 70903508 | 70903508 |
| 606 | Pawl | 70908528 | 70908528 |
| 607 | Spring | 70908526 | 70908526 |
| 608 | Shaft | 70903508 | 70903508 |
| 609 | Shaft | 70905521 | 70905521 |
| 610 | Shaft | 70905522 | 70905516 |
| 611 | Needle Bearing | 42110004 | 42110004 |
| 613 | Bushing | 70908529 | 70908529 |
| * | Screw Kit (Includes screws, pins and grease fittings) | 80143201 | 80143201 |
| 614 | Hex. Drive Socket – 8 mm | 70904707 | 70904570 |
| 614 | Hex. Drive Socket – 10 mm | 70904708 | 70904571 |
| 614 | Hex. Drive Socket – 11 mm | 70904709 | 70904572 |
| 614 | Hex. Drive Socket – 12 mm | 70904710 | 70904578 |
| 614 | Hex. Drive Socket – 5/16 in. | 70904851 | 70904859 |
| 614 | Hex. Drive Socket – 3/8 inn. | 70904852 | 70904759 |
| 614 | Hex. Drive Socket – 7/16 in. | 70904853 | 70904752 |
| 614 | Hex. Drive Socket – 1/2 in. | 70904854 | 70904860 |

* Not illustrated.

## SERIES GH–16 TUBE NUT ATTACHMENT



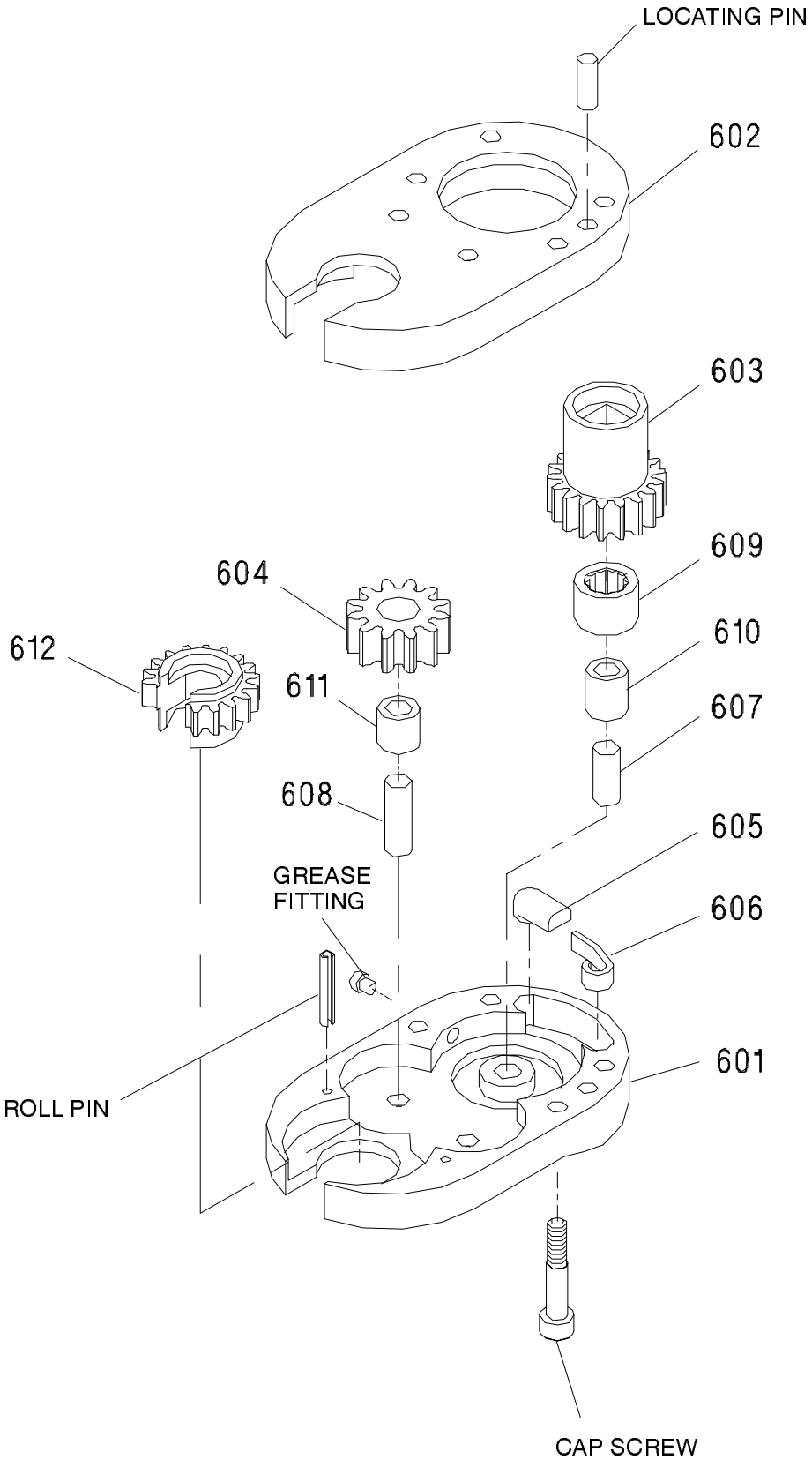

**(Dwg. TPC644)**

PART NUMBER FOR ORDERING

| | | SERIES GH16-14 |
|---|---|---|
| | Tube Nut Attachment | |
| | with 8 mm Hex. Socket | GH16-14-AFO8M |
| | with 10 mm Hex. Socket | GH16-14-AF10M |
| | with 11 mm Hex. Socket | GH16-14-AF11M |
| | with 12 mm Hex. Socket | GH16-14-AF12M |
| | with 7/16 in. Hex. Socket | GH16-14-AF14S |
| | with 1/2 in. Hex. Socket | GH16-14-AF16S |
| 601 | Lower Housing | 70163502 |
| 602 | Upper Housing | 70163501 |
| 603 | Input Spindle Gear | 70901509 |
| 604 | Gear | 70903501 |
| 605 | Idler Gear | 70903508 |
| 606 | Pawl | 70908528 |
| 607 | Spring | 70908526 |
| 608 | Shaft | 70905502 |
| 609 | Shaft | 70906621 |
| 610 | Shaft | 70905516 |
| 611 | Needle Bearing | 42110004 |
| 612 | Bearing Race | 43610001 |
| 613 | Bushing | 70908529 |
| * | Screw Kit (Includes screws, pins, and grease fittings) | 80143201 |
| 614 | Hex. Drive Socket - 8 mm | 70904570 |
| 614 | Hex. Drive Socket - 10 mm | 70904571 |
| 614 | Hex. Drive Socket - 11 mm | 70904572 |
| 614 | Hex. Drive Socket - 12 mm | 70904578 |
| 614 | Hex. Drive Socket - 5/16 in. | 70904859 |
| 614 | Hex. Drive Socket - 3/8 In. | 70904759 |
| 614 | Hex. Drive Socket - 7/16 in. | 70904752 |
| 614 | Hex. Drive Socket - 1/2 in. | 70904860 |

* Not illustrated.

## SERIES GH32 TUBE NUT ATTACHMENT



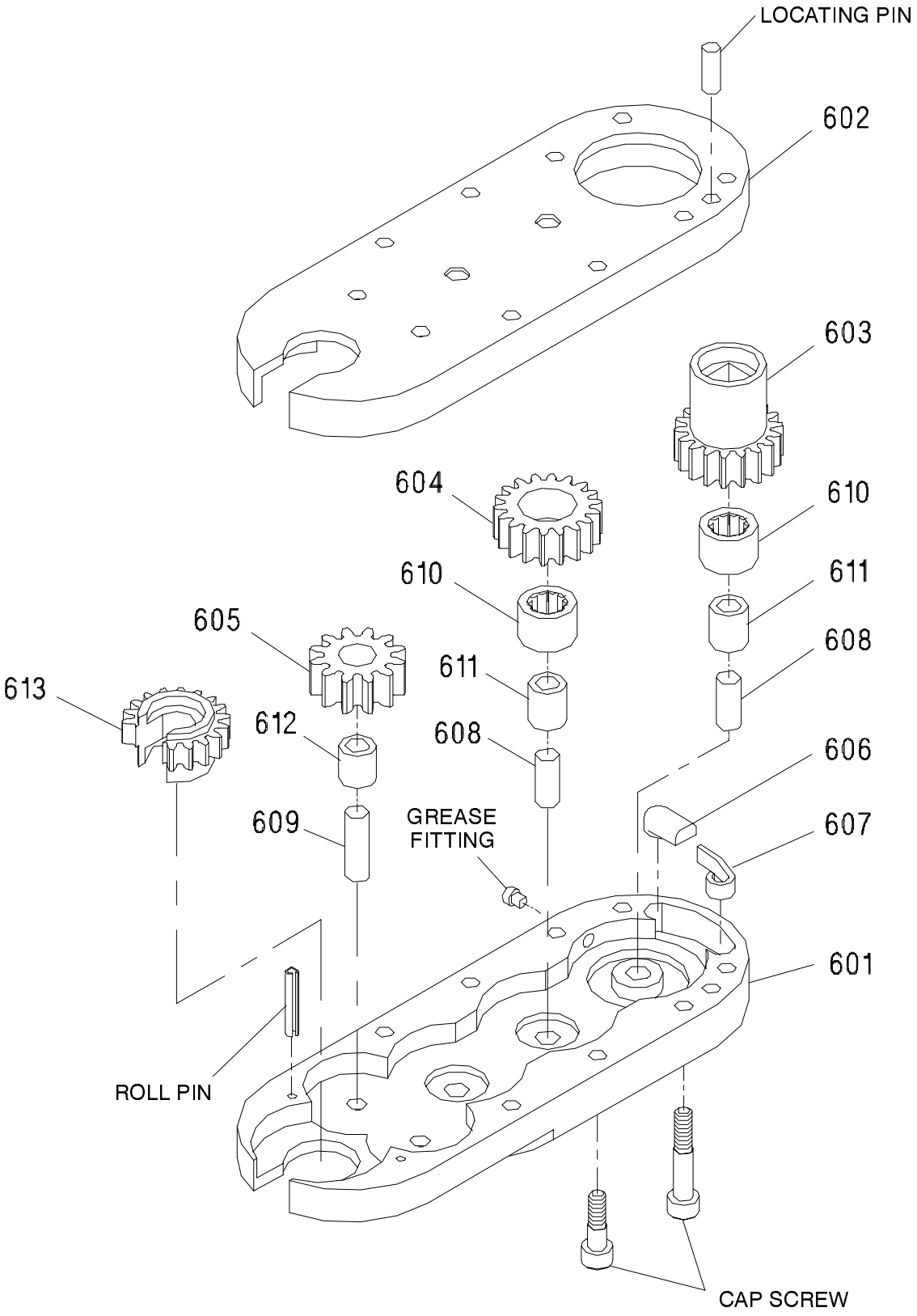

**(Dwg. TPC645)**

PART NUMBER FOR ORDERING

| | | SERIES GH32-16 | SERIES GH32-21 |
|---|---|---|---|
| | Tube Nut Attachment | | |
| | with 11 mm Hex. Socket | GH32-16-AF11M | -------- |
| | with 13 mm Hex. Socket | GH32-16-AF13M | -------- |
| | with 14 mm Hex. Socket | GH32-16-AF14M | GH32-21-AF14M |
| | with 15 mm Hex. Socket | GH32-16-AF15M | GH32-21-AF15M |
| | with 16 mm Hex. Socket | -------- | GH32-21-AF16M |
| | with 17 mm Hex. Socket | -------- | GH32-21-AF17M |
| | with 18 mm Hex. Socket | -------- | GH32-21-AF18M |
| | with 19 mm Hex. Socket | -------- | GH32-21-AF19M |
| | with 22 mm Hex. Socket | -------- | GH32-21-AF22M |
| | with 7/16 in. Hex. Socket | GH32-16-AF14S | -------- |
| | with 3/8 in. Hex. Socket | GH32-16-AF16S | -------- |
| | with 9/16 in. Hex. Socket | GH32-16-AF18S | GH32-21-AF18S |
| | with 5/8 in. Hex. Socket | GH32-16-AF20S | GH32-21-AF20S |
| | with 11/16 in. Hex. Socket | -------- | GH32-21-AF22S |
| | with 3/4 in. Hex. Socket | -------- | GH32-21-AF24S |
| | with 7/8 in. Hex. Socket | -------- | GH32-21-AF28S |
| 601 | Lower Housing | 70163504 | 70306504 |
| 602 | Upper Housing | 70163503 | 70306503 |
| 603 | Input Spindle Gear | 70901518 | 70901505 |
| | Reducer | -------- | 70908568 |
| 604 | Idler Gear | 70903504 | 70903506 |
| 605 | Pawl | 70908528 | 70908505 |
| 606 | Spring | 70908526 | 70908504 |
| 607 | Shaft | 70905502 | 70905510 |
| 608 | Shaft | 70905518 | 70905511 |
| 609 | Needle Bearing | 42110004 | 42110005 |
| 610 | Bearing Race | 43610001 | 43610005 |
| 611 | Bushing | 70908533 | 70908530 |
| * | Screw Kit (Includes screws, pins and grease fittings) | 80324201 | 80326201 |
| 612 | Hex. Drive Socket - 11 mm | 70904735 | -------- |
| 612 | Hex. Drive Socket - 13 mm | 70904612 | -------- |
| 612 | Hex. Drive Socket - 14 mm | 70904614 | 70904602 |
| 612 | Hex. Drive Socket - 15 mm | 70904613 | 70904603 |
| 612 | Hex. Drive Socket - 16 mm | -------- | 70904669 |
| 612 | Hex. Drive Socket - 17 mm | -------- | 70904522 |
| 612 | Hex. Drive Socket - 18 mm | -------- | 70904736 |
| 612 | Hex. Drive Socket - 19 mm | -------- | 70904521 |
| 612 | Hex. Drive Socket - 22 mm | -------- | 70904520 |
| 612 | Hex. Drive Socket - 7/16 in. | 70904728 | -------- |
| 612 | Hex. Drive Socket - 1/2 in. | 70904753 | -------- |
| 612 | Hex. Drive Socket - 9/16 in. | 70904893 | 70904863 |
| 612 | Hex. Drive Socket - 5/8 in. | 70904613 | 70904864 |
| 612 | Hex. Drive Socket - 11/16 in. | -------- | 70904865 |
| 612 | Hex. Drive Socket - 3/4 in. | -------- | 70904866 |
| 612 | Hex. Drive Socket - 7/8 in. | -------- | 70904867 |

* Not illustrated.

## SERIES GH34 TUBE NUT ATTACHMENT




**(Dwg. TPC646)**

PART NUMBER FOR ORDERING

| | | SERIES GH34-16 |
|---|---|---|
| | Tube Nut Attachment | |
| | with 11 mm Hex. Socket | GH34-16-AF11M |
| | with 13 mm Hex. Socket | GH34-16-AF13M |
| | with 14 mm Hex. Socket | GH34-16-AF14M |
| | with 15 mm Hex. Socket | GH34-16-AF15M |
| | with 7/16 in. Hex. Socket | GH34-16-AF14S |
| | with 1/2 in. Hex. Socket | GH34-16-AF16S |
| | with 9/16 in. Hex. Socket | GH34-16-AF18S |
| | with 5/8 in. Hex. Socket | GH34-16-AF20S |
| 601 | Lower Housing | 70344502 |
| 602 | Upper Housing | 70344501 |
| 603 | Input Spindle Gear | 70901518 |
| 604 | Gear | 70903505 |
| 605 | Idler Gear | 70903504 |
| 606 | Pawl | 70908528 |
| 607 | Spring | 70908526 |
| 608 | Shaft | 70905502 |
| 609 | Shaft | 70905518 |
| 610 | Needle Bearing | 42110004 |
| 611 | Bearing Race | 43610001 |
| 612 | Bushing | 70908533 |
| * | Screw Kit (Includes screws, pins, and grease fittings) | 80344201 |
| 613 | Hex. Drive Socket – 11 mm | 70904735 |
| 613 | Hex. Drive Socket – 13 mm | 70904612 |
| 613 | Hex. Drive Socket – 14 mm | 70904614 |
| 613 | Hex. Drive Socket – 15 mm | 70904613 |
| 613 | Hex. Drive Socket – 7/16 in. | 70904728 |
| 613 | Hex. Drive Socket – 1/2 in. | 70904753 |
| 613 | Hex. Drive Socket – 9/16 in. | 70904893 |
| 613 | Hex. Drive Socket – 5/8 in. | 70904613S |

* Not illustrated.

### Disassembly of the Tube Nut Attachment

The Tube Nut Attachment is fastened to the Angle Head with an adapter which can consist of either one or two parts. When the two part adapter is required, the inner adapter replaces the Spindle Bearing Cap on the Angle Head. The outer adapter, which includes the four threaded mounting holes for the Tube Nut Attachment, is welded to the Angle Head.

1. Release the Tube Nut Attachment from the Adapter by removing the four cap screws from the bottom of the Tube Nut Attachment. Separate the Tube Nut Attachment and the Adapter.

**CAP SCREW INFORMATION TABLE**

| Tube Nut Attachment Model | Cap Screw Size | Wrench Size (mm) | Torque Ncm |
|---|---|---|---|
| GH12 | M3 | 2.5 | 225 |
| GH14 | M3 | 2.5 | 225 |
| GH16 | M3 | 2.5 | 25 |
| GH32 | M4 | 3 | 515 |
| GH34 | M4 | 3 | 515 |

2. It is now possible to perform repairs to the Angle Head, if required. Information concerning details about repairs to the Angle Head appears in this document.

**NOTICE**

**The housing parts of the shorter Tube Nut Attachment (two gear stages) are held together by the four cap screws that tighten the Tube Nut Attachment. The housing parts of the longer Tube Nut Attachment (more than two stages) have additional cap screws that need to be loosened before the housing parts can be disassembled.**

**⚠ WARNING**

**Never use a screwdriver and hammer or other tools to separate the two housing parts. Do not clamp the housing parts in a vise while performing repair work.**

3. **To disassemble Tube Nut Attachments with two gear stages:**
   Hold the Tube Nut Attachment in one hand with the Input Spindle Gear facing upward in such a way that the hand mainly holds the upper housing part. Tap the Input Shaft gently with a plastic hammer until the two housing parts separate.
   **To disassemble Tube Nut Attachments with more than two gear stages:**
   Unscrew the cap nuts holding the housing parts together and replace them with longer screws and turn these screws a few turns into the housing. Hold the Tube Nut Attachment in one hand with the Input Spindle Gear facing upward in such a way that the hand mainly holds the upper housing part. Tap the input shaft gently with a plastic hammer until the two housing parts separate. The upper housing part can be lifted carefully from the lower housing part while all internal parts remain in the lower housing.

### Assembly of the Tube Nut Attachment

1. Before assembly, lubricate all parts lightly with Ingersoll-Rand No. 90 high performance grease. **DO NOT OVER LUBRICATE.** Place all the internal parts in their proper positions in the lower housing. Set the upper housing in place.
2. Make certain that the ratcheting parts are positioned in such a way that the output gear is completely in open position when the Input Spindle Gear is rotated in reverse direction against the ratcheting pawl. Install the upper housing.
3. It may be necessary to carefully apply some clamping pressure from a vise or press to the housing parts in order to properly fit them together. Use clamping tools with caution to prevent distortion of the housings.
4. If the Inner Adapter or Spindle Bearing Cap has been removed from the Angle Head, check the Angle Head assembly section of this document for the correct assembly procedure. Make sure that the inner Adapter or Spindle Bearing Cap is tightened to the appropriate torque as shown in the table below.

**TORQUE TABLE**

| Angle Head Model | Spindle Bearing Cap and Adapter Torque Nm |
|---|---|
| DAA2S6 | 20 |
| DAA3S6 | 34 |

* Product of National Starch and Chemical Corporation.

5. Most Tube Nut Attachments can be mounted to the Angle Head in three different positions, straight forward, rotated right or rotated left a specified number of degrees (See the data sheet for standard locations). Any variance to standard location must be specified in the tool order. Make certain that the Location Pin is in place before assembling the Tube Nut Attachment to the Angle Head.
6. **To assemble Tube Nut Attachments with two gear stages:**
   Connect the Tube Nut Attachment to the Angle Head by installing and Hand tightening the four cap screws.
   **To assemble Tube Nut Attachments with more than two gear stages:**
   Hand tighten the cap screws that hold the housings together. Connect the Tube Nut Attachment to the Angle Head by installing and hand tightening the four remaining cap screws.
7. Hold the assembled unit and manually rotate the Bevel Pinion shaft which protrudes from the Angle Head. Make certain that the shaft turns freely and easily.
8. Tighten all cap screws to the required torque (See the cap screw information table) while continuously rotating the Bevel Pinion shaft. Make certain that the shaft continues to rotate freely and easily.
9. Connect the Angle Head to the Power Unit and tighten the Coupling Nut to the torque listed in the specification table on page 6–3 of this document.
10. Inject 0.5 cc of Ingersoll–Rand No. 90 high performance grease into the grease fitting on the Tube Nut Attachments with two gear stages and 1 cc into the grease fitting of Tube Nut Attachments with more than two gear stages.
11. Make certain that the Wrench runs smoothly after assembly.

### Disassembly of the Angle Head

1. Carefully grasp the hex of the Gear Case Assembly in copper–covered or leather–covered vise jaws with the Angle Housing Assembly (600) downward.

**NOTICE**

**In the following step, the Coupling Nut (610) has a left–hand thread.**

2. Using a wrench on the flats of the Coupling Nut (610), loosen the Coupling Nut from the Gear Case. Remove the tool from the vise. Unscrew the Coupling Nut and separate the Angle Housing Assembly from the Gear Case.
3. Carefully grasp the Angle Housing Assembly in copper–covered or leather–covered vise jaws with the Tube Nut Attachment facing upward.
4. **For Tube Nut Attachment models GH12, GH14, and GH16,** use a 2.5 mm hex wrench to remove the screws that secure the Attachment to the Angle Housing and lift the Attachment off the Angle Housing.
   **For Tube Nut Attachment models GH32 and GH34,** use a 3 mm hex wrench to remove the screws that secure the Attachment to the Angle Housing and lift the Attachment off the Angle Housing.
5. **For DAT3 Angle Head Modules,** remove the loose pilot cap from the Angle Housing.

**NOTICE**

**In the following step, the Spindle Bearing Cap (610) has a left–hand thread.**

6. Using the Spindle Bearing Cap Wrench (619), unscrew and remove the Spindle Bearing Cap (618).
   **For DAT2 Angle Head Modules,** if the Spindle Seal (617) is damaged, remove it. Withdraw the Spindle from the Angle Housing.
7. Inspect the Lower Spindle Bearing (613) for looseness or roughness. If either of these conditions exists, replace the Bearing as follows:

   **For DAT2 Angle Head Modules**
   a. Grasp the square drive end of the Spindle in copper–covered vise jaws.
   b. Unscrew the Bevel Gear Retainer (612) and lift the Bevel Gear (609) off the Spindle.
   c. Press the Lower Spindle Bearing from the Spindle.

   **For DAT3 Angle Head Modules**
   a. Remove the Bevel Gear Retainer (612).
   b. Press the Bevel Gear (609) from the Spindle.
   c. Press the Lower Spindle Bearing from the Spindle.

**NOTICE**

**In the next step, do not remove the Upper Spindle Bearing unless you have a new Bearing ready to install. This type of Bearing is always damaged during the removal process.**

**NOTICE**

**The DAT3 Angle Head Modules will require a new Angle Housing Cap (603) when the Upper Spindle Bearing is installed.**

* Product of National Starch and Chemical Corporation.

7. If the Upper Spindle Bearing (602) appears rough or loose, press it from the Angle Housing
8. Remove the Orientation Ring Retainer (605) and slide the Housing Orientation Ring (604), Thrust Bearing (606) and Thrust Washer (607) from the pinion shaft.

**NOTICE**

**In the following step, do not remove the Bevel Pinion and Bearing unless you have a new Bearing on hand. After the Angle Head is disassembled, check all parts for damage or wear.**

9. Grasp the splined end of the pinion shaft in copper–covered vise jaws and while gently tapping the rear face of the Angle Head with a soft hammer, pull the Bevel Pinion (609) and Bevel Pinion Bearing (608) from the Angle Head.

**NOTICE**

**If the gear teeth on either the Bevel Pinion or Bevel Gear are worn or chipped, replace both parts. These are a matched set and must be replaced with another matched set.**

**NOTICE**

**The Bevel Gear and Bevel Pinion are specially matched sets. Some sets are color coded for manufacturing purposes only. Only the Gear and Pinion set furnished as a replacement part or the same Gear and Pinion set removed from one tool, is a matched set. A Bevel Gear from one tool used with a Bevel Pinion from another tool with the same color code IS NOT A MATCHED SET. Replace these parts only as a matched set. Failure to do so will result in unsatisfactory tool performance and damage to the Bevel Gear and Bevel Pinion.**

### Assembly of the Angle Head

1. **For DAT2 Angle Heads,** lubricate the Bevel Pinion (609) with 2 to 4 cc of Ingersoll–Rand No. 67 Grease and insert it, gear end first, into the long bore of the Angle Housing (600).
   **For DAT3 Angle Heads,** lubricate the Bevel Pinion (609) with 3 to 5 cc of Ingersoll–Rand No. 67 Grease and insert it, gear end first, into the long bore of the Angle Housing (600).

**NOTICE**

**The Bevel Gear and Bevel Pinion are specially matched sets. Some sets are color coded for manufacturing purposes only. Only the Gear and Pinion set furnished as a replacement part or the same Gear and Pinion set removed from one tool, is a matched set. A Bevel Gear from one tool used with a Bevel Pinion from another tool with the same color code IS NOT A MATCHED SET. Replace these parts only as a matched set. Failure to do so will result in unsatisfactory tool performance and damage to the Bevel Gear and Bevel Pinion.**

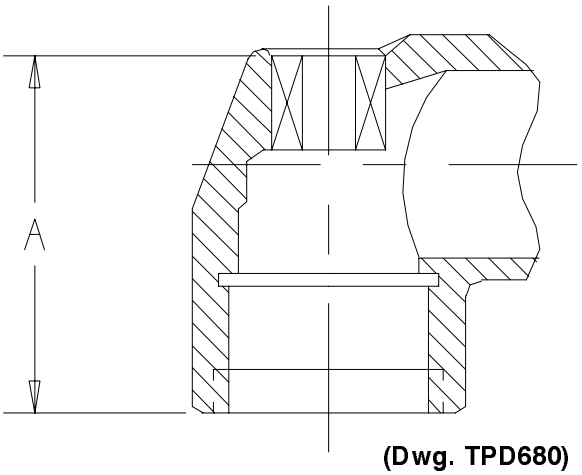
2. Insert the Bevel Pinion Bearing (608), unstamped end first, into the bore of the Angle Housing and onto the bevel pinion shaft (609).
3. **For DAT2 Angle Heads,** use a cylinder that has a .573" (14.55 mm) I.D. and a .755" (19.18 mm) O.D. and is 1.411" (35.84 mm) long and press the Bevel Pinion Bearing so the stamped face is a maximum of 1.416" (35.96 mm), but not less than 1.406" (35.71 mm) below the end face of the Angle Housing.
   **For DAT3 Angle Heads,** use a cylinder that has a .699" (17.75 mm) I.D. and a .965" (24.51 mm) O.D. and is 1.255" (31.88 mm) long and press the Bevel Pinion Bearing so the stamped face is a maximum of 1.26" (32.0 mm), but not less than 1.25" (31.75 mm) below the end face of the Angle Housing.
4. Install, in the order named, the Thrust Washer (607), Thrust Bearing (606) and Housing Orientation Ring (604) over the splined end of the Bevel Pinion and retain the components by installing the Orientation Ring Retainer (605) on the pinion shaft.
5. If the Lower Spindle Bearing (613) has been removed, proceed as follows:
   a. **For DAT2 Angle Heads,** using a sleeve that will contact the inner ring of the Bearing, press the Bearing, sealed side first, onto the Spindle (614).
      **For DAT3 Angle Heads,** using a sleeve that will contact the inner ring of the Bearing, press the Bearing onto the Spindle (614). Press on the stamped side of the Bearing with the side marked with red toward the spindle shoulder.
   b. **For DAT2 Angle Heads,** slide the Bevel Gear (609) onto the Spindle.
      For DAT3 Angle Heads, align the internal flats of the Bevel Gear (609) with the flats on the Spindle and press the Bevel Gear onto the Spindle.
   c. **For DAT2 Angle Head,** apply a drop of Perma bond Surface Conditioner II * to the threads of the Bevel Gear Retainer (612) and Spindle and allow it to cure for five minutes. Apply Perma–Lok HF–138 * to the threads of the Bevel Gear Retainer and tighten it on the Spindle between 8 and 12 ft–lb (11 and 16 Nm) torque.
      **For DAT3 Angle Heads,** spread the Bevel Gear Retainer (612) and slip it over the end of the Spindle. Slide the Retainer down the Spindle and into the groove around the Spindle to retain the Bevel Gear.

* Product of National Starch and Chemical Corporation.

**NOTICE**

**In the following step, press on the stamped face of the Bearing. Failure to do so will cause damage to the Bearing.**

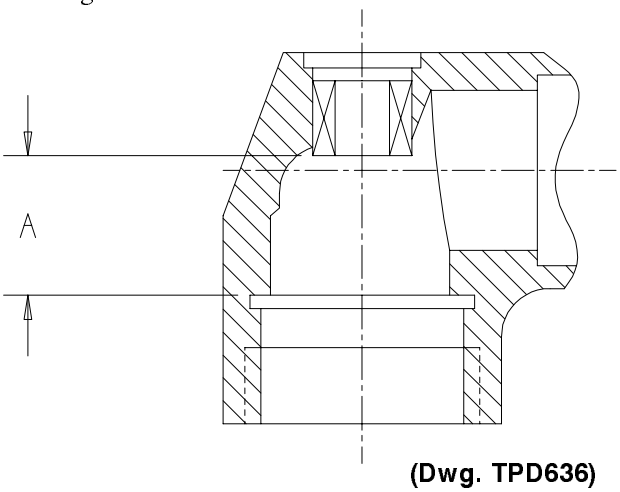
6. If the Upper Spindle Bearing (602) has been removed, proceed as follows:
   **For DAT2 Angle Heads,** press on the closed end of a new Spindle Bearing entering the Bearing into the small bore opposite the threaded end of the Angle Head to the dimension shown in Drawing TPD680.




**(Dwg. TPD680)**

| Minimum Dimension "A" | |
|---|---|
| **in** | **mm** |
| 1.21 | 30.75 |
| **Maximum Dimension "A"** | |
| **in** | **mm** |
| 1.27 | 32.25 |

   **For DAT3 Angle Heads,** press a new Spindle Bearing into the Angle Head from the large threaded end to the dimension shown in Drawing TPD636. Install a new Angle Housing Cap (603) into the top of the Angle Head.




**(Dwg. TPD636)**

| Minimum Dimension "A" | |
|---|---|
| **in** | **mm** |
| 0.718 | 18.25 |
| **Maximum Dimension "A"** | |
| **in** | **mm** |
| 0.728 | 18.50 |

7. **For DAT2 Angle Heads,** apply 2 to 4 cc of Ingersoll–Rand No. 67 Grease to the Bevel Gear. Lubricate the Upper Spindle Bearing and Lower Spindle Bearing and install the Spindle in the Angle Housing.
   **For DAT3 Angle Heads,** apply 3 to 5 cc of Ingersoll–Rand No. 67 Grease to the Bevel Gear. Lubricate the Upper Spindle Bearing and Lower Spindle Bearing and install the Spindle in the Angle Housing.
8. Clean the threads on the Angle Housing and the Spindle Bearing Cap (618) and apply a film of Perma–Lok MM–115* to the threads.
9. **For DAT2 Angle Heads,** install the Spindle Seal (617). Using the Spindle Bearing Cap Wrench (619), install the Spindle Bearing Cap and tighten the Cap between 15 and 20 ft–lb (20 and 27 Nm) torque.
   For DAT3 Angle Heads, using the Spindle Bearing Cap Wrench (619), install the Spindle Bearing Cap and tighten the Cap between 20 and 25 ft–lb (27 and 34 Nm) torque.
10. If the Coupling Nut (610) was removed, slide the Coupling Nut, threaded end trailing, over the motor end of the Angle Housing. Apply the Coupling Nut Retainer (611) to the external groove on the motor end of the Angle Housing.
11. Engage the spline on the Bevel Pinion with the matching internal spline of the Spindle Planet Gear Head and thread the Coupling Nut onto the Gear Case. Orient the Angle Head to the desired position and tighten the Coupling Nut between 25 and 30 ft–lbs. (27 and 40 Nm) torque.

* Product of National Starch and Chemical Corporation.

**TROUBLESHOOTING GUIDE**

| Trouble | Probable Cause | Solution |
|---|---|---|
| Tube Nut Attachment gets hot | Excessive grease | Clean and inspect the Tube Attachment. Lubricate per instructions on page 6–5. |
| | Inadequate grease | Inject grease into the Grease Fitting on the Lower Housing. Lubricate per instructions on page 6–5. |
| | Worn or damaged parts | Clean and inspect the gears for broken teeth. Clean and inspect the Bearings for freedom of action, Lubricate per instructions on page 6–5. |
| Angle Head gets hot | Excessive grease | Clean and inspect the Angle head and gearing parts. Lubricate as instructed. |
| | Inadequate grease | Inject 0.5 to 1.5 cc of grease into the Grease Fitting. |
| | Worn or damaged parts | Clean and inspect the Angle Head and gearing parts. If the Bevel Gear and/or Bevel Pinion is worn or broken, replace both parts as they are a matched set. |

**NOTICE**

**SAVE THESE INSTRUCTIONS. DO NOT DESTROY.**

PART NUMBER FOR ORDERING

| | | SERIES GH34-16 |
|---|---|---|
| | Tube Nut Attachment | |
| | with 11 mm Hex. Socket | GH34–16–AF11M |
| | with 13 mm Hex. Socket | GH34–16–AF13M |
| | with 14 mm Hex. Socket | GH34–16–AF14M |
| | with 15 mm Hex. Socket | GH34–16–AF15M |
| | with 7/16 in. Hex. Socket | GH34–16–AF14S |
| | with 1/2 in. Hex. Socket | GH34–16–AF16S |
| | with 9/16 in. Hex. Socket | GH34–16–AF18S |
| | with 5/8 in. Hex. Socket | GH34–16–AF20S |
| 601 | Lower Housing | 70344502 |
| 602 | Upper Housing | 70344501 |
| 603 | Input Spindle Gear | 70901518 |
| 604 | Gear | 70903505 |
| 605 | Idler Gear | 70903504 |
| 606 | Pawl | 70908528 |
| 607 | Spring | 70908526 |
| 608 | Shaft | 70905502 |
| 609 | Shaft | 70905518 |
| 610 | Needle Bearing | 42110004 |
| 611 | Bearing Race | 43610001 |
| 612 | Bushing | 70908533 |
| * | Screw Kit (Includes screws, pins and grease fittings) | 80344201 |
| 613 | Hex. Drive Socket – 11 mm | 70904735 |
| | Hex. Drive Socket – 13 mm | 70904612 |
| | Hex. Drive Socket – 14 mm | 70904614 |
| | Hex. Drive Socket – 15 mm | 70904613 |
| | Hex. Drive Socket – 7/16 in. | 70904728 |
| | Hex. Drive Socket – 1/2 in. | 70904753 |
| | Hex. Drive Socket – 9/16 in. | 70904893 |
| | Hex. Drive Socket – 5/8 in. | 70904613S |

* Not illustrated.

INSERT DRAWING TPC 643

| | | PART NUMBER FOR ORDERING SERIES GH14-14 | SERIES GH14-14 |
|---|---|---|---|
| | Tube Nut Attachment | | |
| | with 8 mm Hex. Socket | GH14–12–AF08M | GH14–14–AFO8M |
| | with 10 mm Hex. Socket | GH14–12–AF10M | GH14–14–AF10M |
| | with 11 mm Hex. Socket | GH14–12–AF11M | GH14–14–AF11M |
| | with 12 mm Hex. Socket | GH14–12–AF12M | GH14–14–AF12M |
| | with 5/16 in. Hex. Socket | GH14–12–AF10S | GH14–14–AF10S |
| | with 3/8 in. Hex. Socket | GH14–12–AF12S | GH14–14–AF12S |
| | with 7/16 in. Hex. Socket | GH14–12–AF14S | GH14–14–AF14S |
| | with 1/2 in. Hex. Socket | GH14–12–AF16S | GH14–14–AF16S |
| 601 | Lower Housing | 70147502 | 70143502 |
| 602 | Upper Housing | 70143501 | 70143501 |
| 603 | Input Spindle Gear | 70901509 | 70901509 |
| 604 | Gear | 70903501 | 70903501 |
| 605 | Idler Gear | 70903508 | 70903508 |
| 606 | Pawl | 70908528 | 70908528 |
| 607 | Spring | 70908526 | 70908526 |
| 608 | Shaft | 70903508 | 70903508 |
| 609 | Shaft | 70905521 | 70905521 |
| 610 | Shaft | 70905522 | 70905516 |
| 611 | Needle Bearing | 42110004 | 42110004 |
| 613 | Bushing | 70908529 | 70908529 |
| 613 | Bushing | 70908529 | 70908529 |
| 614 | Hex. Drive Socket – 8 mm | 70904707 | 70904570 |
| | Hex. Drive Socket – 10 mm | 70904708 | 70904571 |
| | Hex. Drive Socket – 11 mm | 70904709 | 70904572 |
| | Hex. Drive Socket – 12 mm | 70904710 | 70904578 |
| | Hex. Drive Socket – 5/16 in. | 70904851 | 70904859 |
| | Hex. Drive Socket – 3/8 inn. | 70904852 | 70904759 |
| | Hex. Drive Socket – 7/16 in. | 70904853 | 70904752 |
| | Hex. Drive Socket – 1/2 in. | 70904854 | 70904860 |

INSERT DRAWING TPC 644

(DRAWING TPC 644)

PART NUMBER FOR ORDERING

| | | SERIES GH16-14 |
|---|---|---|
| | Tube Nut Attachment | |
| | with 8 mm Hex. Socket | GH16-14-AFO8M |
| | with 10 mm Hex. Socket | GH16-14-AF10M |
| | with 11 mm Hex. Socket | GH16-14-AF11M |
| | with 12 mm Hex. Socket | GH16-14-AF12M |
| | with 7/16 in. Hex. Socket | GH16-14-AF14S |
| | with 1/2 in. Hex. Socket | GH16-14-AF16S |
| 601 | Lower Housing | 70163502 |
| 602 | Upper Housing | 70163501 |
| 603 | Input Spindle Gear | 70901509 |
| 604 | Gear | 70903501 |
| 605 | Idler Gear | 70903508 |
| 606 | Pawl | 70908528 |
| 607 | Spring | 70908526 |
| 608 | Shaft | 70905502 |
| 609 | Shaft | 70906621 |
| 610 | Shaft | 70905516 |
| 611 | Needle Bearing | 42110004 |
| 612 | Bearing Race | 43610001 |
| 613 | Bushing | 70908529 |
| * | Screw Kit (Includes screws, pins, and grease fittings) | 80143201 |
| 614 | Hex. Drive Socket – 8 mm | 70904570 |
| | Hex. Drive Socket – 10 mm | 70904571 |
| | Hex. Drive Socket – 11 mm | 70904572 |
| | Hex. Drive Socket – 12 mm | 70904578 |
| | Hex. Drive Socket – 5/16 in. | 70904859 |
| | Hex. Drive Socket – 3/8 In. | 70904759 |
| | Hex. Drive Socket – 7/16 in. | 70904752 |
| | Hex. Drive Socket – 1/2 in. | 70904860 |

INSERT DRAWING TPC 645

PART NUMBER FOR ORDERING

| | | SERIES GH32-16 |
|---|---|---|
| | Tube Nut Attachment | |
| | with 11 mm Hex. Socket | GH32–16–AF11M |
| | with 13 mm Hex. Socket | GH32–16–AF13M |
| | with 14 mm Hex. Socket | GH32–16–AF14M |
| | with 15 mm Hex. Socket | GH32–16–AF15M |
| | with 7/16 in. Hex. Socket | GH32–16–AF14S |
| | with 3/8 in. Hex. Socket | GH32–16–AF16S |
| | with 9/16 in. Hex. Socket | GH32–16–AF18S |
| | with 5/8 in. Hex. Socket | GH32–16–AF20S |
| 601 | Lower Housing | 70163504 |
| 602 | Upper Housing | 70163503 |
| 603 | Input Spindle Gear | 70901518 |
| 604 | Idler Gear | 70903504 |
| 605 | Pawl | 70908528 |
| 606 | Spring | 70908526 |
| 607 | Shaft | 70905502 |
| 608 | Shaft | 70905518 |
| 609 | Needle Bearing | 42110004 |
| 610 | Bearing Race | 43610001 |
| 611 | Bushing | 70908533 |
| * | Screw Kit (Includes screws, pins, and grease fittings) | 80324201 |
| 612 | Hex. Drive Socket – 11 mm | 70904735 |
| | Hex. Drive Socket – 13 mm | 70904612 |
| | Hex. Drive Socket – 14 mm | 70904614 |
| | Hex. Drive Socket – 15 mm | 70904613 |
| | Hex. Drive Socket – 7/16 in. | 70904728 |
| | Hex. Drive Socket – 1/2 in. | 70904753 |
| | Hex. Drive Socket – 9/16 in. | 70904893 |
| | Hex. Drive Socket – 5/8 in. | 70904613S |

PART NUMBER FOR ORDERING

| | | SERIES GH32-21 |
|---|---|---|
| | Tube Nut Attachment | |
| | with 14 mm Hex. Socket | GH32-21-AF14M |
| | with 15 mm Hex. Socket | GH32-21-AF15M |
| | with 16 mm Hex. Socket | GH32-21-AF16M |
| | with 17 mm Hex. Socket | GH32-21-AF17M |
| | with 18 mm Hex. Socket | GH32-21-AF18M |
| | with 19 mm Hex. Socket | GH32-21-AF19M |
| | with 22 mm Hex. Socket | GH32-21-AF22M |
| | with 9/16 in. Hex. Socket | GH32-21-AF18S |
| | with 5/8 in. Hex. Socket | GH32-21-AF20S |
| | with 11/16 in. Hex. Socket | GH32-21-AF22S |
| | with 3/4 in. Hex Socket | GH32-21-AF24S |
| | with 7/8 in. Hex. Socket | GH32-21-AF28S |
| 601 | Lower Housing | 70306504 |
| 602 | Upper Housing | 70306503 |
| 603 | Input Spindle Gear | 70901505 |
| | Reducer | 70908568 |
| 604 | Idler Gear | 70903506 |
| 605 | Pawl | 70908505 |
| 606 | Spring | 70908504 |
| 607 | Shaft | 70905510 |
| 608 | Shaft | 70905511 |
| 609 | Needle Bearing | 42110005 |
| 610 | Bearing Race | 43610005 |
| 611 | Bushing | 70908530 |
| * | Screw Kit (Includes screws, pins and grease fittings) | 80326201 |
| 612 | Hex. Drive Socket – 14 mm | 70904602 |
| | Hex. Drive Socket – 15 mm | 70904603 |
| | Hex. Drive Socket – 16 mm | 70904669 |
| | Hex. Drive Socket – 17 mm | 0904522 |
| | Hex. Drive Socket – 18 mm | 70904521 |
| | Hex. Drive Socket – 19 mm | 70904521 |
| | Hex. Drive Socket – 22 mm | 70904520 |
| | Hex. Drive Socket – 9/16 in. | 70904863 |
| | Hex. Drive Socket – 5/8 in. | 70904864 |
| | Hex. Drive Socket – 11/16 in. | 70904865 |
| | Hex. Drive Socket – 3/4 in. | 70904866 |
| | Hex. Drive Socket – 7/8 in. | 70904867 |

(DRAWING TPC 646)

PART NUMBER FOR ORDERING

| | | SERIES GH34-16 |
|---|---|---|
| | Tube Nut Attachment | |
| | with 11 mm Hex. Socket | GH34-16-AF11M |
| | with 13 mm Hex. Socket | GH34-16-AF13M |
| | with 14 mm Hex. Socket | GH34-16-AF14M |
| | with 15 mm Hex. Socket | GH34-16-AF15M |
| | with 7/16 in. Hex. Socket | GH34-16-AF14S |
| | with 1/2 in. Hex. Socket | GH34-16-AF16S |
| | with 9/16 in. Hex. Socket | GH34-16-AF18S |
| | with 5/8 in. Hex. Socket | GH34-16-AF20S |
| 601 | Lower Housing | 70344502 |
| 602 | Upper Housing | 70344501 |
| 603 | Input Spindle Gear | 70901518 |
| 604 | Gear | 70903505 |
| 605 | Idler Gear | 70903504 |
| 606 | Pawl | 70908528 |
| 607 | Spring | 70908526 |
| 608 | Shaft | 70905502 |
| 609 | Shaft | 70905518 |
| 610 | Needle Bearing | 42110004 |
| 611 | Bearing Race | 43610001 |
| 612 | Bushing | 70908533 |
| * | Screw Kit (Includes screws, pins, and grease fittings) | 80344201 |
| 613 | Hex. Drive Socket - 11 mm | 70904735 |
| | Hex. Drive Socket - 13 mm | 70904612 |
| | Hex. Drive Socket - 14 mm | 70904614 |
| | Hex. Drive Socket - 15 mm | 70904613 |
| | Hex. Drive Socket - 7/16 in. | 70904728 |
| | Hex. Drive Socket - 1/2 in. | 70904753 |
| | Hex. Drive Socket - 9/16 in. | 70904893 |
| | Hex. Drive Socket - 5/8 in. | 70904613S |