16575136
Edition 3
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Air Angle Wrenches

9RS, 9S and 9T Series

Maintenance Information

Save These Instructions

Ingersoll Rand

Product Safety Information

⚠ WARNING

- Failure to observe the following warnings, and to avoid these potentially hazardous situations, could result in death or serious injury.
- Read and understand this and all other supplied manuals before installing, operating, repairing, maintaining, changing accessories on, or working near this product.
- Always wear eye protection when operating or performing maintenance on this tool. The grade of protection required should be assessed for each use and may include impact resistant glasses with side shields, goggles, or a full face shield over those glasses.
- Always turn off the air supply, bleed the air pressure and disconnect the air supply hose when not in use, before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool or any accessory.

Note: *When reading the instructions, refer to exploded diagrams in Parts Information Manuals when applicable (see under Related Documentation for form numbers).*

Lubrication

Each time the Series 9RS, 9S and 9T Angle Wrenches are disassembled for maintenance, repair or replacement of parts, lubricate the tool as follows:

1. Work 2 to 3 cc of **Ingersoll Rand** No. 28 Grease into the Upper Spindle Bearing (103), Bevel Pinion Bearing (106), Bevel Pinion Thrust Bearing (110), Spindle Bearing (96), and the Planet Gear Bearings and Rollers.
2. Apply approximately 30 cc of **Ingersoll Rand** No. 66 Grease to the Bevel Gear (105) and Bevel Pinion (104).
3. Inject approximately 2-1/2 cc of **Ingersoll Rand** No. 10 Oil into the air inlet before attaching the air hose.

Disassembly

General Instructions

1. Do not disassemble the tool any further than necessary to replace or repair damaged parts.
2. Whenever grasping a tool or part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members and housings.
3. Do not remove any part which is a press fit in or on a subassembly unless the removal of that part is necessary for repairs or replacement.
4. Do not disassemble the tool unless you have a complete set of new gaskets and O-rings for replacement.
5. Do not press any needle bearing from a part unless you have a new needle bearing on hand for installation. Needle bearings are always damaged during the removal process.

Disassembly of the Angle Attachment

1. With the Gear Case Assembly (76) clamped in leather-covered or copper-covered vise jaws with the Angle Housing Assembly (100) upward, unscrew the Attachment Coupling Nut (124).
2. Carefully separate the Angle Housing Assembly from the Gear Case Assembly.

NOTICE

The Spindle Bearing Cap (122) has left-hand threads. Because an adhesive is used on the threads, it may be necessary to apply moderate heat to release the bond.

⚠ CAUTION

If the application of heat is necessary, apply it only to the area of the Angle Housing Assembly directly over the threads. If this procedure is not followed, the Lower Spindle Bearing (118) may be damaged.

3. Using the No. WFS182-26 Bearing Cap Wrench for the No. 8SA53 Angle Head, or using the No. 8SA32-26 Bearing Cap Wrench for the No. 8SA32 Angle Head, unscrew the Spindle Bearing Cap (122).

⚠ CAUTION

If more than one angle head is disassembled at a time, take care not to mix Bevel Gears (105) and Bevel Pinions (104) from different Angle Heads. These gear sets are specially matched and are available only as matched sets.

4. Withdraw the Socket Adapter Spindle Assembly (114) from the Angle Housing.
5. If required, remove the Bevel Gear Retainer (119) or Bevel Gear Lock Nut (120), the Bevel Gear (105), and the Lower Spindle Bearing (118) from the Socket Adapter Spindle Assembly.
6. If required, release the Socket Retainer (115) by removing the Socket Retainer Spring (116).
7. Remove the Bevel Pinion Snap Ring (112) and slip the Bevel Pinion Retainer (113), Bevel Pinion Thrust Bearing (110), and Bevel Pinion Thrust Washer (111) from the Bevel Pinion shaft.
8. Remove the Bevel Spacer Retainer (121) and withdraw the Bevel Pinion Bearing Spacer (107).

⚠ CAUTION

Do not remove the Pinion from Bevel Pinion Bearing (106) unless you have a new Bearing available.

9. Grasping the bevel pinion shank in leather-covered or copper-covered vise jaws, pull the Pinion from the Angle Housing. Rapping the open end of the Housing with a soft-faced hammer may help remove the Bevel Pinion/Bearing Assembly.
10. Press the Angle Housing Cap (101) and Upper Spindle Bearing (103) out of the Angle Housing Assembly.

Disassembly of Gearing Case Assembly

1. Clamp the Gear Case Assembly (76) in leather-covered or copper-covered vise jaws horizontally.
2. Carefully unscrew the Motor Housing Assembly (1) from the Gear Case.

NOTICE

The rear Spindle Bearing (89), Gear Head Bearing (90), and the Motor Clamp Washer (75) will either stay with the Motor Housing Assembly or the Gear Case Assembly.

3. Remove the Motor Clamp Washer and either Bearing if they stay with the Gear Case Assembly.
   For N, P, or Q Gear Ratios only
4. Remove the Gear Head (78).

NOTICE

The Planet Gear Assembly (79) holds the Rotor Pinion (82) in place.

5. Remove the Planet Gear Shaft (81) that secures the Planet Gear Assembly.
6. Remove the Rotor Pinion.

7. If required, remove the Planet Gear Bearing (80) from the Planet Gear Assembly.
   For all Ratios
8. Remove the Spindle Assembly.
9. Press the Planet Gear Shaft (87) from the splined end of the Spindle Assembly.

Disassembly of Motor

1. Grasp the shaft of the Rotor (38) in leather-covered or copper-covered vise jaws and pull the assembled motor from the Motor Housing Assembly (1).
2. Remove the Front Rotor Bearing Retainer (51) and the Front Rotor Bearing Support Assembly (50).
3. Holding the Cylinder (46), tap the splined end of the Rotor with a light, plastic-faced hammer to remove the Front Rotor Bearing (48), and Front End Plate (47).
4. Remove the Cylinder and Vanes (39) from the Rotor.
5. Remove the Rear Bearing Support Gasket (41) and the Rear Rotor Bearing Support (40).
6. Remove the Rotor Bearing Retaining Nut (43), the Rear Rotor Bearing (42), the Rear End Plate Gasket (44), and the Rear End Plate (45).
7. Examine all motor parts for wear or damage as follows:
   a. **Vanes** - Check for evidence of cracking, chipping or spalling. Replace the complete set of Vanes if any of these conditions exists.
   b. **Rotor Bearings** - Check for looseness or roughness. Replace a Bearing if either condition is detected.
   c. **Cylinder** -Examine the bore. If it is cracked, wavy or rough, replace the Cylinder.
   d. **End Plates** - Examine the rotor side for scoring. Polish out shallow score marks using fine (320 grit) emery cloth placed on a hard, flat surface. Replace End Plates having deep score marks.
   e. **Rotor** - Polish the ends of the Rotor with fine emery cloth to remove score marks. Check the spline for excessive wear. Replace a Rotor with a worn or broken spline.

Disassembly of the Throttle Mechanism

1. Clamp the Motor Housing Assembly (1) in leather-covered or copper-covered vise jaws with the Throttle Lever (29) upward.
2. Drive the Throttle Lever Retaining Pin (30) that secures the Throttle Lever (29), from the Motor Housing.
3. Remove the Throttle Valve Plunger Stop (12), the Throttle Plunger Bushing Assembly (10), and the Throttle Valve Plunger Assembly (8).
4. Rotate the Motor Housing to gain access to the Inlet Bushing (28).
5. Remove the Inlet Bushing, Air Strainer (27), Throttle Valve Spring (17), Throttle Valve Ball (16), Valve Seat Face (14), Throttle Valve Seat Assembly (13), and the Valve Seat Seal (15).

Disassembly of the Shutoff Valve

For Series 9T only

1. Remove the Regulator Body Cap (25).
2. Loosen the Lock Screw (22) and remove the Regulator Adjusting Screw (21).
3. Remove the Regulator Spring (19), and the Regulator Ball (20).
4. Carefully remove the Regulator Body Assembly (18).
5. Remove the Shutoff Valve (2), the Shutoff Valve Body (2A), the Shutoff Valve Spring (3), and the Shutoff Valve Stop (3A).

Disassembly of the Reverse Valve

For Series 9RS only

NOTICE

The Detent Ball (35) is spring-loaded. Do not lose the Detent Ball or the Detent Spring (36).

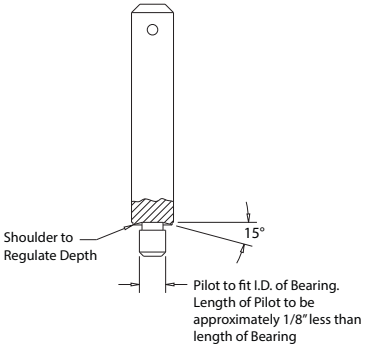
1. Carefully unscrew the Detent Adjusting Screw (37) and remove the Detent Spring and the Detent Ball.
2. Remove the Reverse Valve Knob Pin (34) and the Reverse Valve Knob (33).
3. Pull the Reverse Valve Assembly (31) from the bushing in the Motor Housing Assembly (1).

Assembly

General Instructions

1. Always press on the **inner** ring of a ball-type bearing when installing the bearing on a shaft.
2. Always press on the **outer** ring of a ball-type bearing when pressing the bearing into a bearing recess.
3. Whenever grasping a tool or part in a vise, always use leather-covered or copper-covered vise jaws. Take extra care with threaded parts and housings.
4. Always clean every part and wipe every part with a thin film of oil before installation.
5. Check every bearing for roughness. If an open bearing must be cleaned, wash it thoroughly in a clean, suitable, cleaning solution and dry with a clean cloth. **Sealed or shielded bearings should not be cleaned.** Work grease into every open bearing before installation.
6. Apply a film of O-ring lubricant to every O-ring before installation.
7. Unless otherwise noted, always press on the stamped end of a needle bearing when installing a needle bearing into a recess. Use a bearing inserting tool similar to the one shown in Dwg. TPD786.

Needle Bearing Inserting Tool



(Dwg. TPD786)

Assembly of the Reverse Valve

For Series 9RS only

1. If required, place new Reverse Valve Seals (32) in the grooves on the Reverse Valve Assembly (31).
2. From the Lever (29) side, push the Reverse Valve into the reverse valve bushing in the Motor Housing (1).
3. Place the Reverse Valve Knob (33) onto the exposed hub of the Reverse Valve and secure it using the Reverse Valve Knob Pin (34).
4. Insert the Detent Ball (35), followed by the Detent Spring (36), into the small hole in the Reverse Valve Knob and secure them using the Detent Adjusting Screw (37).

Assembly of the Shut-off Valve

For Series 9T only

1. Place the Shutoff Valve Stop (3A), the Shutoff Valve Spring (3), and the Shutoff Valve Body (2A) and the Shutoff Valve (2) into the bushing in the Motor Housing.

NOTICE

Make certain the Shutoff Valve Spring seats in the recess in the Shutoff Valve.

2. Place the Regulator Body Seal (26) on the Regulator Body Assembly (18), apply Loctite Pipe Sealant with Teflon®* to the threads on the Body and thread the Regulator Body into the Motor Housing Assembly (1) so that it fits snugly.

NOTICE

Do not tighten the Regulator Adjusting Screw (21). The Regulator Spring (19) may be damaged if the Screw is brought down snug.

3. Place the Regulator Ball (20) followed by the Regulator Spring, smaller diameter first, into the large hole in the top of the Regulator Body. Retain the Ball and Spring using the Regulator Adjusting Screw.
4. Apply Loctite Pipe Sealant with Teflon to the threads of the Sensor Port Plug (24) and insert it into the tapped hole adjacent to the Regulator Adjusting Screw (21) hole.
5. Lock the Regulator Adjusting Screw with the Lock Screw (22).
6. Install the Exhaust Deflector Seals (6) into their grooves on the Motor Housing. Wrap the Exhaust Silencer (4) around the Housing in its recess. Slide the Exhaust Deflector (5) over the Seals and retain them using the Deflector Retaining Ring (7). If a Horizontal Hanger (52) is to be used, slide it over the Housing after the Exhaust Deflector and retain it using the Retaining Ring.
7. After assembling the Angle Wrench, adjust the shutoff mechanism as instructed in **Adjustment of the Shutoff Valve.**

Assembly of Throttle

1. Insert the Valve Seat Face (14) into the internal groove and the Valve Seat Seal (15) to the external groove of the Throttle Valve Seat Assembly (13).
2. Insert and firmly seat the assembled Valve Seat, small diameter first, into the tapped end of the Motor Housing (1).
3. With the Housing held firmly in leather-covered or copper-covered vise jaws, inlet bushing end up, place the Throttle Valve Ball (16), the Throttle Valve Spring (17), smaller diameter first, and the Air Strainer (27) into the inlet bushing end.

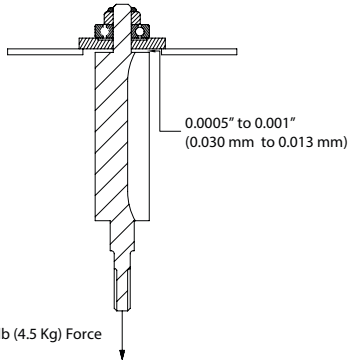
NOTICE

Make certain that the Air Strainer sits within the Inlet Bushing (28).

4. Thread the Inlet Bushing into the Motor Housing and tighten it to 35 to 45 ft-lb (47 to 60 Nm) torque.
5. Place the Throttle Plunger Bushing Seal (11) on the Throttle Plunger Bushing Assembly (10) and thread the Bushing Assembly into the Motor Housing.
6. Place the Throttle Plunger Seal (9) on the Throttle Valve Plunger Assembly (8) and insert the Plunger, beveled end first, through the Throttle Plunger Bushing Assembly.
7. Install the Throttle Lever (29) using the Throttle Lever Retaining Pin (30) and operate the lever to check for free movement.

Assembly of Motor

1. Slide the Rear End Plate (45), recessed face trailing, followed by the Rear Rotor Bearing (42), shielded side trailing, onto the threaded hub of the Rotor (38). Thread the Rotor Bearing Retaining Nut (43) onto the hub a few turns.
2. Support the Rear End Plate, see Dwg. TPD614, and place one 0.001" (0.03 mm) thick shim between the End Plate and a solid rotor boss.



(Dwg. TPD614)

3. While applying a 10 lb (4.5 kg) force downward as illustrated, tighten the Retaining Nut until the spacing of the Rotor and End Plate is approximately 0.001". Remove the shim and manually rotate the preloaded Rotor to detect rubbing between the Rotor and End Plate. If rubbing is detected, back the Nut off a turn and repeat this procedure. Add one small drop of wicking Loctite 290 to the thread and wipe off the excess.
4. Stand the assembled Rotor on a workbench with the splined end up. Slide the Cylinder (46) over the Rotor so the 1/8" (3 mm) diameter hole in the Cylinder is aligned with the slot in the Rear End Plate and so the recess port in the end of the Cylinder is to the left of the 1/8" hole when viewed from the splined end.
5. Wipe each Vane (39) with a light coat of **Ingersoll Rand** No. 10 Oil. Insert a Vane into each slot in the Rotor. Slide the Front End Plate (47), recessed face trailing, onto the splined Rotor hub.
6. Press the Front Rotor Bearing (48) onto the splined hub and rotate the Rotor manually to make certain it moves freely without binding.

NOTICE

The dowel hole in the bore of the Housing is in line with the Throttle Lever.

7. Using an 1/8" (3 mm) diameter rod as a guide going through the notch in the Front End Plate, through the hole in the Cylinder, the notch in the Rear End Plate, and the holes in the Rear End Plate Gasket and the Rear Rotor Bearing Support, guide the motor into the bore of the Motor Housing Assembly (1).
8. Carefully remove the guide rod and replace it with the Cylinder Dowel (49).
9. Install the Front Rotor Bearing Retainer (51) in its groove inside the Front Rotor Bearing Support (50).

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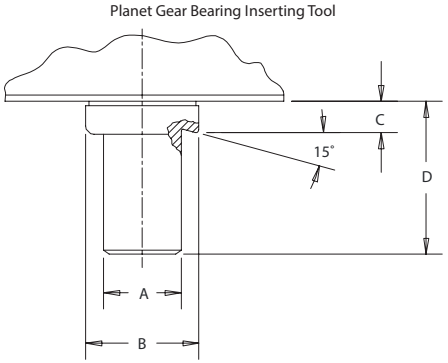
Assembly of the Gear Case Assembly

For L and M Ratio Gearing

NOTICE

An L or M is stamped on the web of Spindles for L or M ratio gearing.

1. Press a Planet Gear Bearing (86) into each Spindle Planet Gear (85) to a depth of 0.000" to 0.010" (0.00 mm to 0.25 mm) from the face of the Gear using the proper bearing inserting tool, see Dwg. TPD637-1 and Table A, and lubricate the Bearings as instructed in LUBRICATION.



(Dwg. TPD637-1)

TABLE A

Bearing Number	A		B		C		D	
	Min	Max	Min	Max	Min	Max	Min	Max
WFS182-654	0.152" (3.86 mm)	0.153" (3.89 mm)	0.265" (6.73 mm)	0.266" (6.76 mm)	0.051" (1.30 mm)	0.059" (1.50 mm)	0.296" (7.52 mm)	0.312" (7.92 mm)
8SL-500	0.1207" (3.07 mm)	0.1217" (3.09 mm)	0.234" (5.94 mm)	0.235" (5.97 mm)	0.005" (0.13 mm)	0.010" (0.25 mm)	0.125" (3.18 mm)	0.140" (3.56 mm)
9SN-500	0.1207" (3.07 mm)	0.1217" (3.09 mm)	0.234" (5.94 mm)	0.235" (5.97 mm)	0.005" (0.13 mm)	0.010" (0.25 mm)	0.125" (3.18 mm)	0.140" (3.56 mm)
W22-654	0.152" (3.86 mm)	0.153" (3.89 mm)	0.265" (6.73 mm)	0.266" (6.76 mm)	0.051" (1.30 mm)	0.059" (1.50 mm)	0.296" (7.52 mm)	0.312" (7.92 mm)

2. Insert an assembled Planet Gear into each slot in the Spindle Assembly and press a Planet Gear Shaft (87) into the Spindle through each Planet Gear from the smooth bore hub end of the Spindle.
3. Using the Rotor (50) as a pilot inside the Spindle, insert the Spindle Assembly into the Gear Case Assembly (76).
4. Turn the Gear Case end for end, with the small diameter of the Gear Case up, and slide the Spindle Spacer (88) onto the end of the Spindle.
5. Support the motor end of the Spindle and press the front Spindle Bearing (89) onto the end of the Spindle.
6. Place the Motor Clamp Washer (75), concave (dished) face first, over the unsplined end of the Spindle.
7. Press the Gear Head Bearing (90) into the large recess in the Front Rotor Bearing Support (50) and slide the Bearing and Support onto the hub of the Spindle.
8. Thread the assembled Gear Case onto the assembled Motor Housing (1) and tighten to a minimum of 35 ft-lb (47 Nm).

For N, P and Q Ratio Gearing

NOTICE

An N, P, or Q is stamped on the web of Gear Heads for N, P and Q ratio gearing.

1. **For N ratio gearing** - Press two Planet Gear Bearings (86) into each Spindle Planet Gear (85), to a depth of 0.000" to 0.005" (0.00 mm to 0.13 mm).
   For P and Q ratio gearing - Press two Planet Gear Bearings (86) into each Spindle Planet Gear (85) to a depth of 0.037" to 0.045" (0.95 mm to 1.15 mm) from the face of the Gear.
2. Insert an assembled Gear into each slot in the Spindle (84) and press a Planet Gear Shaft (87) from the smooth bore end of the Spindle into the pin holes to retain the Gears.
3. Using the unassembled Gear Head (78) as a pilot through the center of the assembled Spindle Assembly, insert the Spindle and Planet Gears into the Gear Case. Take care to engage the Planet Gears with the internal gear in the Gear Case.
4. Slowly withdraw the Gear Head from the Gear Case.
5. Press two Planet Gear Bearings (80) into each of the Planet Gears (79).
6. Insert an assembled Planet Gear into each slot in the Gear Head, capturing the Rotor Pinion (82) in the Gear Head, and retain the Planet Gears by pressing the Planet Gear Shafts (81) from the smooth outside diameter end of the Gear Head.
7. Slide the Gear Head Spacer (83) over the geared end of the Gear Head and insert this assembly into the ear Case. Make certain the Gear Head properly meshes with the Spindle Planet Gears Assembly (85).
8. Place the Gear Case Assembly on the workbench with the small diameter up and slide the Spindle Spacer (88) onto the end of the Spindle.
9. Support the motor end of the Gear Head and press the front Spindle Bearing (89) onto the Spindle.
10. Turn the Gear Case end for end and place the Motor Clamp Washer (75), concave (dished) face first, over the Gear Head. Make certain that the outside diameter of the Motor Clamp Washer contacts the end of the shoulder in the Gear Case.
11. Slide the Reaction Bar Adapter Assembly (91) over the Gear Case Assembly. Secure it to the Gear Case by tightening the Adapter Bolt (93). Place the Torque Reaction Bar (94) into the Reaction Bar Holder Assembly and secure it with the Bar Lock Screw (92).
12. Press the Gear Head Bearing (90) into the large recess in the Front Rotor Bearing Support and slide the Bearing onto the hub of the Gear Head.
13. Thread the assembled Gear Case onto the assembled Motor Housing (1) and tighten to a minimum of 35 ft-lb (47 Nm) torque.

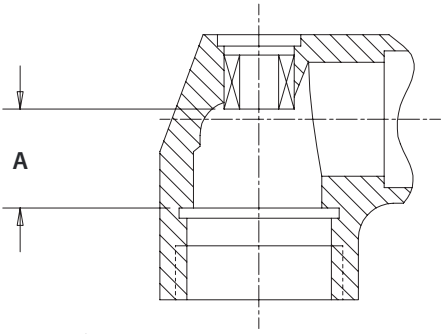
Assembly of Angle Attachment

1. Lubricate the Bevel Pinion (104) as instructed in **LUBRICATION** and insert it, gear end first, into the long bore of the Angle Housing Assembly (100).
2. Lubricate the Bevel Pinion Bearing (106) as instructed in **LUBRICATION** and insert it, unstamped end first, into the bore of the Angle Housing, after the Bevel Pinion.
3. Using a bearing inserting tool, see Dwg. TPD786, press the Bearing so the stamped face is 1-11/32" (34 mm) below the end face of the Angle Housing.
4. Install the Front Seal (108) and the Rear Seal (109) onto the Bevel Pinion Bearing Spacer (107).
5. Insert the Spacer, small diameter first, into the long bore of the Angle Housing and retain it using the Bevel Spacer Retainer (121).
6. Lubricate the Bevel Pinion Thrust Bearing (110) as instructed in **LUBRICATION**. Install, in the following order; the Bevel Pinion Thrust Washer (111), Bevel Pinion Thrust Bearing and the Bevel Pinion Retainer (113), recessed face trailing, over the splined end of the Bevel Pinion. Retain these parts using the Bevel Pinion Snap Ring (112).
7. If the Lower Spindle Bearing (118) has been removed, press the new Bearing onto the Socket Adapter Spindle Assembly (114) with the red side closest to the square drive end.
8. Press the Bevel Gear (105), geared side trailing, onto the ground end of the Spindle and into contact with the Lower Spindle Bearing.
9. **For No. 8SA32** - Retain the Bevel Gear using the Bevel Gear Retainer (119).
   For No. 8SA53 and 9SA83 - Clean the threads on the Spindle, apply a film of thread locking compound to the threads, apply the Bevel Gear Lock Nut (120) and tighten it to a minimum of 50 ft-lb (68 Nm) torque.

⚠ CAUTION

Press on the stamped face of the Upper Spindle Bearing (103). Failure to do so will cause damage to the Bearing.

10. If the Upper Spindle Bearing was removed, press a new Bearing into the Angle Housing (100) from the large threaded end to the dimension, shown in Dwg. TPD636 and Table B.



(Dwg. TPD636)

TABLE B

Minimum Dimension "A"		
Angle Attachment	**inch**	**mm**
8SA32	0.718	18.25
8SA53	0.683	17.35
9SA83	0.720	18.30

Minimum Dimension "A"		
Angle Attachment	**inch**	**mm**
8SA32	0.728	18.50
8SA53	0.693	17.60
9SA83	0.730	18.55

11. Lubricate the Upper Spindle Bearing as instructed in **LUBRICATION** and press the Angle Housing Cap (101) into its recess.
12. Insert the assembled Socket Adapter Spindle Assembly (114) into the Angle Housing, clean the threads on the Angle Housing and Spindle Bearing Cap (122), apply a film of thread locking compound to the threads and tighten the Bearing Cap to a minimum of 25 ft-lb (34 Nm) torque.
13. Slide the Attachment Coupling Nut (124), threaded end trailing, over the splined end of the Angle Housing.
14. Apply the Coupling Nut Retainer (125) to the external groove on the splined end of the Angle Housing.
15. Engage the spline on the Bevel Pinion (104) with the matching spline on the Spindle Assembly (84) and tighten the Coupling Nut (124) to a minimum of 35 ft-lb (47 Nm) torque.

Adjustment of Shutoff Valve

NOTICE

Adjustment to the Shutoff Valve system is preset at the factory. Do not adjust any part of the Valve unless, after prolonged use of the Tool, the Tool shuts off prematurely or the Tool fails to shut off. Only if either of these conditions exist are you to adjust the Valve. Adjust the Valve according to the procedures below.

If premature shutoff occurs, proceed as follows:

NOTICE

The Bleed Adjusting Screw is located in the tapped port marked "A" on the face of the Regulator Body Assembly. The port marked "S" is a signal port to be used with monitoring equipment.

1. Set the inlet air pressure at 90 psig (6.2 bar/620 kPa) with the motor running. Slightly rotate the Bleed Adjusting Screw (23) counterclockwise and slowly depress the Throttle Lever to determine continual motor operation. If necessary, repeat this procedure until the motor runs and remains running with the Lever depressed.
2. Securely anchor the Wrench and run it on a Model J Skidmore Test Stand a number of times at 50 psig (3.4 bar/340 kPa) air pressure and at 90 psig (6.2 bar/620kPa) air pressure. The tool must shut off when tested at each pressure setting. If the Angle Wrench fails to shut off, adjust the Shutoff Valve as follows:
3. Operate the Tool at 90 psig as instructed in Step 2. Release the Throttle Lever and rotate the Bleed Adjusting Screw slightly clockwise and retest the Tool. Continue testing and adjusting the Valve a slight amount each time until the Wrench shuts off properly.

Test and Inspection Procedure

Run the performance tests at 90 psig (6.2 bar/620 kPa) air pressure at the inlet of the tool using 1/2" (13 mm) inside diameter supply hose.

1. Check the free speed of the Angle Wrench using a hand-held tachometer applied to the spindle. The minimum allowable free speeds are listed below.

Model	Stamped Free Speed rpm (r/min)	Minimum Free Speed rpm (r/min)
9SQ83	300	270
9RSM53	665	600
9RSN53	535	480
9RSP53	425	380
9RSQ83	300	270
9TM53	780	700
9TN53	630	565
9TP53	500	450
9TQ83	355	320

2. Using a Model J Skidmore tester, operate the Wrench to determine torque output. The minimum allowable torque levels are as follows.
3. There must be no objectionable leaks in any non-exhaust areas. The exhaust deflector must rotate manually.
4. The throttle must operate freely and must not remain open when the lever is released with air at the inlet.
5. The angle attachment, gear case and motor case must not generate excessive heat. Operate the tool at free speed for 20 seconds.

WARNING

Disconnect the air supply hose to the tool before proceeding.

6. Rotate the output spindle using a wrench. The spindle must rotate smoothly with no binding.
7. Examine the Tool to see that the Throttle Lever is on the opposite side of and in line with the output spindle

Model	Minimum Torque	
	ft-lb	Nm
9SQ83	85	115
9RSM53	40	54
9RSN53	50	68
9RSP53	65	88
9RSQ83	85	115
9TM53	40	54
9TN53	50	68
9TP53	65	88
9TQ83	85	115

Troubleshooting Guide

Trouble	Probable Cause	Solution
Low power or low free speed	Low air pressure	Check the air pressure at the inlet. The pressure must not exceed 90 psig (6.2 bar/620 kPa).
	Plugged Inlet Bushing Screen or Air Strainer Screen	Clean the Screen in a clean, suitable, cleaning solution. If it cannot be cleaned, replace it.
	Worn or broken Vanes	Replace the complete set of Vanes.
	Loose Rotor Bearing Retaining Nut	Tighten the Nut.
	Worn or broken Cylinder	Replace the Cylinder if it is worn or broken or if the bore is scored or wavy.
	Scoring of End Plates	Replace End Plates if they are scored.
	Improper lubrication or dirt build-up in the motor.	Lubricate the Wrench as instructed in **LUBRICATION**. If lubrication does not result in satisfactory operation, disassemble the motor inspect and clean all parts.
Scoring	Improper assembly	Make certain that all motor or Cylinder parts are properly aligned prior to clamping the motor assembly.
Gear Case gets hot	Excessive grease	Clean and inspect the Gear Case gearing parts and lubricate as instructed in **LUBRICATION**.
	Worn or damaged parts	Clean and inspect the Gear Case and gearing. Replace worn or broken components.
Tool fails to shut off	Dirt or Burrs on Shutoff Valve or Bushing	Clean the parts and remove the burrs.
	Bleeder ports plugged	Clean the bleeder ports with a fine wire.

Related Documentation

For additional information refer to:
Product Safety Information Manual 04585006.
Product Information Manual 80167521 and 80167539.
Parts Information Manual 16574089.

Manuals can be downloaded from ingersollrand.com

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