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## Air Drills

Series QS

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# Maintenance Information



**Save These Instructions**

**IR** *Ingersoll Rand*

## ⚠ WARNING

**Always wear eye protection when operating or performing maintenance on this tool. 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.**

**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 a Series QS Drill is disassembled for maintenance and repair or replacement of parts, lubricate the tool as follows:

1. Coat all exposed gears with **Ingersoll Rand No. 67** Grease and work some of the Grease into the gearing of the Spindle Assembly (40).

2. Use **Ingersoll Rand No. 10** Oil to lubricate the motor. Inject approximately 1 to 2 cc of oil into the air inlet before attaching the air hose to the tool.

## Speed Adjustment

Series QS Inline Drills are furnished with the ability to precisely control speed, within certain ranges. Setting the speed requires a tachometer. Therefore, the adjustment, although simple, should only be attempted by a competent technician using the proper equipment.

The Back Cap (6) has a small, molded stud on the end face of the Cap nearest the Exhaust Diffuser (15). Take an initial reading of the tool speed by applying a tachometer to the end of the Chuck (50) without a drill bit and with the Lever (10) completely depressed. If the tachometer has a concave tip, close the Chuck completely; if the tip is convex, open the Chuck completely.

After determining the actual velocity, shut off the air supply and disconnect the air line. Use a 3/4" wrench to loosen the Inlet Bushing. The longest slot in the Exhaust Diffuser will contain the molded stud on the Back Cap. Rotate the Diffuser to open the exhaust ports to increase speed or rotate it to restrict the exhaust to reduce speed. Being careful not to allow the Diffuser to damage the molded stud, tighten the Inlet Bushing to 15 ft-lbs. (20 Nm) torque. Connect the air line and restore the air supply and check the velocity again. Determine which direction you need to rotate the Diffuser to obtain the desired speed and then rotate it accordingly. Best results are achieved by using gradual increments and frequent tachometer readings. Be sure to turn off the air supply and disconnect the line when making adjustments.

## 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 a 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. Tap the Motor Housing on a block of wood to remove the motor assembly from the Motor Housing.
6. Lightly grasp the flats of the Motor Housing in leather-covered or copper-covered vise jaws with the Inlet Bushing (16) upward.
7. Place a 1-3/16" open end wrench on the flats of the Back Cap (6) to prevent it from rotating, and use a 3/4" wrench to unscrew and remove the Inlet Bushing.
8. Lift the Exhaust Diffuser (15) off the Back Cap.
9. If the Throttle Valve Spring (14) did not come out of the tool with the Inlet Bushing, use needle nose pliers to remove it and the Throttle Valve (13) from the Motor Housing.
10. To remove the Throttle Valve Seat (12), insert a hooked tool through the central opening of the Seat and pull it from the Motor Housing.

### Disassembly of the Tool

Each Series QS Lever Inline Drill is made using three modules or units which include a housing and throttle unit, a motor unit and a combined gearing with spindle unit. The tool can be disassembled for repairs to each individual unit without disturbing the other units. To separate the modules, proceed as follows:

1. Remove the Chuck (50) using the following technique:
  - a) Insert the short leg of a 1/4" hex wrench into the jaws of the Chuck and tighten the Chuck.
  - b) Using a brass hammer, sharply rap the long leg of the wrench in a counterclockwise direction to loosen the Chuck.
  - c) Unscrew and remove the Chuck from the spindle.
2. Use a thin blade screwdriver to spiral the Grip Retainer (42) out of the groove in the Gear Case (41) and pull the Housing Grip (43) off the front of the tool.
3. Using a wrench on the flats of the Gear Case, unscrew and separate the Gear Case from the Motor Housing (1).
4. Remove the Motor Clamp Washer (32) and the Motor Seal (31) from the assembled motor in the Housing.

11. Using a 1/16" pilot punch, tap the Throttle Lever Pin (11) out of the Back Cap and remove the Throttle Lever (10).
12. Pull the Throttle Plunger (5) out of the Motor Housing and remove the assembly from the vise.
13. Holding the assembly horizontally, remove the Back Cap, the Memory Chip (9) (if included with the tool), and the Back Cap Gasket (7).
14. If the Muffler Elements (8) need to be cleaned or replaced, pull them out of the Back Cap.

### Disassembly of the Gearing

1. Using snap ring pliers, remove the Gear Retainer (33) from inside the Gear Case and remove the Gear Head Spacer (34).
2. **For Series QS30, QS38 and QS51**, lightly rap the motor end of the Gear Case on a wooden work bench top to remove the Planet Gear Head Drive Plate (35), Planet

Gear Head Assembly (36) and the Planet Gear Head Spacer (39).

**For Series QS05 and QS09**, lightly rap the motor end of the Gear Case on a wooden work bench top to remove the three Planet Gears (37), the Planet Gear Head Assembly (36) and the Planet Gear Head Spacer (39).

**For Series QS15 and QS20**, lightly rap the motor end of the Gear Case on a wooden work bench top to remove the three Planet Gears (37), the Rotor Pinion (38), the Planet Gear Head Assembly (36) and the Planet Gear Head Spacer (39).

## NOTICE

**If the Spindle Assembly is being removed or replaced, the Spindle Bearing and Spindle Cap Bearing may be damaged during the removal process. We recommend that new replacement bearings be available for installation when the tool is reassembled.**

- Stand the Gear Case on the table of an arbor press with the threaded end of the Spindle Assembly (40) upward. Using a rod slightly smaller than the spindle shaft, press the Spindle Assembly out of the Spindle Cap Bearing (49) and Spindle Bearing (46).
- Insert a long, small drift through the central opening of the Spindle Bearing and push the Bearing Spacer (47) off to one side. Using a hammer with the drift, tap the inner ring of the Spindle Cap Bearing. Repeat the process at several points until the Bearing is free from the Gear Case. Remove the Bearing Spacer from the Gear Case.
- Using snap ring pliers, remove the two Bearing Stops (48).
- Stand the Gear Case on the table of an arbor press with the threaded end of the Spindle Assembly (40) upward. Using a rod slightly smaller than the spindle shaft, press the Spindle Assembly out of the Spindle Cap Bearing (49) and Spindle Bearing (46).
- Insert a long, small drift through the central opening of the Spindle Bearing and push the Bearing Spacer (47) off to one side. Using a hammer with the drift, tap the inner ring of the Spindle Cap Bearing. Repeat the process at several points until the Bearing is free from the Gear Case. Remove the Bearing Spacer from the Gear Case.
- Using snap ring pliers, remove the two Bearing Stops (48).
- Stand the Gear Case on the table of an arbor press with the threaded end upward, and press the Spindle Bearing out of the Gear case.

### Disassembly of the Motor

- If the motor was not removed from the Housing (1) when the tool was disassembled, slide the Motor Clamp Washer (32) off the shaft of the Rotor (26) and remove the Motor Seal (31).
- Tap the Motor Housing on a block of wood to remove the motor assembly from the Motor Housing.
- Using snap ring pliers, remove the Rear End Plate Assembly Retainer (22) from the shaft of the Rotor.
- Pull the Rear End Plate Face Plate (20) and Rear End Plate Assembly (21) off the hub of the Rotor.
- Using a piece of leather or other type of protective material, grasp the shaft of the Rotor and pull the Rotor out of the Cylinder (23).
- Remove the Vanes (27) from the Rotor.
- Support the Front End Plate Assembly (28), as near the rotor body as possible, on the table of an arbor press and press the Rotor from the Front Rotor Bearing (30). Remove the Bearing from the Front End Plate.

### Disassembly of the Housing

- Pull the Housing Plug Cover (19) off the inlet end of the Motor Housing (1).
- If the Housing Plug (3) does not drop out of the Housing when the Cover is removed, tap the inlet end of the Housing on a block of wood to dislodge the Plug from the Housing.
- Insert a 5/16" wooden dowel between 6 and 8 inches long, into the inlet end of the Motor Housing and push the Reverse Valve Assembly (4) out the motor end of the Housing.
- Use a hooked tool to pull the Housing O-Ring (2) out of the Motor Housing.

## Assembly

### General Instructions

- Always press on the **inner** ring of a ball-type bearing when installing the bearing on a shaft.
- Always press on the **outer** ring of a ball-type bearing when pressing the bearing into a bearing recess.
- 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.
- Except for bearings, always clean every part and wipe every part with a thin film of oil before installation.
- Apply O-ring lubricant to all O-rings before final assembly.
- 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 never be cleaned.** Work grease into every open bearing before installation.
- Insert the pin end of the Housing Plug (3) into the hole in the Reverse Valve while fitting the remainder of the Plug into the recess in the Motor Housing.
- While holding the Plug in position, from the inlet end of the Housing, slide the Housing Plug Cover (19) onto the Housing. Make certain it captures the Plug when it moves along the Housing and stops against the housing shoulder.

### Assembly of the Motor

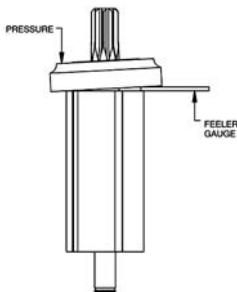
- Place the Front End Plate (28) on the splined shaft of the Rotor (26) with the bearing recess away from the rotor body.
- Place the Front Rotor Bearing (30) onto the shaft and using a sleeve or piece of tubing that contacts the inner race of the Bearing, press the Bearing onto the shaft until the Front End Plate nearly contacts the rotor body.

## NOTICE

**In the following step, the measurement must be made at the end corner of the large rotor body.**

- The clearance between the Front End Plate and Rotor is critical. While pressing down with your finger on the outer edge of the Front End Plate on the bearing side, insert a 0.004" (0.1 mm) feeler gauge between the face of the rotor body and the face of the End Plate at a point that is 180 degrees from where the pressure is applied. Refer to Dwg. TPA1740. To increase the gap, support the End Plate and lightly tap the rotor shaft with a plastic hammer; to decrease the gap, press the Bearing farther onto the rotor shaft.

### Measurement of Front End Plate Clearance



(Dwg. TPA1740)

- Wipe each Vane (27) with a light film of **Ingersoll Rand** No. 10 Oil and place a Vane in each slot in the Rotor.
- One end of the Cylinder Assembly (23) has a notch that breaks the outer wall and end face of the Cylinder. With that end trailing, install the Cylinder Assembly over the Rotor and Vanes against the Front End Plate. Make certain the Cylinder Front Alignment Pin (25) enters the hole in the Front End Plate.
- Install the Rear End Plate Assembly (20), flat face leading, on the rear hub of the Rotor. Make certain the Cylinder Rear Alignment Pin (24) enters the hole in the Rear End Plate.
- Examine the Rear End Plate Face Plate (21) for scratches. If it is scratched, replace it. If it is not, slide it onto the rear hub of the Rotor and onto the Cylinder Rear Alignment Pin against the Rear End Plate. Some pressure may be required to fit the hole in the Plate onto the Alignment Pin.
- Using snap ring pliers, install the Rear End Plate Assembly Retainer (22) in the annular groove on the rear rotor hub to secure the assembly in position.
- Set the assembled motor aside.

### Assembly of the Gearing

- Work some **Ingersoll Rand** No. 67 Grease into the gearing of the Spindle Assembly (40).
- Insert the threaded end of the Spindle Assembly into the threaded end of the Gear Case (41) while meshing the teeth of the gears with the spline inside the Gear Case.
- Support the gear end of the Spindle Assembly on the table of an arbor press while leaving clearance for the Gear Case. Using a piece of tubing that will clear the shaft and contact the inner ring of the Spindle Bearing (46), press the Bearing onto the shaft of the Spindle Assembly until it contacts the gear hub.
- Using snap ring pliers, install one of the Bearing Stops (48) in the internal groove nearest the Bearing.
- Apply some **Ingersoll Rand** No. 67 Grease to the Bearing Spacer (47) and slide it onto the shaft of the Spindle Assembly with the smaller end trailing.
- Using snap ring pliers, install the second Bearing Stop in the internal gear case groove nearest the threaded spindle end.
- Stand the assembled Gear Case on the table of an arbor press with the output Spindle upward. Install the Spindle Cap Bearing (49) over the output shaft, and using a piece of tubing that contacts the outer ring of the Bearing, press the Bearing into the Gear Case against the Bearing Stop.
- Insert the Planet Gear Head Spacer (39) and Planet Gear Head Assembly (36), spline hub leading into the open end of the Gear Case.
- For Series QS05, QS09, QS15 and QS20**, apply **Ingersoll Rand** No. 67 Grease to the three Planet Gears

(37) and install them on the shafts of the Planet Gear Head Assembly.

- For Series QS15 and QS20**, apply **Ingersoll Rand** No. 67 Grease to the Gear Head Pinion (38) and while meshing the gear teeth, insert it in the opening between the three Planet Gears.
- For Series QS30, QS38 and QS51**, install the Planet Gear Head Drive Plate (35) on the shafts of the Planet Gear Head Assembly.
- Place the Gear Head Spacer (34) in the Gear Case and secure the assembly by using snap ring pliers to install the Gear Retainer (33) in the annular groove inside the Gear Case.

### Assembly of the Tool

- Lightly grasp the flats on the Motor Housing (1) in leather-covered or copper-covered vise jaws with the inlet end of the tool upward.
- Insert a 5/8" dowel through the opening in the Back Cap (6), and using the dowel as an alignment device, install the three Muffler Elements (8) in the cavity of the Back Cap. Make certain the notches in the outer edge of the Elements fit over the memory chip pocket in the bottom of the Cap.
- If the tool is equipped with a Memory Chip (9)**, install it (with the leads entering first) in the pocket at the bottom of the Back Cap.
- Make certain the tab on the inside edge of the Back Cap Gasket (7) is aligned with the pocket for the Memory Chip and install the Gasket, metal face leading, in the recess of the Back Cap against the face with the cavity containing the Muffler Elements.
- Position the gasket end of the alignment dowel against the inlet hub on the Motor Housing. Align the flats on the Cap with the flats on the Housing. Orient the Back Cap and slide the Back Cap Assembly off the alignment dowel and onto the Motor Housing.
- The Exhaust Diffuser (15) has one slot that is longer than the other five slots. The Back Cap has a short, molded stud projecting from inlet end. Place the Exhaust Diffuser against the Back Cap with the long slot encircling the molded stud. Rotate the Diffuser counterclockwise until the wall of the slot stops against the stud. The exhaust ports are now in the full open position which will provide maximum free speed.
- Being careful not to damage it, insert the Throttle Valve Seat (12) into the central opening at the inlet end of the Motor Housing at an angle until it clears the threads in the Housing. Using a rod with a flat end and no sharp edges, push the Seat to the bottom of the opening until it seats flush.
- Using needle nose pliers, insert the Throttle Valve (13), long stem leading, into the opening against the Seat. Center the Valve in the Seat.
- Install the Throttle Valve Spring (14) in the opening so that it encircles the Valve.
- If the Inlet Screen (18) required replacement, use a wooden dowel to carefully push a new one into the Inlet Bushing (16).
- If the Inlet Bushing Seal (17) is nicked or damaged, carefully install a new one over the threads of the Inlet Bushing.
- Thread the Inlet Bushing Assembly through the Diffuser and Back Cap into the Motor Housing. Using a 1-3/16" wrench on the flats of the Back Cap to keep it from turning, tighten the Inlet Bushing between 15 and 20 ft-lbs. (20 and 27 Nm) torque.
- The Throttle Plunger (5) has a lengthwise flat on the outer edge at one end of the Plunger. Insert the Plunger, flat end first, into the cross hole in the Housing. Push on the end of the Plunger to make certain it springs back from contact with the stem of the Throttle Valve.

14. Position the Throttle Lever (10) in the slot in the Back Cap and Motor Housing and using a 1/16" diameter rod, align the holes through the Back Cap, Motor Housing and Throttle Lever. While maintaining alignment, install the Throttle Lever Pin (11) in place of the rod by tapping it through all three pieces.
15. Remove the assembled Housing from the vise jaws.
16. Lightly grasp the flats at the inlet end of the Motor Housing in leather-covered or copper-covered vise jaws with the motor bore upward.
17. Grasp the spline of the Rotor (26) in the assembled motor and after aligning the End Plate Alignment Pin (29) with the internal notch in the motor end of the housing bore, insert the assembled motor into the Motor Housing. Make certain the motor is far enough into the Housing to have the undercut below the internal housing thread visible.
18. Lubricate the Motor Seal (31) with O-ring lubricant and install it around the Front End Plate (28) and into the undercut in the Housing.
19. Align the tab of the Motor Clamp Washer (32) with the internal notch in the Housing and install it over the rotor hub and End Plate Alignment Pin against the Motor Seal. Make certain the Pin enters the hole in the Washer and the Washer is flat against the Seal.
20. Apply some **Ingersoll Rand** No. 67 Grease to the spline on the rotor shaft.
21. Thread the assembled Gear Case (41) and Spindle Assembly (40), gear case end leading, into the Motor Housing and tighten the joint between 15 and 20 ft.-lbs. (20 and 27 Nm) torque.
22. Install the Housing Grip (43), internal slotted end leading, over the Gear Case and Housing and engage the slots in the Grip with the projections on the Housing.
23. Install the Grip Retainer (42) in the groove on the Gear Case to secure the Grip.
24. Remove the tool from the vise jaws and thread the Chuck (50) onto the Spindle.
25. Check the free speed of the tool using a tachometer and following the instructions in the **SPEED ADJUSTMENT** section of this manual.

## Troubleshooting Guide

Trouble	Probable Cause	Solution
Loss of Power	Low air pressure	Check air supply. For top performance, the air pressure must be 90 psig (6.2 bar/620 kPa) at the inlet.
	Plugged Inlet Bushing Screen	Clean the Inlet Bushing Screen using a clean, suitable cleaning solution. If the Screen cannot be cleaned, replace it.
	Worn or broken Vanes	Replace a <b>complete</b> set of Vanes.
	Worn or broken Cylinder	Replace the Cylinder if it is cracked or if the bore appears wavy or scored.
	Exhaust control restricted	Make certain the Exhaust Diffuser is in the fully open position.
Motor won't run	Motor Clamp Washer binding	Remove the Gear Case make certain the Washer is flat and the Motor Seal is properly positioned.
	Gears binding	Clean and inspect all gearing. Replace any worn or damaged gearing.
Leaky Throttle Valve	Worn Throttle Valve and/or Throttle Valve Seat	Install a new Valve and/or Seat.
	Dirt accumulation on Throttle Valve and/or Throttle Valve Seat	Clean or replace the Throttle Valve and/or Throttle Valve Seat.
Gear Case gets hot	Excessive grease	Clean and inspect Gear Case and gearing parts and lubricate as instructed.
	Worn or damaged parts	Clean and inspect the Gear Case and gearing. Replace worn or broken components.

## Related Documentation

For additional information refer to:  
 Air Drills Product Safety Information Manual Form 04580353.  
 Air Drills Product Information Manual Form 16572042.  
 Air Drills Parts List manual Form 16572752.

Manuals can be downloaded from [www.irtools.com](http://www.irtools.com)

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