47616906001
Edition 2
July 2018

Air Starters for Internal Combustion Engines

ST400 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 starter. 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 and disconnect the air supply hose before installing; removing or adjusting any accessory; or before performing any maintenance on this starter.**

General Instructions

- Reference Parts Information Manual for item number call outs.
- Do not disassemble the starter any further than necessary to replace or repair damaged parts.
- Always mark alignment between the starter housing (13) and mounting flange (5) with a permanent mark that cannot be erased or washed away in order to retain proper orientation.
- Always use soft jaws when grasping a part in a vice. Do not tighten vice more than necessary.
- Always have a complete set of seals, gaskets, and O-Rings on hand before starting any overhaul. Never reuse old seals, gaskets, or O-Rings.
- These steps outline complete disassembly. Do not disassemble the starter any further than necessary to replace a worn or damaged part.
- Do not remove any press fit part unless the removal of that part is necessary for replacement or repairs.
- Do not reuse any bearing disassembled from a press fit.
- Ensure all parts are clean and free of debris or damage before assembly. Replace any damaged parts with genuine **Ingersoll Rand** replacements.
- Lubricate all O-Rings with O-Ring lubricant prior to assembly.
- Clean all grease and oils from housings prior to assembly.
- Never wash the Liner Assembly (9) in solvent.

Disassembly of Starter

1. Remove the Drive Pinion Screw (1) from the drive shaft and remove the Drive Pinion (2).
2. Remove the six Flange Cap Screws (3) from the Flange Cover (4).
3. Pull up on Flange (5) to simultaneously remove both the Flange Cover (4) and Flange (5).
4. Remove the Front Drive Shaft Bearing (15) from the Flange Cover (4).
5. Remove the Drive Housing Seal (16) from Flange Cover (4).
6. Place the starter in a fixture with the pinion side down.

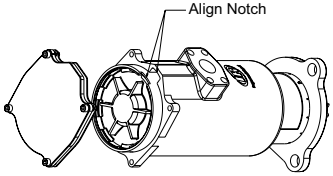
NOTICE

Use care when removing the Housing Cover Bolts (12) holding the Housing Cover (11) to the starter. The Liner (9) is spring loaded and will protrude approximately one inch beyond the Housing (13) once released.

7. To remove the Housing Cover (11), slowly loosen the four Housing Cover Bolts (12) while holding the Housing Cover (11) in place. Make sure the Housing Cover is not adhered to the Housing before the screws are completely removed. Remove the screws and slowly decrease pressure from the Housing Cover allowing the spring to relax.
8. Slide the Liner Assembly (9) out of the Housing.
9. Remove the Return Spring (8).

Assembly of the Starter

1. Place the Return Spring (8) in the Housing (13).
2. Slide the Liner Assembly (9) into the Housing (13). The Liner Assembly and Housing is slotted, make sure the notch on the back of the Liner Assembly is aligned to the notch on the back of the Housing. See Dwg. 47615017-7.



(Dwg. 47615017-7)

3. Attach the Housing Cover Gasket (10) to the Housing Cover (11). Align the Housing Cover to the Housing (13). Press down and torque Cover Cap Screws (12) to 5-6 ft-lb (60-72 in-lb). Another method its install one cap screw a few threads, press on the liner with one hand and rotate the cap in place.
4. Press the Drive Housing Seal (16) into the Flange Cover (4) with the sealing lip pointed down.
5. Press the Front Drive Bearing (15) into the Flange Cover (4). Press on outside race only.
6. Place the Flange Cover (4) in the Flange (5) so that the shoulder of the Flange Cover sits on the counter bore of the Flange.
7. Slide the flange assembly over the drive shaft. Careful not to damage the Drive Housing Seal (16).
8. Rotate Flange (5) to desired position. Install the six Flange Cap Screws (3) using a thread locking compound. Torque the Flange Cap Screws to 9-11 ft-lb.
9. Attach the Drive Pinion (2) to the drive shaft using the Drive Pinion Cap Screw (1) with a thread locking compound on the threads of the screw. Torque the Drive Pinion Cap Screw to 53-58 ft-lb.

Test and Inspection Procedure

1. **Clutch Ratcheting:** Turn the drive (2) pinion by hand in the direction of starter rotation. The clutch should ratchet smoothly with a slight clicking action.
2. **Motor and Gearing Freeness:** Turn the drive (2) pinion opposite the direction of Starter rotation. The pinon should turn by hand.
3. **Motor Action and Pinion Engagement:** Secure starter in a vise or fixture that will safely allow to pinion to extend and rotate. Install a regulator using ½" (13 mm) airline to the starter inlet. Slowly increase pressure to 30 psig, the pinion should extend 1-¼" (31.8 mm) and rotate the direction marked on the nameplate.

Troubleshooting

Trouble	Probable Cause	Solution
Motor will not run and pinion does not engage	No air supply	Check for blockage or damage to air supply lines or tank.
	Foreign material in starter and/or piping	Remove liner assembly and/or piping and remove blockage.
	Defective control valve or relay valve	Replace control valve or relay valve.
	Low air signal pressure to start valve	Check air supply.
Loss of Power	Low air pressure to starter	Check air supply.
	Restricted air supply line	Check for blockage or damage to air lines.
	Relay valve malfunctioning	Clean or replace lines or relay valve. Lube relay valve.
	Foreign material in starter	Remove liner assembly and remove blockage.
	Damaged liner assembly components	Replace liner assembly.
Motor runs and pinion engages, but does not rotate flywheel	Damaged or broken liner assembly	Replace liner assembly.
Excessive butt engagement	Damaged drive pinion or flywheel	Inspect drive pinion and flywheel and replace if necessary.
	Low air pressure	Check air supply.
	Wrong drive pinion	Replace with proper drive pinion.
Oil leaking out of exhaust	Oil in air supply line	Inspect airline and remove source of oil including inline lubricators.
	Oil leaking from engine bell housing	Replace drive seal.
	Worn or damaged seals in liner assembly	Replace liner assembly.
Air leakage	Loose joints	Make sure all joints are tight. Use **Ingersoll Rand** SMB-441 Sealant on all NPT connections.
	Worn or damaged inlet O-Ring	Replace O-Ring using O-Ring lubricant.

Parts and Maintenance

NOTICE

The use of other than genuine Ingersoll Rand replacement parts may result in safety hazards, decreased motor performance, and increased maintenance, and may invalidate all warranties. Ingersoll Rand is not responsible for customer modification of motors for applications on which Ingersoll Rand was not consulted.

When product life has expired, it is recommended that the product be disassembled, degreased and parts be separated by material for proper recycling.

Repair and maintenance should only be carried out by an authorized Service Center. Refer all communications to the nearest **Ingersoll Rand** office or distributor.

Related Documentation

Manuals can be downloaded from **ingersollrandproducts.com**

For additional information, refer to:

Product Safety Information Manual: 45558624
Product Information Manual: 47619006001
Parts Information Manual: 47616907001

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