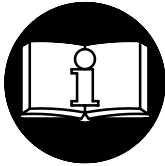
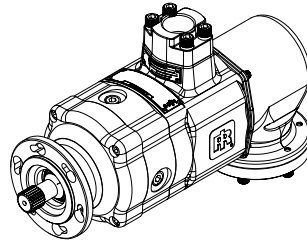


INSTALLATION AND MAINTENANCE MANUAL

for

TS799BBEF-LM and TS799BBEF-LE TURBINE-POWERED STARTERS



⚠ WARNING

**IMPORTANT SAFETY INFORMATION ENCLOSED.
READ THIS MANUAL BEFORE OPERATING TOOL.**

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

- For safety, top performance, and maximum durability of parts do not operate Series TS700B Starters at air pressures over the pressure rating stamped on the nameplate. Use supply lines of adequate size as directed in the installation instructions in this manual.
- Always turn off the air or gas supply and disconnect the air or gas supply hose before installing, removing or adjusting any accessory on this starter, or before performing any maintenance on this starter.
- Series TS700B Starters are designed for gas operation. They are not totally sealed in dynamic operation since the exhaust must be vented or piped away and there is a possibility of leakage around the output shaft when rotating.
- Caution should be taken when operating these starters on gas because of the danger of fire, explosion, or inhalation. After assembling a starter, always test in accordance with the procedures outlined in this manual. Never install a reassembled starter that has not been tested in accordance with the procedures in this manual.
- Operate this starter only when properly installed on the engine.
- Do not lubricate starters with flammable or volatile liquids such as kerosene or jet fuel. For personal protection, do not remove any labels. Replace any damaged label.
- Use only recommended Ingersoll-Rand accessories.

NOTICE

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

Ingersoll-Rand is not responsible for customer modification of starters for applications on which Ingersoll-Rand was not consulted.

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

It is the responsibility of the employer to place the information in this manual into the hands of the operator.

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

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INGERSOLL-RAND

PRODUCTION EQUIPMENT



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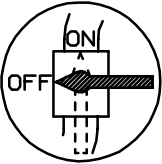

SAFETY INFORMATION



WARNING

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

	 WARNING
	Always wear eye protection when performing maintenance on this starter.

	 WARNING
	Always wear hearing protection when testing this starter.

	 WARNING
	Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this starter, or before performing any maintenance on this starter.

	 WARNING
	Do not use damaged, frayed or deteriorated air hoses and fittings.

SERIES TS700B TURBINE STARTER OPERATING GUIDELINES

⚠ WARNING

- Never exceed the operating pressure stamped on the Nameplate.
- Always release the start button immediately after the engine starts.

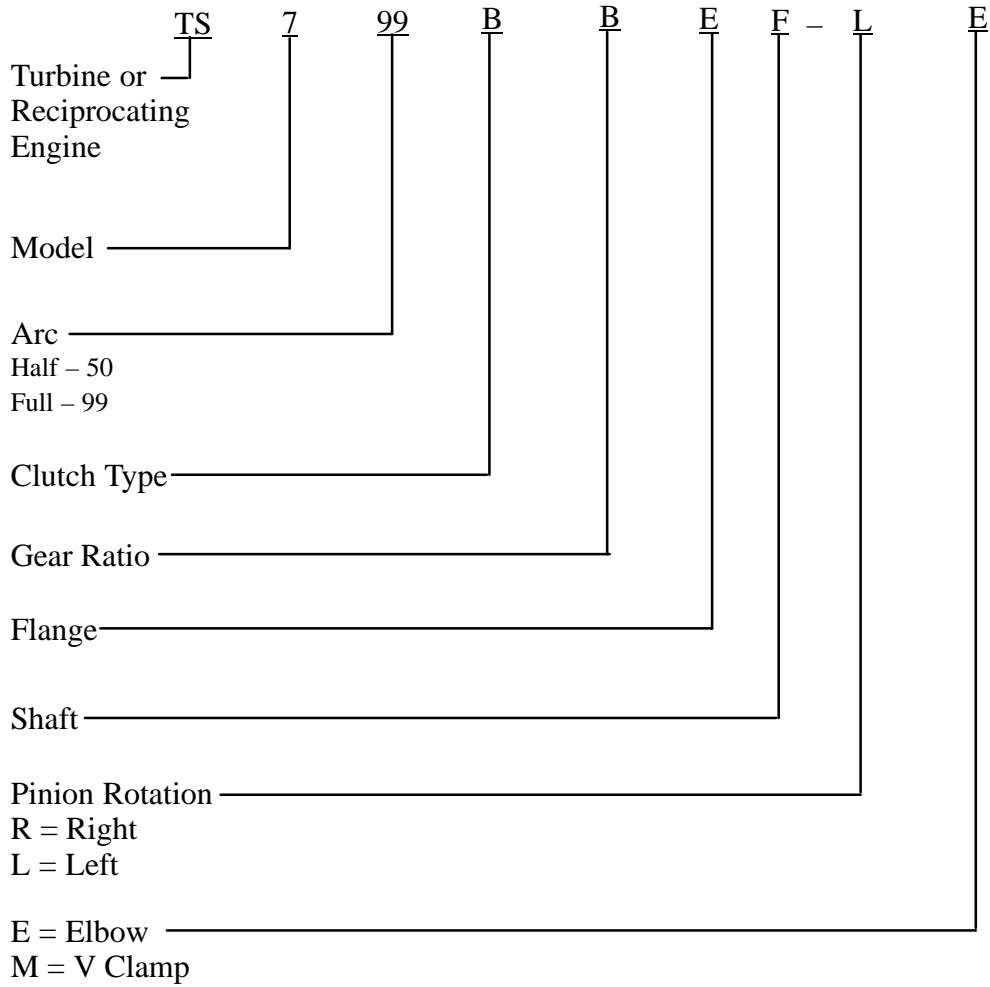
NOTICE

- If the engine has not started after 60 seconds of cranking, refer to the engine maintenance guides for information on starting, ignition and fuel systems.
 - When using the starter for dynamic timing measurements, rest the starter for 2 1/2 minutes between 60 second measurements.
 - Supply of Air or Gas must be free of particulates. New piping must be free of scale and weld slag particles
 - Starter oil level should be checked annually and changed every 500 starts to ensure maximum clutch life.
- If the supply of Air or Gas is not free of particulates, a ST900 Series Strainer or equivalent is required for optimum Starter operation and longevity.
 - For natural gas operation, starter main exhaust must be piped away. To pipe the drive housing vent, remove the Drive Housing Plug and replace it with a suitable tubing line. The tubing must vent at a safe location and must not be interconnected with any other exhaust lines which might introduce a back pressure on the Drive Housing Vent.
 - The TS700B Series Starter is designed for long crank heavy duty applications. When cranking attempts fail to start the engine in 60 seconds, stop and allow the starter to allow the starter to cool for 2 1/2 minutes before attempting to start the engine.

SPECIFICATIONS

Model Code Explanation

Example: TS799BBEF-LE



Model	Supply Pressure psi/kPA Max	Pinion Data			
		No. of Teeth	Diametral Pitch	Pitch Diameter	PA
TS799BBEF-LE	150/1035	24	20/30	1.2	30
TS799BBEF-LM	150/1035	24	20/30	1.2	30

PLACING THE STARTER IN SERVICE

INSTALLATION

For maximum performance, read this manual prior to the installation or operation of Series TS700B Turbine-Powered Starters.

General Information

1. All pipe connections to the starter must be designed to provide continuously leak proof joints. Piping the starter should not impose stress on the starter as the result of operating vibration, thermal expansion or unsupported weight.
2. All piping, hoses, fittings and components must be clean, free of weld splatter, and any contamination that can enter the starter.
3. The exhaust of the starter has a 90° housing for use in piping away the exhaust.
90° Exhaust Cover – ST700–350.
“V” Clamp Straight Exhaust Cover – TS799–350.
Refer to Dwg. TPE_1016 for instructions.
4. The installation of the starter must comply with all appropriate specifications; such as torquing threaded fasteners and fittings, lubrication as installed and during operation, air (or gas) flow to and from the unit, cleanliness and safety.
5. It is **required** that a Strainer be installed in the inlet line for each starter. Ingersoll-Rand offers 3 sizes of Strainers: ST900–267–24 for 1 1/2 inch lines, ST900–267–32 for 2 inch lines and ST900–267–64 for 4 inch lines. These 300 mesh strainers provide 50 micron filtration and offer significant protection against supply line contaminants which could damage the turbine components. Replacement elements are ST900–266–24 for 1– inch, ST900–266–32 for 2 inch, and ST900–266–64 for 4 inch lines.
6. All air (gas) line connections must be bubble tight. Ingersoll-Rand No. 5MB–441 sealant applied to clean threads will help assure a leak proof system.
7. In gas installations, all exhausts must be piped to a safer location. This applies to the exhaust from the Relief Valve and the Control Valve (5MBG–618 or 150BMD–Z451B) as well as the starter exhaust.
8. If the supply air (gas) to the starter is at a higher pressure than that stamped on the nameplate of the starter, a pressure regulator must be installed in the supply line ahead of the relay valve. The pressure setting of the regulator is to be the operating pressure of the starter and not greater than the nameplate stamping. A relieving type regulator is recommended. If this type is not available it is important to install a relief valve between the regulator and relay valve. The opening pressure of

the relief valve should be 15 psi. above the regulator setting.

9. The air supply lines between the relay valve, toe control valve, and starter should be as short and free of fittings as practical.
10. The air supply lines should be arranged to provide drainage for condensation. This is especially important when the lines are long.
11. The starter, control components and air lines should be arranged so that they are protected from heat, vibration and contamination.
12. Apply a film of Dextron® *II Automatic Transmission fluid to the driving spline and mount the starter using the Mounting Cap Screws. Tighten the Mounting Cap Screws to 40–45 ft–lbs (54–61 Nm) torque.
13. Refer to Dwg. TPE_1019 for torque and lubrication specifications.

Barring Over the Engine

The rotor shaft has a 1/4” hex socket in the end that can be used to rotate the engine shaft. This hex socket can be accessed by removing the directional exhaust 1/4” NPT plug (28B) from that housing to access the 1/4” hex socket.

Orientation of the Starter

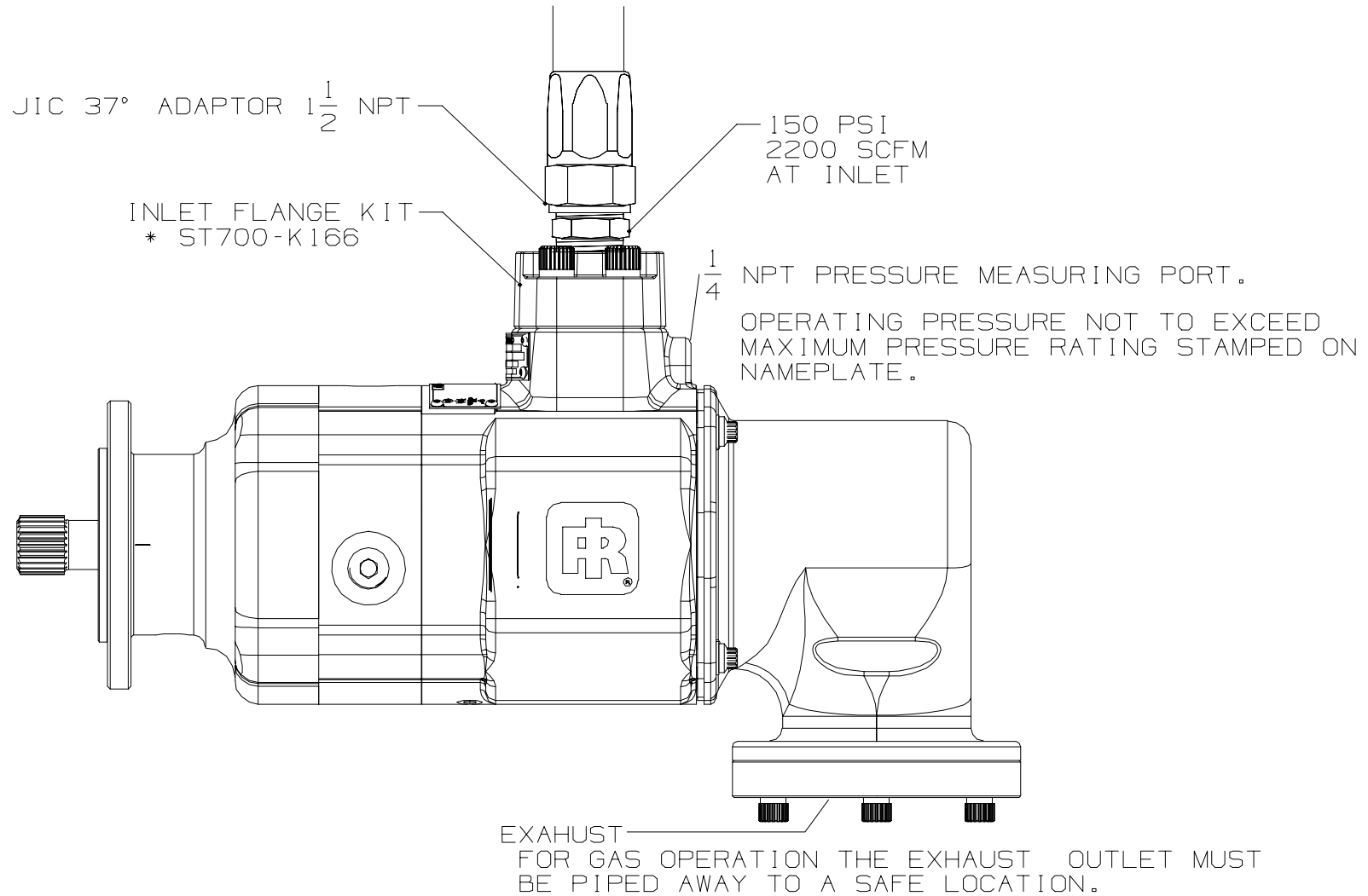
Orientation refers to the rotational location of the lubrication ports in the Drive Housing, the rotational location of the air (gas) inlet, and if used, the rotational location of the directional exhaust cover.

It is recommended that the correct orientation be ordered from the factory. If it is necessary to reorient the unit in the field, refer to Dwg. TPE_1018 and proceed as follows:

1. To rotate the Drive Housing relative to the inlet:
 - a. Remove the Cap Screws (13) holding the Drive Housing (1) to the Gear Case (12).
 - b. Rotate the Drive Housing to the required position. Do not remove the Drive Housing (1) from the Gear Case (12).
 - c. Install the Cap Screws (13) and tighten to 28 ft.–lbs. (38 Nm) torque.
2. To rotate the Directional Exhaust cover with respect to the inlet:
 - a. Remove the Starter Assembly Cap Screws (35).
 - b. Rotate the Exhaust Cover (33) to its required position. Do not remove the Cover from the Motor Housing (24) or separate the Motor Housing and Gear Case (12)
 - c. Reinstall the Cap Screws (35) and tighten them to 60 ft.–lbs. (81.4 Nm) torque in 20 ft.–lb. (27 Nm) increments.

* Registered trademark of Exxon Corp.

TYPICAL SERIES TS700B TURBINE INTERFACE



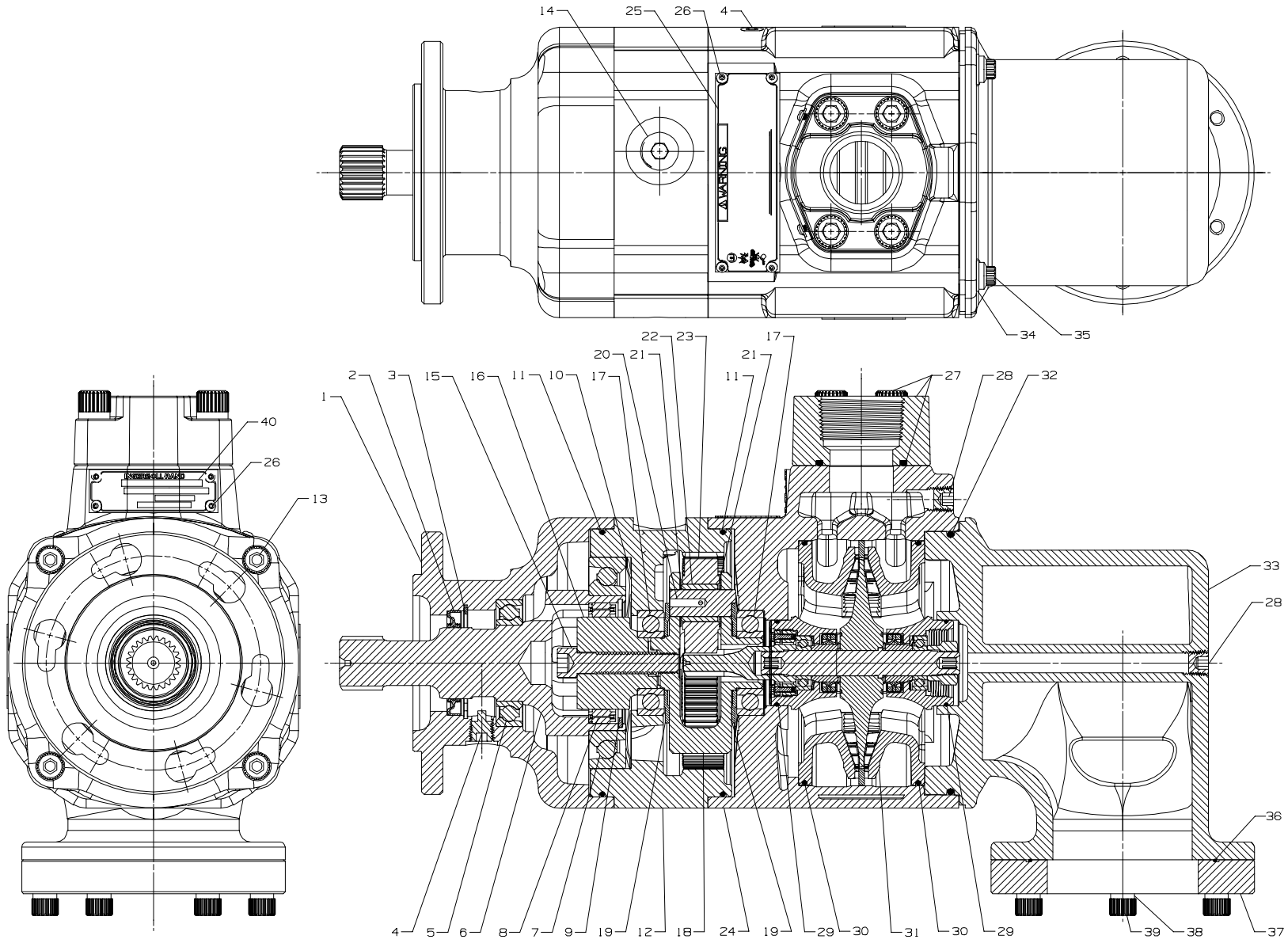
NOTE:
FOR ALL APPLICATIONS USE SEALANT * SMB-441 OR EQUIVALENT
ON ALL PIPE CONNECTIONS.

* INDICATES INGERSOLL-RAND PART NUMBER

TPE_1014

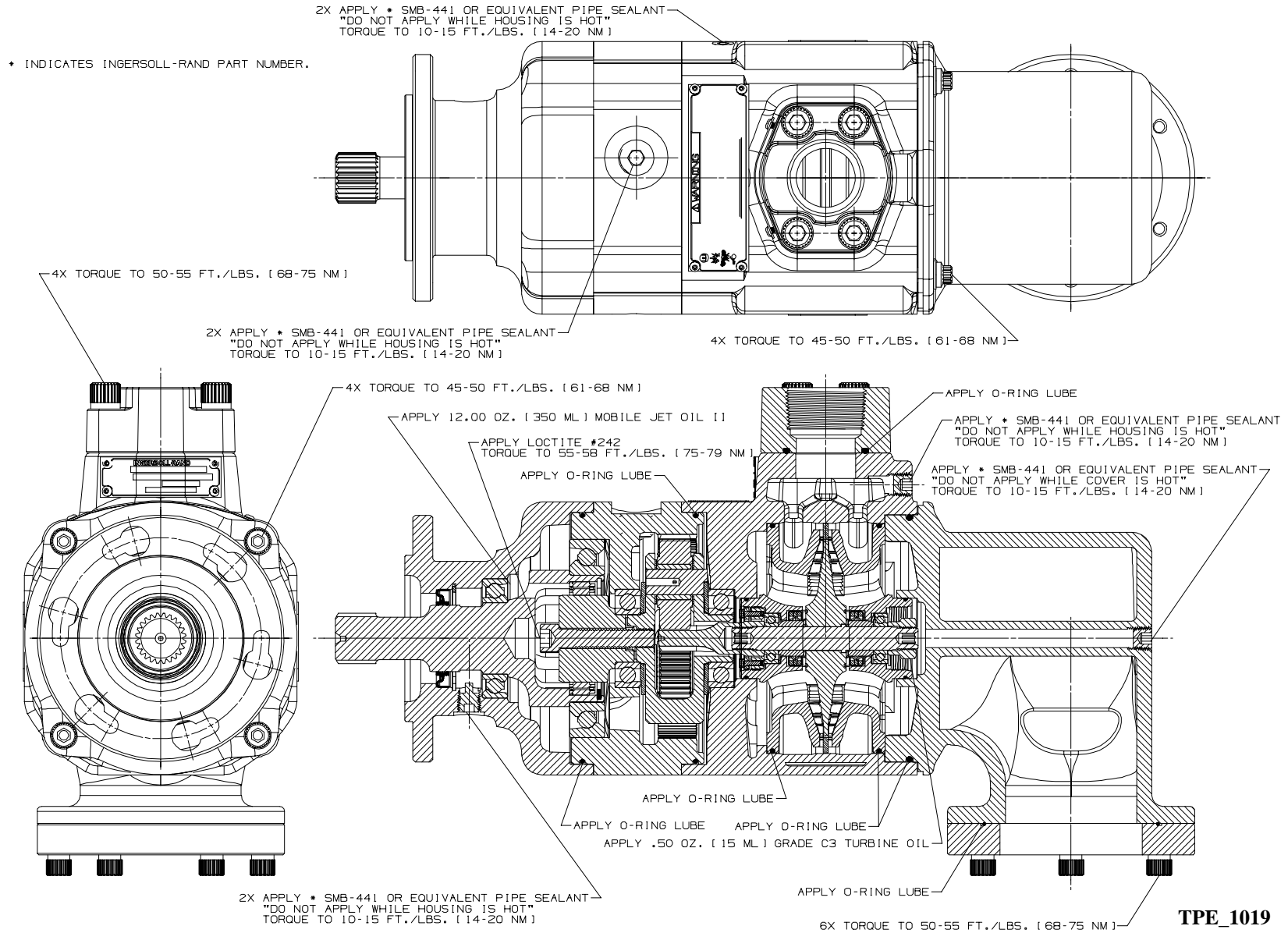
MODEL TS799BBEF-LE CROSS SECTION DRAWING

8



MAINTENANCE SECTION

MODEL TS799BBEF-LE LUBE and TORQUE DRAWING



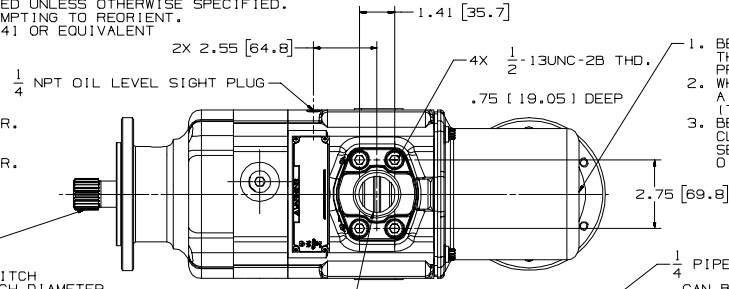
MODEL TS799BBEF-LE DIMENSIONAL DRAWING

NOTES:

1. STARTERS SHOULD BE INSTALLED ON THE ENGINE WITH THE EXHAUST POINTED DOWN.
2. ORIENT GEAR CASE SO OIL DRAIN IS VERTICAL 90°.
3. STANDARD ORIENTATION SHOWN WILL BE SHIPPED UNLESS OTHERWISE SPECIFIED.
4. PLEASE READ THE INSTRUCTIONS BEFORE ATTEMPTING TO REORIENT.
5. FOR ALL APPLICATIONS USE SEALANT *SMB-441 OR EQUIVALENT ON ALL PIPE CONNECTIONS.
6. * INDICATES INGERSOLL PART NUMBER
7. () INDICATES METRIC DIMENSIONS

STARTER ROTATION:

LEFT HAND ROTATION IS CW
WHEN LOOKING AT OUTPUT SHAFT END OF STARTER.
RIGHT HAND ROTATION IS CW
WHEN LOOKING AT OUTPUT SHAFT END OF STARTER.



1. BEFORE REMOVING THE HEX PLUG, THE STARTER MUST BE REASONABLY LEVEL TO PREVENT DRAINING THE OIL FROM THE GEAR CASE.
2. WHEN THE HEX PLUG IS REMOVED, A SLIGHT AMOUNT OF OIL MAY LEAK FROM THE HOLE. (THIS IS NORMAL)
3. BEFORE REASSEMBLY, CLEAN ALL OIL FROM THE THREADS AND APPLY PIPE THREAD SEALANT *SMB-441 OR EQUIVALENT TO PREVENT OIL LEAKAGE.

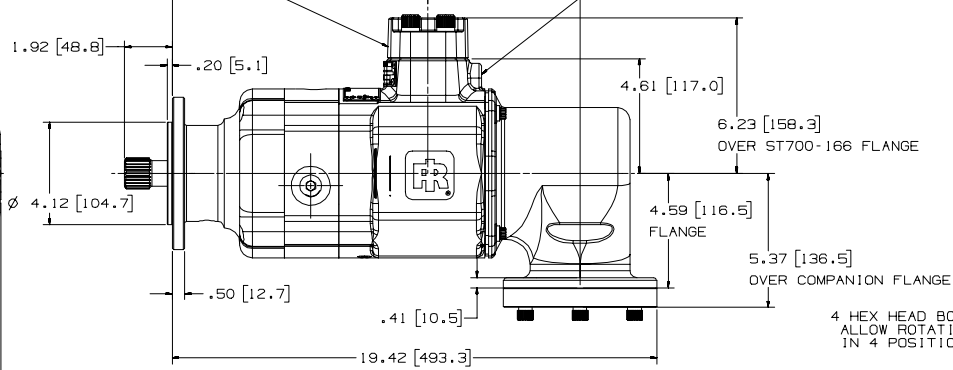
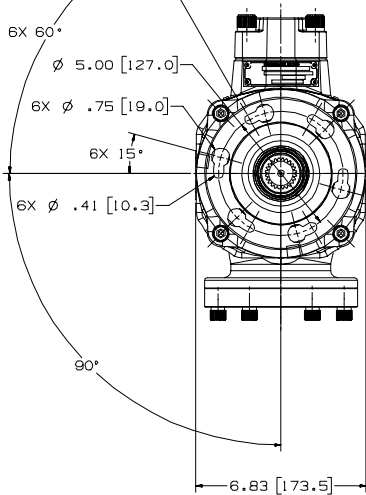
SPLINE DATA:
24 TEETH
20/30 DIAMETRAL PITCH
1.200 [30.48] PITCH DIAMETER

STANDARD INLET FLANGE KIT * ST700-K166
(INCLUDES MOUNTING HARDWARE)

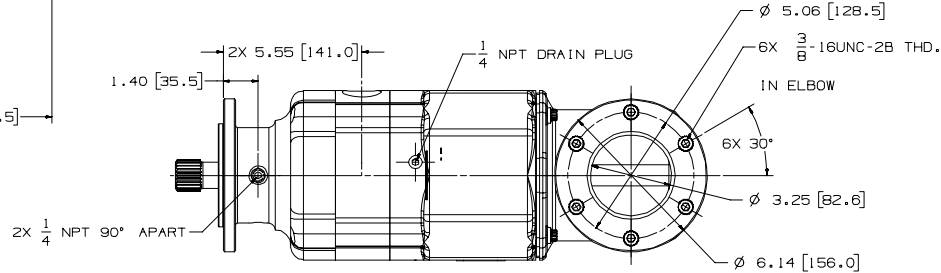
TYPE J518C FLANGE

- 1/4 PIPE PLUG IN HOUSING INLET BOSS
CAN BE REMOVED AND GAGE INSTALLED TO CHECK SUPPLY PRESSURE TO STARTER.
BEFORE REASSEMBLY, CLEAN ALL OIL FROM THE THREADS AND APPLY PIPE THREAD SEALANT *SMB-441 OR EQUIVALENT TO PREVENT OIL LEAKAGE.

10



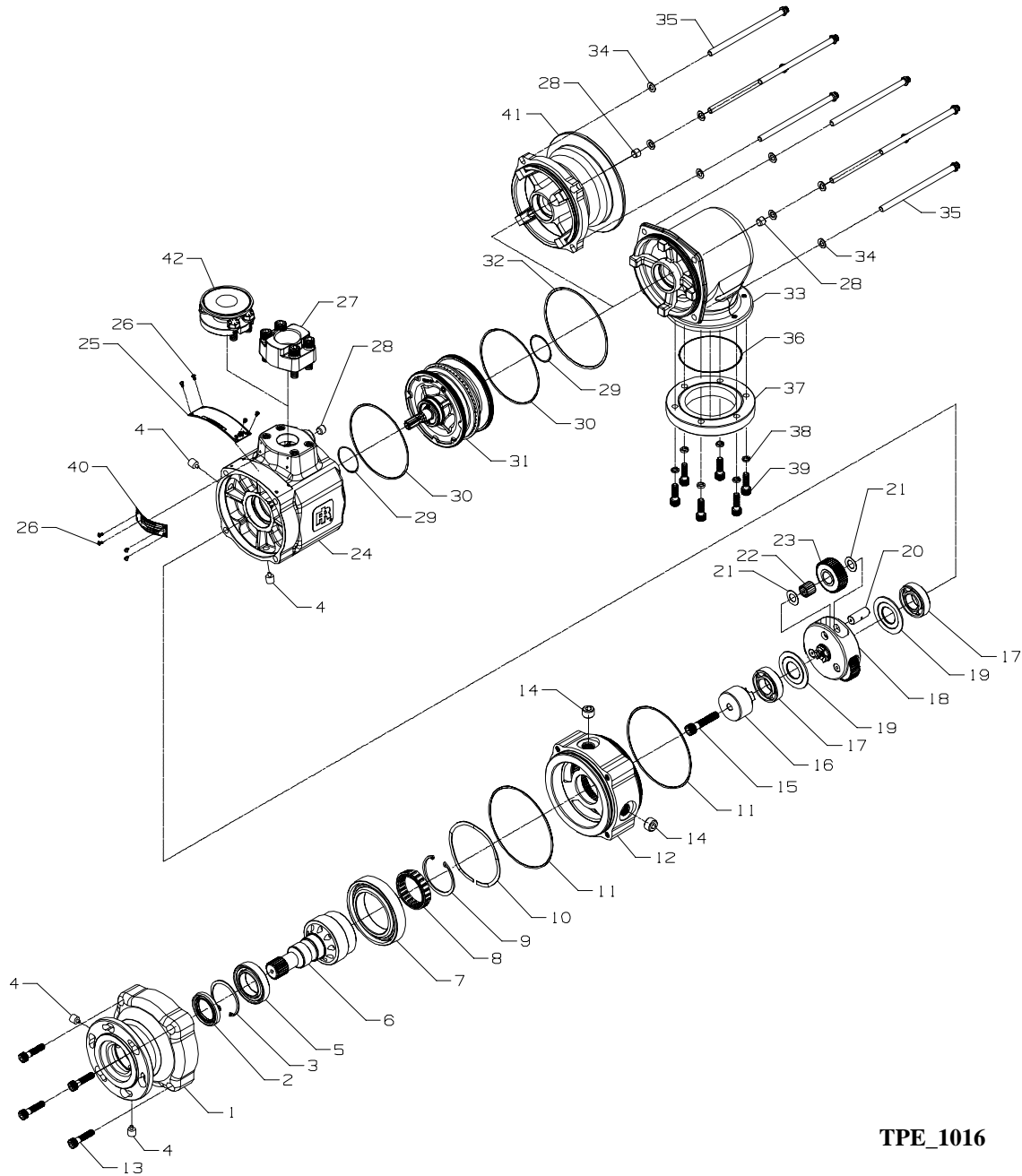
- 4 HEX HEAD BOLTS—
ALLOW ROTATION OF INLET
IN 4 POSITIONS.



TPE_1018

MAINTENANCE SECTION

SERIES TS700B ASSEMBLY DRAWING



MAINTENANCE SECTION

TPE_1016

PART NUMBER FOR ORDERING 

PART NUMBER FOR ORDERING 

	Drive Housing Assembly	TS799-A300F	24	Housing	04559217
1	Drive Housing	TS799-300F	25	Nameplate	ST700-301
2	Seal	10581783	26	Screw (8)	R4K-302
3	Retaining Ring	Y147-244	27	Inlet Flange Kit for TS799BBEF-LE (includes Inlet Flange, O-Ring, Flange Mounting Bolts and Lock Washers)	ST700-K166
4	Pipe Plug (4)	CE110-29			
	Output Shaft Assembly	TS799-A18E			
5	Bearing	TS799-278	28	Pipe Plug (2)	R0H-377
6	Drive Shaft	TS799-18E	29	O-Ring (2)	Y327-32
7	Bearing	TS799-399	30	O-Ring (2)	ST700-67
8	Clutch Sprag	TS799-359	31	Motor Assembly	TS799L-A53B
9	Retaining Ring	Y147-281	32	O-Ring	Y330-257
10	Washer	TS799-224	33	Exhaust Cover for TS799BBEF-LE	ST700-350
11	O-Ring (2)	Y327-163	34	Washer (4)	SS800-26
12	Housing	TS799-37	35	Screw (4)	SS800-25
13	Screw (4)	SS350-394		Exhaust Flange Kit for TS799BBEF-LE	ST700-K166
14	Pipe Plug (2)	Y17-53	36	O-Ring	Y327-46
	Gear Assembly	TS799-A108B	37	Adapter	ST700-351
15	Screw	SS800-732	38	Washer (6)	845-58
16	Shaft Clutch	TS799-8	39	Screw (6)	ST700-703
	Frame Assembly	TS700-A108B	40	Nameplate	04612313
17	Bearing (2)	TA-22	41	Exhaust Cover for TS799BBEF-LM	TS799-350
18	Gear Frame	TS700-108B	42	Inlet Flange Kit for TS799BBEF-LM (includes Inlet Flange, O-Ring, Flange Mounting Bolts and Lock Washers)	TS799-K166
19	Washer (2)	TS700-100B		Seal Kit	TS799-SK1
20	Shaft (3)	ST700-191			
21	Spacer (6)	ST700-364			
22	Roller (54)	ST700-363-R			
23	Planet Gear (3)	TS700-10B			

MAINTENANCE SECTION

Always wear eye protection when operating or performing any maintenance on this starter. Always turn off the air or gas supply and disconnect the air or gas supply hose before installing, removing or adjusting any accessory on this starter or before performing any maintenance on this starter.

LUBRICATION

Each time a Series TS700B Starter is disassembled for maintenance or repair, lubricate the starter as follows:

1. Lubricate all o-rings with o-ring lubricant.
2. Add 350 ml (approximately 1/2 pint) of Mobil Jet Oil II through the side plug hole in the Motor Housing (24)
3. Wipe end of splined output shaft (6) with Ingersoll-Rand No. 130 Grease.
4. Add 15 ml of Mobil Jet Oil II at plug (28B) in exhaust cover (33).

DISASSEMBLY

General Information

1. Do not disassemble the Starter any further than necessary to replace worn or damaged parts.
2. When grasping a part in a vise, always use copper-covered vice jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded and die cast members.
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 replacement or repairs.
4. Always have a complete set of seals and o-rings (TS799-SK1) on hand before starting any overhaul of a Series TS700B Turbine Starter. Never reuse old seals or o-rings.
5. Mark adjacent housings so they can be reassembled into the same relative positions with adjacent center punch marks on the out side of the flanges on the exhaust cover (33), Motor housing (24), and Gear Case (3). A quick drying marking pen can be used as an alternative.
6. Do not press any bearing from a part unless you have new bearings on hand for installation. Bearings are always damaged during the removal process.

Housing Exhaust Cover, Motor Assembly, and Motor Housing.

1. If replacing the Motor Assembly (31), remove Housing Plug (4D) and drain the oil from the gearing before beginning disassembly of the Starter. Inspect the Magnetic Housing Plugs (4C & 4D) for metal particles. Very fine metal particles are normal. Remove particles and reinstall plugs.

Large particles or chips are an indication of a problem. If apparent, disassemble Gear Case (12) and inspect.

2. Using an 8 mm Hex-head wrench, unscrew and remove the Starter Assembly Cap Screws (35) and Washers (34).
3. Pull the Housing Exhaust Cover (33) from the Motor Housing (24). To dislodge the Housing Exhaust Cover, rotate it until the ears clear the Motor Housing. Using a plastic hammer, tap the ears alternately until the Housing Exhaust Cover can be removed from the Motor Housing. Refer to Dwg. TPE_1016.
4. To disassemble the Housing Exhaust Elbow and components. Refer to Dwg. TPE_1016.
5. Tap the Motor Housing with a plastic hammer to dislodge it from the Gear Case (12).
6. Grasp the rear of the Motor Assembly (31) and pull from the rear of the Motor Housing. If the Motor Assembly is difficult to remove, lightly, push the motor pinion which is in the front of the Motor Assembly toward the exhaust side of the Motor Housing in order to free the Motor Assembly. The Motor Assembly (31) is replaced as a unit and not disassembled in the field. Refer to Dwg. TPE_1016.

Drive Housing Disassembly

1. Remove the 4 Head Cap Screws (13) that hold the Drive Housing (1) and Gear Housing (12) together. Refer to Dwg. TPE_1016.
2. Using two pry bars on opposite sides of the assembly, carefully pry the two housings apart.

CAUTION

Be careful not to damage the O-Ring and Pilot diameters.

Clutch Removal

1. To remove the Clutch (8), remove Retaining Ring (9) from the Output Shaft (6) and slide the Clutch (8) out.

Drive Housing Seal Removal

1. Remove Retaining Ring (3) from the Drive Housing (1). Refer to Dwg. TPE_1016.
2. Support the Drive Housing (1) and carefully press the Seal (2) out of the Drive Housing (1)
3. Inspect the level and Drain Plugs (4) in the Drive Housing (1). Very fine metal particles are normal. Remove the particles and reinstall the plugs (4). Large particles or chips are an indication of a problem. If apparent, disassemble Gear Housing (12) and inspect.

MAINTENANCE SECTION

Gear Housing Disassembly

1. To remove the Gear Assembly, grasp the Gear Housing (12) and pull the Planet Gear Frame (18) out from the rear of the Gear Housing (12).

Gear Package Disassembly

1. Remove the Socket Head Cap Screw (15) from the Gear Frame Assembly.
2. Slide the Clutch shaft (16) off of the Gear Frame Assembly.
3. Using a bearing puller, remove the two bearings (17A and 17B).
4. The two Gear Shaft Retaining Washers (19) can be removed from the Planet Gear Frame (18).
5. The three Planet Gear Shafts (20) can be pushed from the planet frame (18).

CAUTION

This will free for removal the Planet Gears (23), the Bearing Spacers (21), and the Needle Rollers (22).

ASSEMBLY

Assembly of the Starter

General

1. Always press on the **inner** ring of a ball bearing when installing the bearing on a shaft.
2. Always press on the **outer** ring of a ball bearing when pressing the bearing in a bearing recess.
3. Whenever grasping a part in a vise, always use leather-covered, copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded and die cast parts.
4. Always clean every part, and wipe every part with a thin oil film before installation.
5. Note the orientation markings that were placed on the mating flanges before disassembly and assure the assembled unit is arranged as before disassembly.
6. Coat all O-rings and the contact surface on their mating parts with o-ring lubricant immediately before assembling those parts.
7. When pressing parts together, assure that the parts are located firmly against a shoulder or otherwise positioned as specified.

Output Shaft Assembly

NOTICE

The Clutch should be replaced after 1500 starts.

1. Press Bearings (5) and (7) onto Output Shaft (6) making sure Bearing Shoulders are facing the correct direction. Refer to Dwg. TPE_1016.
2. Insert Clutch (8) into Output Shaft (6) with the Clutch shoulder pointed into the Output Shaft.
3. Insert Retaining Ring (9) into groove on Output Shaft (6).

Drive Housing Assembly

1. Press Drive Housing Seal (2) into Drive Housing (1) until flush with the lip.
2. Install Retaining Ring (3) into groove on Drive Housing (1).
3. Install Magnetic Plugs (4) into Drive Housing (1), Torque to 12.5 ft-lbs (17 Nm).
4. Carefully slide the Output Shaft Assembly into the Drive Housing Assembly.

Assembly of Drive Housing Assembly to Gear Housing

1. Slide O-Rings (11) onto the Gear Housing (12).
2. Install Plugs (14) into Gear Housing (12). Torque to 12.5 ft-lbs (17 Nm).

NOTICE

Use Loctite® 56747 **Pipe Sealant on all plugs.

3. Position Spring Washer (10) into Gear Housing (12).
4. Assemble together, taking care not to damage the O-Ring (11) on the Gear Housing (12).
5. After positioning the Drive Housing Assembly to the orientation marks on the Gear Housing (12), install Socket Head Cap Screws (13) through Drive Housing (1) and into the Gear Housing (12). Torque to 47.5 ft-lbs (64.5Nm) in 20 ft-lbs (27Nm) increments.

Gear Case Assembly

1. Assemble Gear Shaft Retaining Washer (19B) onto end of Planet Frame opposite the driving dogs. The counterbored side of the Washer must be towards the Planet Frame. Refer to Dwg. TPE_1016
2. Press Bearing (17B) onto Planet Frame so that it seats against the Washer.
3. Hold the end of the Planet Gear Shaft (20) in a leather covered or copper covered vice jaws. Place a Bearing Spacer (26) over the Shaft. Place a Bearing Spacer (21) over the shaft. Lay a fillet bed of Ingersoll-Rand No. 100 grease around the Shaft and Spacer. Place Planet Gear (23) over the Shaft and seat onto the grease. Insert eighteen Rollers (22) between the Shaft (20) and Gear (23). Add a fillet of Grease over the end of the Rollers and seat a Bearing Spacer over the Shaft.

MAINTENANCE SECTION

- Carefully lift the assembly of two Spacers, Gear and Rollers from the Shaft and slide it onto the Planet Frame so that the holes line up.
- Remove the Shaft from the vise, holding it by the plain end, and position it so that the step on the opposite end lines up with the Retaining Washer (19B) on the opposite side of the Planet Frame (18). Slide it into the Planet Frame, through the Gear and Spacer Pack, and through the opposite side of the Planet Frame. Tap lightly with a plastic hammer if necessary. Repeat this procedure for each Planet Gear.
- Place a Gear Shaft Retaining Washer (19A) on the driving dog end of the Planet Frame (18). The counter-bored side of the washer must face the Planet Frame.
- Press the Planet Frame Bearing (17A) onto the Planet Frame (18) so that it seats against the Washer (19A).
- Slide the Clutch Shaft (16) into the Gear Frame Assembly. Apply Loctite No. 242** to the first three threads on the Socket Head Cap Screw (15) and install to the Gear Frame Assembly. Torque to 58 ft–lbs (79 Nm).
- Carefully slide the Gear Frame Clutch Assembly into the Drive and Gear Housing Assembly, taking care not to damage the Clutch (8) or outer race of the Clutch Shaft (16).

Assembly of the Directional Housing Exhaust Cover

- Coat the Exhaust Cover Seal (32) with O–Ring Lubricant and install in the groove in the Directional Housing Exhaust Cover (33).
- Install Directional Housing Exhaust Cover (33) on the rear of the Motor Housing (24) in the desired orientation and using a plastic hammer, tap the Directional Housing Exhaust Cover (33) until it seats.
- Secure the Directional Housing Exhaust Cover (33) on the rear of the Motor Housing (24) using the starter assembly Cap Screws (35) and Cap Screw Washers (34). Using an 8 mm Hex–Head Wrench, tighten each Cap Screw to a final torque of 55 ft–lbs (74.5 Nm) in 20 ft–lbs (27 Nm) increments.

NOTICE

Use Loctite® 56747 **Pipe Sealant on all plugs.

- Place the starter in a vertical position with Exhaust Elbow Plug (28B) up. Pour .50 oz (15ml) of Mobil Jet Oil II and replace plug. Torque to 15 ft–lbs (20Nm).
- Install the Bottom Housing Plug (4D) and Inlet Housing Boss Plug (28A). Torque to 15 ft–lbs (20Nm).
- Place the starter on a level workbench with side plug hole upward. Add 10.3 oz (350ml) of Mobil Jet Oil II through the side plug in the Motor Housing (24). Install the side plug (4C) into the housing (24) and torque to 15 ft–lbs (20Nm).

Assembly of Exhaust Adapter

- Lubricate Exhaust Adapter Seal (36) with O–Ring Lubricant and install in groove in Exhaust Flange (37).
- Align Exhaust Flange (37) with Directional Housing Exhaust Cover (33).
- Install Cap Screws (39) and Washers (38) into Exhaust Adapter and tighten each cap screw to a final torque of 55 ft–lbs (74.5 Nm) in 20 ft–lbs (27Nm) increments.

Test And Inspection Procedure

- Turn the Splined Shaft by hand in the direction of starter rotation. It should turn freely and easily.
- Turn the Shaft in the opposite direction. It will be more difficult to turn; however, it should turn smoothly with no binding. Turn the shaft through 12 to 15 revolutions.
- Confirm orientation by referring through to previously placed markings or installation drawing.
- Secure starter in a vise and apply 90 psi (6.2 BAR/620kPa) pressure using a 3/8" (9mm) supply line to the inlet of the motor. The starter should run smoothly. Confirm that the Splined Shaft is turning in the correct direction. If applicable, confirm that the exhaust deflector returns to its normal position after the air is turned off.
- With the starter immersed in a non–flammable, bubble–producing liquid, slowly apply 20 psi (1.38 Bar/138 kPa) to the inlet of the motor for 30 seconds. No bubbles should appear.

MAINTENANCE SECTION

TROUBLESHOOTING GUIDE		
Trouble	Probable Cause	Solution
Motor will not run	No air supply	Check for blockage or damage to air supply lines or tank
	Damaged Motor Assembly (31)	Inspect Motor Assembly and power train and repair power train or replace Motor Assembly if necessary
	Foreign material in Motor and/or piping	Remove Motor Assembly and piping and remove the blockage
	Blocked exhaust system	Remove Housing Exhaust Cover (33) and check for blockage
	Defective Control or Relay Valve	Replace Control Valve or Relay Valve
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. Lubricate Relay Valve
	Exhaust flow restricted	Check for blockage or damaged piping. Clean or replace piping. Check for dirt or foreign material and clean or remove. Check for ice build-up. Melt ice and reduce moisture build-up to Starter
	Damaged Motor Assembly	Replace Motor Assembly
Oil blowing out of exhaust	Oil in air supply line	Inspect air line and remove source of oil.
	Pipe Plug (28B) missing.	Install Pipe Plug (28B).
	Worn or damaged rotor seals or static O-rings	Replace static seals on outside of Motor or send Motor to Ingersoll-Rand to be rebuilt.
Oil leaking from Gear Case	Worn or damaged O-rings	Replace O-rings
	Loose joints	Make sure that joints fit properly and Starter Assembly Cap Screws are tightened to 60 ft-lb (81 Mn) torque. Make sure all seals and O-rings fit and seal properly at their perimeters. If they do not replace with new seals and O-rings.
	Excessive high speed operation	Operate according to recommendations.
	High number of start cycles	Replace worn components
	Loose or leaking Pipe Plugs (4A), (4B), (4C), (4D), (14A) and (14B)	Tighten or replace Pipe plugs using Ingersoll-Rand No. SMB-441 Pipe Sealant.
	Pipe Plug missing.	Replace Pipe Plug.
Air or Gas Leakage	Loose joints	Make sure that joints fit properly and Starter Assembly Cap Screws are tightened to 60 ft-lb (81 Mn) torque. Make sure all seals and O-rings fit and seal properly at their perimeters. If they do not replace with new seals and O-rings.
	Excessive high-speed operation	Operate according to recommendations.
	High number of start cycles	Replace worn components.
	Loose or leaking Pipe Plugs	Tighten or replace Pipe Plugs
	Pipe Plug missing	Replace Pipe Plug.
No or Low Output Speed	Clutch slipping	Replace Clutch
Running Hot	Excessive Oil	Check Oil Level

MAINTENANCE SECTION

SERIES TS700B MAINTENANCE SCHEDULE

STARTS	COMPONENTS	RECOMMENDATION
500	MOBIL JET OIL II	CHANGE
500	ALL EXTERNAL CAP SCREWS	CHECK TORQUE
500	STRAINER	CHECK ELEMENT
1000	MOBIL JET OIL II	CHANGE CHANGE
1000	ALL EXTERNAL CAP SCREWS	CHECK TORQUE
1000	STRAINER	CHEC, ELEMENT
1500	MOBIL JET OIL II	CHANGE
1500	ALL EXTERNAL CAP SCREWS	CHECK TORQUE
1500	STRAINER	CHECK ELEMENT
1500	CLUTCH, TS799-359	CHANGE
1500	REAR BEARING, TS799-399	CHANGE
1500	FRONT BEARING, TS799-278	CHANGE
1500	SEAL, TS700-54	CHANGE
1500	O-RING, Y327-163	CHANGE
1500	O-RING, Y330-257	CHANGE
1500	BEARING, TA-22	CHANGE
2000	MOBIL JET OIL II	CHANGE
2000	ALL EXTERNAL CAP SCREWS	CHECK TORQUE
2000	STRAINER	CHECK ELEMENT
2500	MOBIL JET OIL II	CHANGE
2500	ALL EXTERNAL CAP SCREWS	CHECK TORQUE
2500	STRAINER	CHECK ELEMENT
3000	MOBIL JET OIL II	CHANGE
3000	CLUTCH, TS799-359	CHANGE
3000	ALL EXTERNAL CAP SCREWS	CHECK TORQUE
3000	STRAINER	CHECK ELEMENT
3000	REAR BEARING, TS799-399	CHANGE
3000	FRONT BEARING, TS799-278	CHANGE
3000	SEAL, TS700-54	CHANGE
3000	O-RING, Y327-163	CHANGE
3000	O-RING, Y330-257	CHANGE
3000	BEARING, TA-22	CHANGE
3500	MOBIL JET OIL II	CHANGE
3500	ALL EXTERNAL CAP SCREWS	CHECK TORQUE
3500	STRAINER	CHECK ELEMENT

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