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68899402HT Gearshaft, Helical - PTO

For Warranty Policy & Model Eligibility, Please visit us at www.hyetechLLc.com

Subject: Removal, cleaning, inspection, rework, repair, and installation procedures for 6899402HT – PTO Helical Gearshaft.

Please Note: *These instructions are also applicable to **HYE-Tech Super Finished** PTO Gears. The active gear tooth profiles **and** seal journals are isotropic finished using the proven C.A.S.E.™ method (Chemically Assisted Surface Engineering). In order to get the maximum possible benefit from our new super finished gears, it is recommended that they be mated and used with our other super finished gears. It **is** permissible to use our C.A.S.E. processed, isotropic super finished gear with one that is not isotropic super finished; however, in this case, there is no net benefit.*

Compliance: Anytime the PTO Helical Gearshaft is removed. MPI Compliance is required every 3500 hours or anytime the AFT PTO Ball Bearing and Forward PTO Roller Bearing Inner Race is removed.

Notes: Refer to OEM's published engine operation data.

Technical aspects are FAA approved

Standard shop practices may be substituted for materials and procedures referenced herein provided they have been demonstrated as effective and safe for use with these parts or their OEM and other FAA approved equivalents.

1.0 REMOVAL

If installed, remove Accessories Gearbox. Remove the nuts, bolts & washers had split the Gearbox Cover from the Gearbox Housing in accordance with the OEM's instructions.

Remove the torque meter support shaft from the gearbox cover then simultaneously remove the Helical Torque Meter and Helical PTO Gearshaft.

If necessary, remove the AFT PTO Ball Bearing using 6796948 drift or equivalent and 6796950 plate with detail –11 or equivalent. Remove the Forward PTO Roller Bearing Inner Race using 6796948 drift or equivalent and 6796950 plate with detail –10 or equivalent.

2.0 CLEANING

Exercise extreme caution while cleaning. The 6899402HT Gearshaft has fine finished surfaces (e.g. gear teeth, internal splines, bearing & seal journals) with closely machined tolerances that must be cleaned with care to avoid damage. The recommended cleaning method is vapor degreasing.



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3.0 SPECIAL INSPECTIONS
OVERSPEED INSPECTION

The gear teeth & internal splines of the 6899402HT Helical PTO Gearshaft **MUST** pass both visual and NDT inspection anytime the Accessories Gearbox has experienced a complete loss of output shaft load or an overspeed of, or in excess of 120%.

ACCESSORIES GEARBOX OPERATION WITHOUT OIL PRESSURE

All 6899402HT Helical PTO Gearshaft **MUST** pass both visual and NDT inspection anytime the Accessories Gearbox has operated for, or in excess of 30 seconds without oil pressure. Any evidence of higher than normal gearbox temperature (e.g. abnormal discoloration, blistered paint, etc.) will also require a hardness check (minimum 15N-90).

NOTE: Anytime the gearbox is opened, review the engine & gearbox records to determine the number of operating hours that have elapsed since the 6899402HT PTO Helical Gearshaft was new or was last magnafluxed (at overhaul or repair). Gear must not exceed more than 3500 operating hours between magnetic partial inspections. MPI Gear if unable to determine time since last inspection. Record compliance with this inspection in the appropriate section of the engine log book (gearbox section) stating the date & engine/gearbox total operating hours.

4.0 INSPECTIONS

Inspect and repair or replace the gear shaft in accordance with the following tables.

Table 1

Condition/Inspection	Service Limit	Repair Limit	Corrective Action
Wear on gear teeth (Visual)	Slight normal wear with all mating parts in good condition & within PD limits	Wear pattern which is more than a matte (dull) surface condition	Remove sharp edges by stoning. Replace if evidence exists of healed prior scuffing
Spalling. Use 5X magnification lens.	Light pitting (as evidenced by a matte or dull worn area) not exceeding 35% of the load carrying (contact) area of the tooth.	None	Stone, hone and/or grind* lightly to remove spalling and/or raised metal.
Scuffing	Scuffing when accompanied by wear off of metal pickup. If gear assembly is still matched with respective mating gears	Scuffing evidenced by pickup	Remove sharp edges by stoning, honing and/or grinding.



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Table 1

Condition/Inspection	Service Limit	Repair Limit	Corrective Action
Tooth damage which involves metal displacement to a degree when sub-surface damage is detected by magnetic inspection. (Visual and MPI)	No sub-surface damage acceptable	No repair	Replace
Measurement over pins 50 Teeth Measure gear teeth over 0.1728 pins.	Min. measurement: 5.2288 inches.	Min. measurement: 5.2288 inches.	Remove sharp edges by stoning. Hone or grind* to remove irregular tooth wear. The allowable reduction of the distance over pins after honing shall not exceed 0.002 inch. Replace gears which have less than the over pins dimension listed.
37 Teeth Measure gear teeth over 0.1080 pins.	Min. measurement: 2.4436 inches.	Min. measurement: 2.4436 inches.	

NOTES: *Inspect for grinding burns per HTS-1018

Table 2: Splines

Condition	Service Limit	Method & Procedure	Corrective Action
Internal Spline Wear. (Visual)	0.002 inch max wear allowed	Dimensions are to be measured using either a T-gage or .0864 in. pins. Measurements over worn & unworn areas must NOT differ more than .0037 inch.	Replace.
Cracks. Radii root corners of spline teeth or in line or parallel in close proximity on the involute of a gear tooth side (Visual with magnification and MPI)	No cracks.	No repair.	Replace.
Tooth damage which involves metal displacement to a degree where subsurface damage is detected by magnetic inspection (Visual and MPI)	No sub-surface damage acceptable.	No repair.	Replace.



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Table 3: Seal Journals

Condition	Service Limit	Repair Limit	Corrective Action
Seal Journal Wear (Dia. E 2 places)	0.0015 inch max radial wear on journal diameter with respect to adjacent unworn surface. <i>Minimum OD is 1.5570 Both Ends</i>	0.005 inch max radial wear on journal diameter with respect to adjacent unworn surface.	Hard chrome plate seal journals (Dia. E) per Paragraph 5.0 & Figure 1.
Scoring, grooves, nicks, gouges, scuffing or minute flats on shaft seal journal surfaces.	Evenly polished surface in seal contact without lead or axial marking.	Damage or wear contributing to oil seal leakage shall be cause for repair	Hard chrome plate seal journals (Dia. E) per Paragraph 5.0 & Figure 1.

Table 4: Bearing Journals

Condition	Service Limit	Repair Limit	Corrective Action
Shaft O.D. (Forward PTO Roller Bearing Location) (AFT PTO Ball Bearing Location)	1.5762 inch 1.5749 inch	1.5765/1.5762 inch 1.5754/1.5749 inch	1) Grind to clean (.005 in. max radial) per Paragraph 5.0 & concentricity requirements of Figure 1 and MPI. 2) Prior to copper flash, electroless nickel plate bearing journal per (5b) of Paragraph 5.0 Journal Repair 2) Copper plate Dia A or Dia. B per AMS 2418 .0001 to .0002 thick. Optional to plate adjacent shoulder. Do not plate within .060 in. of Journal shoulder.

Table 5: Bearing Thrust Shoulders

Condition	Service Limit	Repair Limit	Corrective Action
Grinding checks on bearing shaft thrust shoulders. (Visual and MPI)	Checks not breaking an edge or extending into a radius.	No repair permitted.	Replace
Roughened surface on thrust face. (Visual)	No roughened surface.	Max of 20% of the area is affected and condition well dispersed.	Remove by light stoning and polishing. If this does not remove roughness, it is permissible to grind the mounting face to remove damage if no more than 0.005 inch stock is removed. Chrome plate surface per paragraph 5.0



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Table 6: All Areas

Condition	Service Limit	Repair Limit	Corrective Action
Nonmetallic inclusion. (MPI)	Light scattered non-metallic indications parallel to the material flow lines.	No repair permitted.	Replace
Nicks and dents in gear teeth. (Visual)	Nicks and dents, without sharp corners and no more than .010 inch in length, width or diameter.	Remove sharp corners without exceeding 0.060 inch in length, width or diameter.	Remove repairable nicks and dents by stoning.

5.1 JOURNAL REPAIR

Journals worn beyond the serviceable limits shall be repaired by plating as specified below:

NOTE: *Unless otherwise specified, plating may be omitted within 0.060 inch of journal shoulders.*

- 1) In accordance with Figure 1, grind the bearing or seal journal (.005 in max) to remove any roughness or previous plating while maintaining the concentricity requirements.
- 2) Inspect ground area per HTS-1018.
- 3) MPI the ground journal.
- 4) Heat treat at $275 \pm 10^{\circ}\text{F}$ for five hours.
- 5) Mask areas not to be plated with masking wax. Remove wax from surfaces to be plated and clean surfaces.
- 5a) Hard chrome plate the Seal Journal per AMS-2406 to a thickness sufficient to produce .0005 to .010 inch thickness after finish grinding. Remove masking wax after plating.

NOTE: *Seal Journals may be plated any number of times. Final plating thickness must NOT exceed .010 inch; however, plating thickness should be held to a minimum.*

- 5b) Prior to copper flash, electroless nickel plate Bearing Journals **A** or **B** per AMS 2405. Plating shall extend to within .006 in. for the journal shoulder & must be a minimum .0005 inch thick after finish grinding per Figure 1 dimensions.
- 6) Finish grind the plated journal in accordance with Figure 1. Concentricity and finish requirements must be met. There must be no spiral lead in the finish on seal journals.
- 7) FPI the finish-ground plated surfaces for cracks.



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6.0 INSTALLATION

Install the AFT PTO ball bearing and Forward PTO Roller Bearing Inner Race in accordance with the OEM's assembly instructions. Check to insure that the gearshaft front bearing journal and the bearing inner race bore are clean and oil free.

Install the 6899402HT Helical PTO Gearshaft into the Accessory Gearbox Cover in accordance with the OEM's assembly instructions.

Figure 1 6899402HT Helical PTO Gearshaft

Use a No. 80 - 100 grit wheel (not exceeding 3 in. dia.) at a speed of 15,000 - 20,000 rpm for blending.

To smooth the subsequent blend edges to the adjoining areas using a No. 80 - 100 grit wheel with a diameter of approximately 1 inch dia. at a speed of 15,000 - 20,000 rpm.

NOTE: SLOWLY GRIND WITH VERY LIGHT PRESSURE AS TO MINIMIZE HEAT.

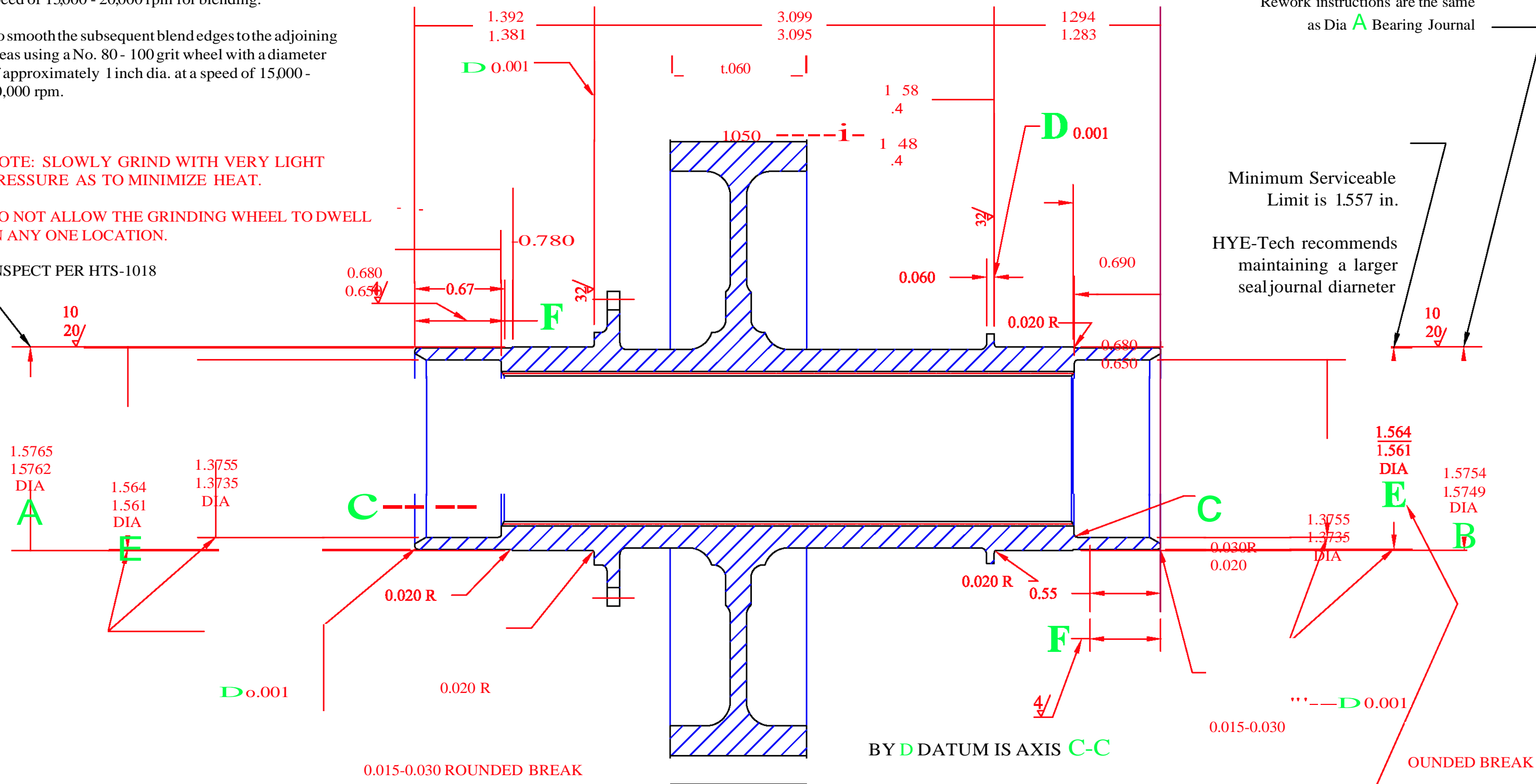
DO NOT ALLOW THE GRINDING WHEEL TO DWELL IN ANY ONE LOCATION.

INSPECT PER HTS-1018

Rework instructions are the same as Dia **A** Bearing Journal

Minimum Serviceable Limit is 1.557 in.

HYE-Tech recommends maintaining a larger seal journal diameter




AXIS **C-C** ESTABLISHED BY DIAMETERS **A** AND **B**

FEATURES SHALL BE WITHIN THE TOTAL RUNOUT SPECIFIED

SURFACES LAY IN AREA **F** OF DIA **E** (2 PLACES) SHALL

BE ANNULAR AND
FREE FROM LONGITUDINAL AND SPIRAL TOOL MARKS.

AFTER CHROME PLATING, OUT OF ROUNDNESS OF THIS DIA
SHALL NOT EXCEED 0.0002 TIR
(2 PLACES MARKED DIA )