BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 12.01

PRODUCTION PROCESS STANDARD

Machining, Re-Lubrication, Packaging and Installation of Sintered Porous Bearings (Bushings)

Issue 6
- This standard supersedes PPS 12.01, Issue 5.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements to be followed when machining, re-impregnating (re-lubricating), packaging and installing of sintered porous bearings (bushings).

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 PPS 13.26 - General Subcontractor Provisions.

3.2 PPS 31.17 - Solvent Usage.

4 Materials and Equipment

4.1 Materials

4.1.1 Oil, to MIL-L-7870 (e.g., Aeroshell Fluid 3). Unless otherwise specified by the engineering drawing, use only oils meeting the requirements of MIL-L-7870 for re-impregnating sintered porous bearings.

4.1.2 Barrier material, grease-proof, to MIL-B-121, Type 2, Grade A, Class 2.

4.1.3 Polyethylene bags.

4.2 Equipment

4.2.1 Small tank, equipped with lid and heater.

4.2.2 Arbor press and shouldered arbors.

4.2.3 Carbide-tipped cutting tools.

4.2.4 Plain burnishing broaches.

5 Procedure

5.1 Machining

5.1.1 In general, follow standard practices for machining cast bronze when machining sintered core or bar stock.

5.1.2 Finish machine with a “dead sharp” standard carbide-tipped cutting tool using a fine feed and high surface speed.

5.1.3 Ensure that the cutting width of the tool overlaps the width of the feed.

5.1.4 Do not use coolant of any type during machining operations.

5.1.5 Do not grind, buff, polish or use any type of adhesive during the finishing operation.

5.1.6 Chamfers on inside or outside diameters of bushings shall be as specified on the engineering drawing.

5.1.7 After machining, remove all swarf and foreign matter from the bushings using clean dry compressed air.

5.2 Re-Impregnating (Re-Lubricating) Bushings

5.2.1 After machining, re-impregnate bushings as follows:

Step 1. Fill a small tank to the operating level with oil (MIL-L-7870) and heat to 135°F - 140°F.

Step 2. Immerse the bushings in the heated oil tank for at least 15 minutes. During this time, maintain the oil temperature at 135°F - 140°F. Keep the tank closed while the bushings are in the oil. Carry out the operation in a clean and adequately ventilated area.

Step 3. Cool the bushings by immediately transferring them from the heated bath to a bath of oil (MIL-L-7870) maintained at room temperature (60°F - 90°F).

5.3 Removal of Lubricant

5.3.1 If it is necessary to re-impregnate bushings with a special lubricant, or to remove a contaminant, remove the existing lubricant as follows before re-impregnating the bushing according to section 5.2:

Step 1. Immerse the bushings in the solvent specified in PPS 31.17 for approximately 30 minutes at room temperature (60°F - 90°F).

Step 2. Remove the bushings from the solvent and allow them to drain.

Step 3. Heat the cleaned bushings in an oven at 200°F - 250°F for at least one hour to remove residual solvent.

5.4 Shop Handling

5.4.1 After completion of all machining, re-lubricating and inspection procedures, package bushings according to section 5.5.

5.4.2 Do not allow bushings to contact materials such as porous paper, wood, cloth or other absorbent materials which will draw the oil from the bushings.

5.5 Packaging

5.5.1 Individually wrap bushings in either grease-proof, water-proof barrier material (MIL-B-121) or polyethylene bags, the latter being heat sealed or stapled.

5.5.2 Identify each packaged bushing by part number.

5.5.3 After packaged and identified according to paragraph 5.5.1 and paragraph 5.5.2, bushings may be stored. Do not remove a bushing from its protective wrapping until required for installation.

5.6 Installation of Bushings

5.6.1 Install bushings as follows:

Step 1. Check the housing bore for cleanliness. Remove any dirt or other contamination with a clean cloth or by blowing with compressed air.

Step 2. Apply dissimilar metal protection when specified on the engineering drawing.

Step 3. Remove the bushing from its protective wrapping.

Step 4. Carefully align the bushing with the housing bore and press into place using an arbor press and shouldered arbor as shown in Figure 1.

Step 5. Support the part or assembly around and close to the housing bore in such a manner that the thrust axis of the press is in perfect alignment with the housing bore.

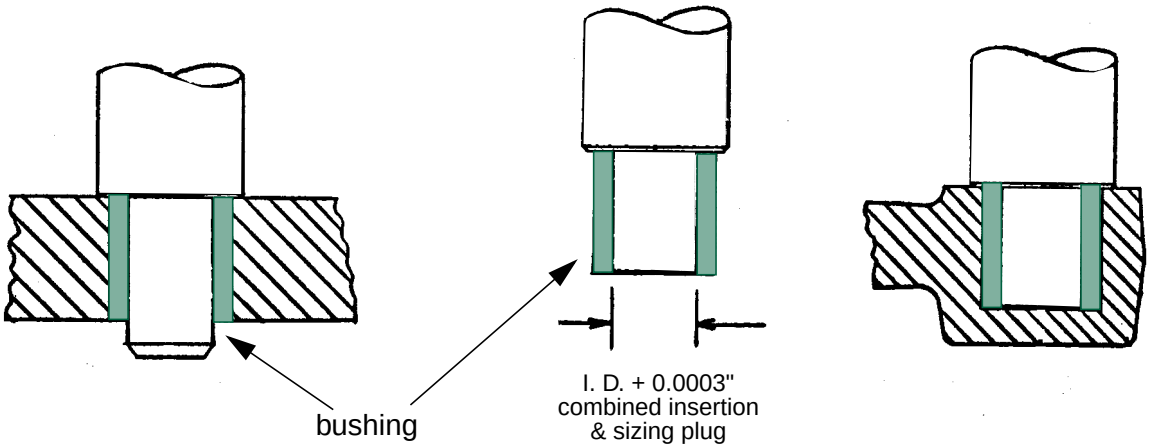

FIG.1 A - OPEN END HOUSING

FIG.1 B - BLIND BUSHING

Figure 1 - Shouldered Arbors

5.7 Sizing the Bore of Installed Bushings

5.7.1 The preferred method for sizing the bore of installed bushings is by burnishing, using one of the following methods:

- Combined insertion and sizing tool (as shown in Figure 1-B) used in an arbor press. This method is suitable for the installation of blind bushings.
- Burnishing broach used in an arbor press. This is particularly suitable for sizing a line of open-end bushings of the same dimension (see Figure 2).
- Spiral burnishing tool in a drill press or lathe. It is important that the helix of such tools be left-handed (see Figure 3).

5.7.2 Alternatively, the bushing I.D. may be brought to finished size by reaming provided that a dead sharp reamer is used.

5.7.3 In all of the above mentioned operations, ensure that the tool is always in perfect axial alignment with the bushing.

5.7.4 Do not apply additional lubrication during sizing operations.

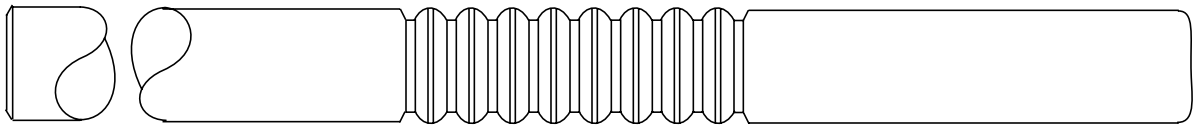

Figure 2 - Typical Burnishing Broach

Figure 3 - Plain Spiral Burnishing Tool

6 Requirements

6.1 Surface porosity of bushings after machining must be checked visually by one of the following methods:

- Compare a machined and an un-machined unit under 8X magnification. The surface appearance should be similar.
- Apply gentle, uniform heat to the bushing (by holding it near a lamp-bulb, for example). If a uniform film of oil appears on the machined surface, the bushing is acceptable.

7 Safety Precautions

7.1 Observe general shop safety precautions when performing the procedure specified herein.

7.2 Refer to PPS 31.17 for the safety precautions regarding the handling and use of solvents.

8 Personnel Requirements

8.1 Personnel responsible for machining, re-lubricating, packaging and installing sintered porous bearings (bushings) must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

9 Points to Note

9.1 Sintered porous bushings must not be cadmium plated.

9.2 Assemblies containing installed bushings must not be solvent cleaned, chemically treated or painted unless proper protection has been provided for the bushing. Such assemblies must not be vapour degreased.