

Contains Useful Information Pertaining to Your Aircraft Engine

SUBJECT: Cylinder Bore Honing Instructions

PURPOSE: To provide instructions for identifying and honing cylinder bores authorized under FAA Parts Manufacturer Approval (PMA) manufactured by Continental Motors.

COMPLIANCE: During engine assembly, repair, at overhaul or cylinder replacement.

MODELS

AFFECTED: All Continental Motors (CMI) PMA and experimental aircraft engine cylinders.

I. GENERAL INFORMATION

Removing and reinstalling a PMA cylinder to perform maintenance or repairs, requires special honing instructions that differ from hardened steel or NiC3™ cylinders. Additionally, different cylinder bore surfaces and piston ring combinations require appropriately specific break-in techniques. Accordingly, each cylinder bore processed by Continental Motors should be returned to service in accordance with the following requirements prior to installation:

II. REQUIREMENTS FOR ALL CYLINDER BORES

1. Do not reuse piston rings removed from piston.
2. Check the piston ring end gap and side clearance prior to installation. End gap should be checked in choke area as well as in the straight portion of the bore. Use engine manufacturer's data (see Table 2).
3. Setting a custom gap for piston rings is standard procedure prior to installation. However, *always* break the sharp edges at the ring gap to prevent the ring from digging into the groove and preventing normal rotation.
4. Cylinder bore cleanliness can be evaluated by using clean cellophane tape and a white sheet of paper. Wrap a length of tape (sticky side out) around two or three fingers. Pat the tape at many locations on the cylinder bore and after cutting the tape, place it sticky side down on a white sheet of paper.

NOTE: A high particle count indicates a dirty surface and requires that the bore cleaning be repeated.

5. Break-in procedures should be carefully followed *prior* to return to service in accordance with Lycoming®¹ instructions for break-in and oil consumption (see Table 2).

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III. CYLINDER INSPECTION AND RETURN TO SERVICE REQUIREMENTS

Perform an initial cylinder inspection to determine return to service applicability according to primary ICA instructions (see Table 2):

1. Perform a fluorescent penetrant inspection on the cylinder head to determine airworthiness using suitable equipment.
2. Verify the cylinder bore is within service limits using suitable measuring equipment (see Table 2).
3. Check bore for signs of distress.
4. Check (visually and dimensionally) seats and guides; replace as necessary (see Table 2).

CAUTION: The following procedures only apply to Continental Motors PMA cylinder bore finish specified by the appropriate process. Identify and select the appropriate cylinder bore finish before performing the steps to return the cylinder to service (see Table 2).

A. THROUGH-HARDENED STEEL BORES

Refer to OEM guidance for returning steel cylinder bores to service (see Table 2).

B. NiC3 CYLINDER BORE HONING

Perform this procedure under any of the following circumstances:

- after grinding a cylinder barrel bore
 - when replacing piston rings
 - to restore the cylinder bore cross hatch pattern
- 1.hone the cylinder bore using a wet honing process and hone stones that will produce a surface finish as specified in Table 1. Consult with your hone manufacturer to ensure compatibility with NiC3 surface and hardness specifications (see Table 1). Successful results have been obtained using Brush Research Mfg. P/N GBD512600BC (5"-5-1/4" bore). Consult with your hone manufacturer to ensure appropriate honing lubricant.
 2. Inspect the cylinder barrel wall for corrosion, pitting and scoring. Discard any cylinder exhibiting any of these unacceptable, non-conforming conditions.
 3. Measure the surface finish using a contact profilometer.
 4. After wet honing, the bore finish must show a cross hatch pattern. The included angle of the cross hatch measured perpendicular to the axis of the cylinder is 22°- 32°. Inspect the hone pattern taken at 100X magnification. An acceptable cross hatch pattern must be cleanly cut and free of torn and folded metal.

NOTE: Honed turnaround areas up to 0.5 inch from the skirt and barrel stop are exempt from cross hatch angle requirements.

5. After honing, clean the cylinder thoroughly using hot soapy water and a rotating, stiff bristled scrub brush to remove all honing material from the cylinder.
6. Rinse the cylinder with hot water to remove soap residue.

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7. Dry the cylinder completely; repeat step 2 to verify cylinder serviceability. If the honed cylinder passes inspection, thoroughly coat the cylinder bare steel surfaces with clean 50 weight aviation engine oil.
8. The surface finish of the cylinder barrel bore must conform to the specifications listed in Table 1.

Table 1. Cylinder Bore Surface Finish Specifications

Symbol	Description	Range
R_a	Arithmetic average surface roughness	3-8 micro inches
R_{ZDIN}	Average maximum height of the profile	Must be between 6 and 12 times R_a
N/A	Bore Surface Hardness (for hone selection only)	320 HV minimum (Vickers)



Figure 1. NiC3 Cylinder Bore Cross Hatch

IV. INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA), REFERENCES

Table 2 is provided to serve as a reference to all service and maintenance personnel engaged in the repair and overhaul of Lycoming® Aircraft Engines. The documents referenced in Table 2 are subject to revision or supersession. Always use the most current version of the referenced ICA.

Table 2. Reference ICAs

ICA	Lycoming® Reference ICAs ¹
SSP-1776	Service Table of Limits and Torque Value Recommendations
60294-7	Lycoming® Direct Drive Overhaul Manual
60294-5	Lycoming® Gear Engine Overhaul Manual
SI-1427	Lycoming® Reciprocating Engine Break-In and Oil Consumption

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