



Service Instruction

ENGINE COMPONENTS, INC.

S.I. No.: **96-3**

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Title: CONTINUED AIRWORTHINESS INSTRUCTIONS FOR ECI® TITAN® AEL65102 CYLINDERS FOR PARALLEL LYCOMING ENGINES

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Technical Portions are FAA DER Approved.

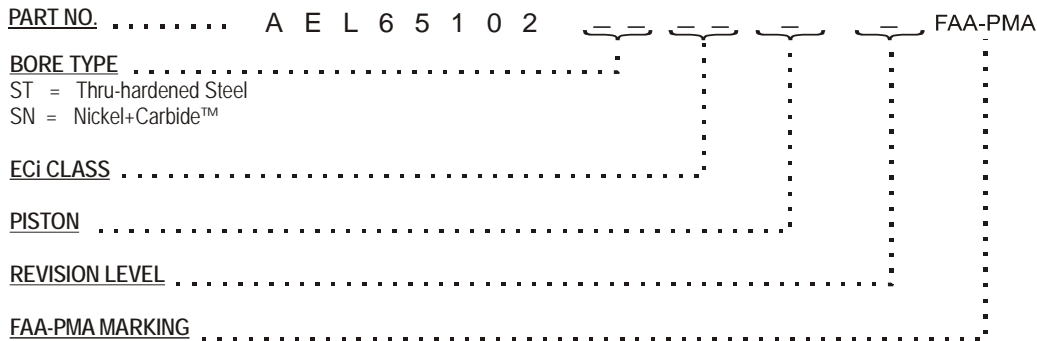
1.0 PURPOSE: Continued Airworthiness Instructions

2.0 SCOPE: Engine Components, Inc. (ECi) has obtained FAA Engineering Design Approval for new cylinders eligible for installation on Lycoming 320, 360 and 540 series engines with parallel valves. This Service Instruction provides installation eligibility for PMA parts and assemblies and provides documentation required by the FAA under FAR Part 33.4 and Appendix A for continued airworthiness. If a specific procedure is not addressed in this Service Instruction, the applicable procedure in the OEM's current overhaul manual and/or Service Bulletins and/or Service Instructions applies.

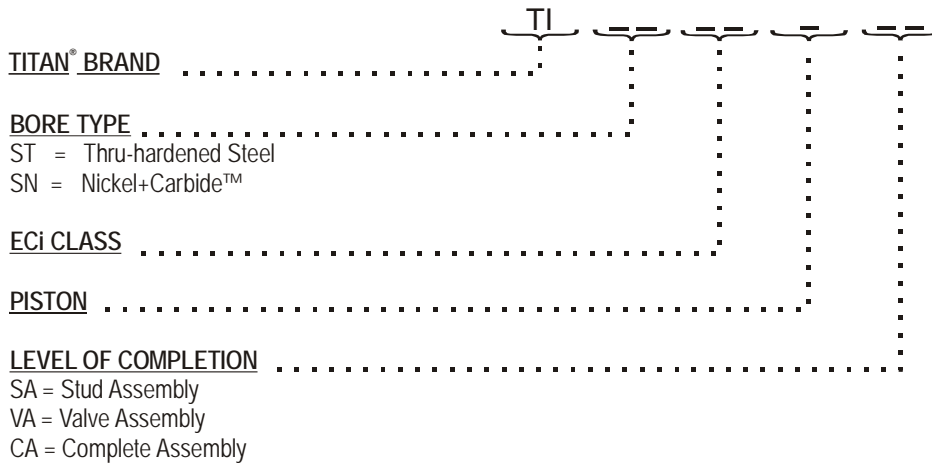
3.0 COMPLIANCE: Anytime cylinders are installed or removed for overhaul or repair.

4.0 IDENTIFICATION:

4.1 Cylinder Marking



4.2 Price List Designation





5.0 **MODELS AFFECTED:** The Cylinder complete assemblies are approved for installation on the following engines.

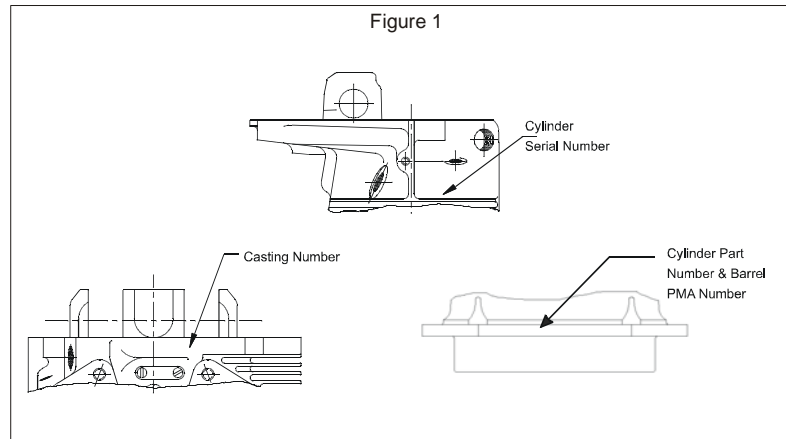
Complete Assembly Cyl. Class	Bore Type	Complete Assy. Part Number	Piston	C.R.	Installation Eligibility
TIST04.0CA	Steel	AEL65102ST04.0	AEL75413	7.0	O-320-A1B, A2B, A2C, A2D, A3A, A3B, C2B, C2C, C3B, C3C, E1A, E1B, E1C, E1F, E1J, E2A, E2B, E2C, E2D, E2E, E2F, E2G, E2H, E3D, E3H IO-320-A1A, A2A, E1A, E1B, E2A, E2B AEIO-320-E1A, E1B, E2A, E2B
TISN04.0CA	Nickel	AEL65102SN04.0			
TIST04.1CA	Steel	AEL65102ST04.1	AEL75089	8.5	O-320-B2B, B2C, B2D, B2E, B3B, B3C, D1A, D1B, D1C, D1D, D1F, D2A, D2B, D2C, D2F, D2G, D2H, D2J, D3G IO-320-B1A, B1B, B1C, B1D, B1E, B2A, C1B, D1A, D1AD, D1B, D1C AIO-320-A1A, A1B, A2A, A2B, B1B, C1B LIO-320-B1A AEIO-320-D1B, D2B
TISN04.1CA	Nickel	AEL65102SN04.1			
TIST05.0CA	Steel	AEL65102ST05.0	AEL75089	8.5	IO-320-C1A, C1B, C1F, F1A LIO-320-C1A
TISN05.0CA	Nickel	AEL65102SN05.0			
TIST06.0CA	Steel	AEL65102ST06.0	AEL75413	7.0	O-320-(no suffix), A1A, A2A, A2B, A2C, A3A, A3B, A3C, E1A, E1B, E2A, E2C IO-320-A1A, A2A
TISN06.0CA	Nickel	AEL65102SN06.0			
TIST07.0CA	Steel	AEL65102ST07.0	AEL75089	8.5	IO-320-B1A, B1B LIO-320-B1A
TISN07.0CA	Nickel	AEL65102SN07.0			
TIST08.0CA	Steel	AEL65102ST08.0	AEL75089	8.5	O-320-B1A, B1B, B2A, B2B, B3A, B3B, B3C, D1A, D1B, D2A, D2B, D2C
TISN08.0CA	Nickel	AEL65102SN08.0			
TIST08.0ACA	Steel	AEL65102ST08.0A	AEL75413	7.0	O-320-C1A, C1B, C2A, C2B, C3A, C3B, C3C
TISN08.0ACA	Nickel	AEL65102SN08.0A			
TIST09.0ACA	Steel	AEL65102ST09.0A	AEL75089	8.5	O-340 A1A, A1B, A2A
TISN09.0ACA	Nickel	AEL65102SN09.0A			
TIST09.0BCA	Steel	AEL65102ST09.0B	AEL75413	7.2	O-340-B1A, B2A
TISN09.0BCA	Nickel	AEL65102SN09.0B			
TIST10.0CA	Steel	AEL65102ST10.0	AEL75413	7.2	O-360-B1A, B1B, B2A, B2B, D1A, D2A, D2B O-540-B1A5, B1B5, B1D5, B2A5, B2B5, B2C5, B2C5D, B4A5, B4B5, B4B5D
TISN10.0CA	Nickel	AEL65102SN10.0			
TIST10.1CA	Steel	AEL65102ST10.1	AEL75089	8.5	O-360-A1A, A1C, A1D, A2A, A2E, A3A, A3D, A4A, C1A, C1C, C1G, C2A, C2B, C2C, C2D HO-360-A1A, B1A, B1B IO-360-B1A, B1B, B1C HIO-360-B1A, B1B AEIO-360-B1B O-540-A1A, A1A5, A1B5, A1C5, A1D, A1D5, A2B, A3D5, A4A5, A4B5, A4C5, A4D5, D1A5, E1A, E4A5, E4B5, E4C5, F1A5, F1B5, G1A5, G2A5 IO-540-C1B5, C1C5, C2C, C4B5, C4B5D, C4C5, D4A5, D4B5, N1A5, N1A5D
TISN10.1CA	Nickel	AEL65102SN10.1			



Complete Assembly Cyl. Class	Bore Type	Complete Assy. Part Number	Piston	C.R.	Installation Eligibility
TIST12.0CA	Steel	AEL65102ST12.0	AEL75089	8.5	O-360-A1A, A1AD, A1D, A1F, A1F6, A1F6D, A1G, A1G6, A1G6D, A1H, A1H6, A1J, A1LD, A1P, A2A, A2D, A2F, A2G, A2H, A3A, A3AD, A3D, A4A, A4AD, A4D, A4G, A4J, A4JD, A4K, A4M, A4N, A4P, A5AD, C1A, C1C, C1E, C1F, C1G, C2A, C2B, C2C, C2D, C2E, C4F, C4P, F1A6, G1A6 HO-360-C1A IO-360-B1B, B1BD, B1D, B1E, B1F, B1F6, B1G6, B2E, B2F, B2F6, B4A, E1A, L2A, M1A, M1B
TISN12.0CA	Nickel	AEL65102SN12.0			LO-360-A1G6D, A1H6 HIO-360-B1A, B1B, G1A AEIO-360-B1B, B1D, B1F, B1F6, B1G6, B1H, B2F, B2F6, B4A, H1A, H1B O-540-A4D5, E4A5, E4B5, E4B5D, E4C5, G1A5, G1A5D, G2A5, H1A5, H1A5D, H1B5D, H2A5, H2A5D, H1B5, H2B5D IO-540-C4B5, C4B5D, C4D5, C4D5D, D4A5, D4B5, D4C5, N1A5, N1A5D, T4A5D, T4B5, T4B5D, T4C5D, V4A5, V4A5D AEIO-540-D4A5, D4B5, D4C5, D4D5
TIST12.2CA	Steel	AEL65102ST12.2	AEL75413	7.2	O-360-B1A, B2C, D2A TO-360-A1A6D LTO-360-A1A6D O-540-B2B5, B2C5, B2C5D, B4B5, B4B5D
TISN12.2CA	Nickel	AEL65102SN12.2			
TIST26.0CA	Steel	AEL65102ST26.0	AEL75089	8.5	IO-540-J4A5, R1A5 TIO-540-G1A
TISN26.0CA	Nickel	AEL65102SN26.0			
TIST26.1CA	Steel	AEL65102ST26.1	AEL75413	7.2	TIO-540-C1A, E1A, H1A
TISN26.1CA	Nickel	AEL65102SN26.1			
TIST38.0CA	Steel	AEL65102ST38.0	AEL75413	7.2	TIO-540 C1A, C1AD
TISN38.0CA	Nickel	AEL65102SN38.0			
TIST38.1CA	Steel	AEL65102ST38.1	LW-12733	8.0	TIO-540-K1AD, AA1AD, AB1AD, AB1BD, AF1A, AG1A, AK1A LTIO-540-K1AD
TISN38.1CA	Nickel	AEL65102SN38.1			
TIST38.3CA	Steel	AEL65102ST38.3	AEL75089	8.5	IO-360-F1A
TISN38.3CA	Nickel	AEL65102SN38.3			
TIST43.0CA	Steel	AEL65102ST43.0	LW-13396	8.5	O-540-J1A5D, J1B5D, J1C5D, J1D5D, J2A5D, J2B5D, J2C5D, J2D5D, J3A5, J3A5D, J3C5D IO-540-W1A5, W1A5D, W3A5D, AB1A5
TISN43.0CA	Nickel	AEL65102SN43.0			
TIST43.1CA	Steel	AEL65102ST43.1	AEL75089	8.5	O-360-J2A O-540-F1B5
TISN43.1CA	Nickel	AEL65102SN43.1			
TIST44.0CA	Steel	AEL65102ST44.0	AEL75089	8.5	O-540-L3C5D
TISN44.0CA	Nickel	AEL65102SN44.0			



- 6.0 MARKING:** (See Figure 1 Below) All TITAN Parallel Lycoming Cylinders will be serialized and identified as indicated in Fig. 1. Additionally, the barrel PMA number and cylinder part number are marked on the barrel flange.



7.0 CYLINDER HEAD

7.1 Material: The AEL65102 Series TITAN cylinder heads are semi-permanent shell molded castings manufactured from the TITAN® Advanced™ Aluminum Alloy. This alloy incorporates a high-purity AMS 4220 composition. The casting is solution heat treated and overaged before machining.

7.2 Rebarreling: The cylinder head is machined in the barrel attachment area to make it compatible with the OEM barrel thread design as well as ECI barrel threads.

Disassembly and reassembly of the cylinder head is deemed to be a major repair and must be accomplished in accordance with FAA approved procedures. The preload (interference fit) alignment and compression height between head and barrel must be approved by FAA engineering.

7.3 Parts Installation: FAA-PMA approved replacement parts may be installed in AEL65102 Series cylinder heads using interference fit data and installation procedures contained in the OEM's current overhaul manual.

7.4 Weld Repairs:

7.4.1 Minor: Minor welds are defined as welds to the following areas:

- Intake and exhaust port flanges
- Rocker cover flange and threaded holes
- Cooling fins

The welding process must be based on FAA acceptable data and must be performed by a properly rated FAA Certificated Repair Station. AMS 4043 filler rod that is correctly work hardened is approved for minor repairs.

7.4.2 Major: Major welds are defined as welds to structural areas of the cylinder and may be performed if all of the following criteria are met:

- The welding process must be based on FAA approved data and meet all of the requirements of FAA advisory Circular No. 33-6 dated December 20, 1994.
- The welding must be performed by a properly rated FAA Certificated Repair Station.
- The filler rod must be heat treatable and compatible with the casting alloy.
- After welding, the repaired casting must be solution heat-treated and overaged.
- After machining and parts installation, the hardness of the weldment will be Brinell 60-75 (500 kg load, 10mm ball).

7.5 Acceptable Cracks: Minor cooling fin cracks that do not extend into the cylinder head structure and heat checks in the exhaust port less than 1/8" in length are acceptable for return to service.



8.0 CYLINDER BARREL:

8.1 Material: A cylinder barrel manufactured by ECI is made from AISI 4140 steel that is through hardened..

8.2 Rebarreling: (See Cylinder Heads)

8.3 Weld Repairs: No weld repairs of any kind are permitted on any surface of the barrel.

8.4 Oversizing: ECI through-hardened barrels may be oversized to either +0.010" or +0.020" to accommodate oversize pistons and rings.

8.5 Plating: ECI through-hardened barrels may be plated back to standard using FAA approved data.

8.6 Bore Inspection: Whenever a cylinder is removed from an engine, the diameter and out-of-round condition of the bore should be measured as well as checks made for scoring, galling, low spots and ring step. Inspection results should be compared to the dimensions in Figure 2 and in the OEM's current overhaul manual (ECi data will prevail in the event of conflict). Affix a repairable or rejected part tag, as appropriate, to any cylinder that does not meet the standard (or properly oversized) bore criteria.

9.0 PISTON RINGS: See ECI Service Instruction No. 94-4-1 for proper fitting of piston rings.

10.0 CYLINDER REMOVAL AND INSTALLATION: See ECI Service Instruction 92-9-6 or subsequent revision

11.0 COLOR CODES ON CYLINDERS: See ECI Service Instruction 92-7-1.

12.0 TIME BETWEEN OVERHAUL (TBO): ECI has addressed the subject of TBO through test and computation, 150 hour certification testing and durability testing with extended test cell run time. From all of the data that has been acquired and analyzed, TBO recommendations that have been established for OEM cylinders also apply to ECI cylinders in similar applications.

FIGURE 2

