



# Service Instruction

## ENGINE COMPONENTS, INC.

S.I. No.: **03-8**

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**Title: ECi TITAN® REPLACEMENT CYLINDERS FOR TCM GTSIO-520 & 550 ENGINES**

Issued: **09/02/03**

Revision: **3 (06/15/07)**

*Technical Portions are FAA DER Approved.*

### 1.0 **PURPOSE:**

Continued Airworthiness Instructions for Engine Components, Inc. (ECi®) Replacement Cylinder for TCM Crossflow-Style Cylinder Heads.

### 2.0 **SCOPE:**

Engine Components, Inc. has obtained FAA Engineering Design Approval for new cylinders (P/N AEC654966) eligible for installation in TCM TSIO-520-BE, GTSIO-520, IO-550, IOF-550 and TSIO-550 series engines. This Service Instruction provides complete installation eligibility for the PMA cylinder assemblies and documentation required by the FAA under 14 CFR Part 33.4 and Appendix A to Part 33 Instructions 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 Instruction/Bulletin(s) applies.

### 3.0 **COMPLIANCE:**

Any time cylinders are installed or removed for overhaul or repair.

### 4.0 **IDENTIFICATION:**

#### 4.1 **Cylinder Marking:**

PART NO. . . . . A E C 6 5 4 9 6 6 XX REV-FAA-PMA

BORE TYPE . . . . .

ST = Thru-hardened Steel

SN = Nickel+Carbide™

ECi CLASS. . . . .

REVISION LEVEL . . . . .

FAA-PMA MARKING . . . . .

PISTON . . . . .

For Class 72.1 & 73.0

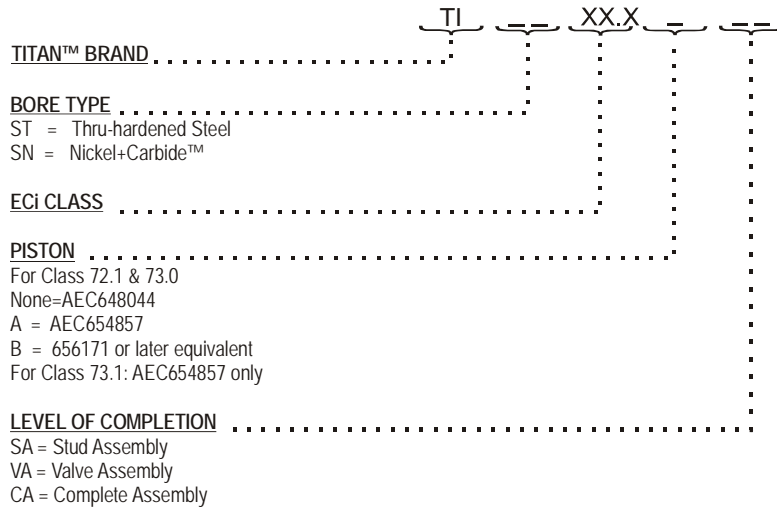
None=AEC648044

A = AEC654857

B = 656171 or later equivalent

For Class 73.1: AEC654857 only

**4.2 Price List Designation:**



**5.0 INSTALLATION ELIGIBILITY:**

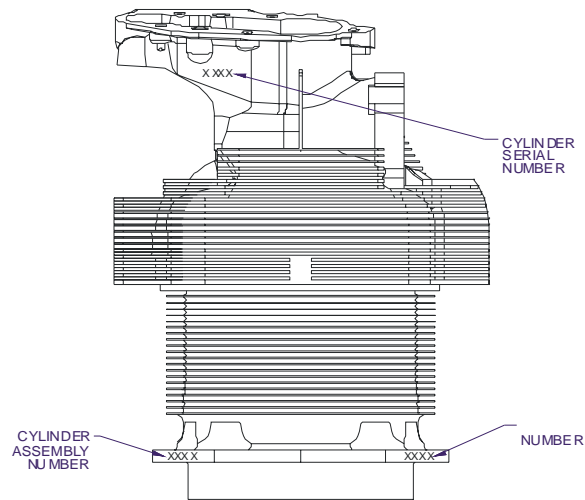
Price List Designation	Part Designation	Bore Type	Intake Port Length	Piston Part No.	Barrel Type	Installation Eligibility
TIST72.1CA	AEC654966ST72.1	Thru-hardened Steel	Short	AEC648044	Straight	GTSIO-520-C, D, E, H
TISN72.1CA	AEC654966SN72.1	Nickel+Carbide™				
TIST73.0CA	AEC654966ST73.0	Thru-hardened Steel	Long	AEC648044	Straight	TSIO-520-BE GTSIO-520-F, K, L, M, N
TISN73.0CA	AEC654966SN73.0	Nickel+Carbide™				
TIST73.0ACA	AEC654966ST73.0A	Thru-hardened Steel	Long	AEC654857	Straight	IO-550-G
TISN73.0ACA	AEC654966SN73.0A	Nickel+Carbide™				
TIST73.0BCA	AEC654966ST73.0B	Thru-hardened Steel	Long	656171 <sup>1</sup>	Straight	TSIO-550-B, C, E
TISN73.0BCA	AEC654966SN73.0B	Nickel+Carbide™				
TIST73.1CA	AEC654966ST73.1	Thru-hardened Steel	Long	AEC654857	Tapered Fin	IO-550-N, P, R IOF-550-N, P, R
TISN73.1CA	AEC654966SN73.1	Nickel+Carbide™				

**6.0 MARKING: SEE FIGURE 1 BELOW.**

- 6.1 Serial number stamped on head
- 6.2 Barrel PMA number stamped on barrel flange
- 6.3 Cylinder assembly number marked on barrel flange

<sup>1</sup> Or later equivalent

Figure 1



**7.0 CYLINDER REMOVAL AND INSTALLATION:** See ECi Service Instruction 92-9-6.

**8.0 COLOR CODES:** See ECi Service Instruction 92-7-1.

**9.0 TIME BETWEEN OVERHAUL (TBO):**

ECi has addressed the subject of TBO through test and computation, 150-hour endurance 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 the latest OEM cylinders apply to ECi cylinders in similar applications.

**10.0 CYLINDER HEAD:**

- 10.1 Material:** The cylinder heads are sand shell mold castings manufactured from TITAN™ Advanced™ Aluminum Alloy. This material incorporates a composition derived from both AMS 4220 and RR350 alloys. The casting is solution heat-treated and overaged before assembly.
- 10.2 Thread Design:** 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.
- 10.3 Head Inspection:** Cylinder head inspection shall be performed in accordance with the OEM overhaul manual. Minor cooling fin cracks that do not extend into the cylinder head structure and heat checks in the exhaust port less than 1/8 inch in length are acceptable for return to service. All other cracks make the cylinder unairworthy without major repair.
- 10.4 Disassembly and Reassembly:** Disassembly and reassembly of the cylinder head and barrel has been deemed a major repair and must be accomplished in accordance with FAA-approved procedures. The preload (interference fit), alignment, and compression height between the head and barrel must be approved by FAA engineering.



**10.5 Exhaust Studs:** The cylinder head is fitted with stainless steel Rosan-type exhaust studs (ECi part number AEC640482-2).

**10.6 Part Installation:** OEM and FAA-PMA approved replacement parts may be installed in ECi cylinder heads using interference data and installation procedures contained in the OEM's current overhaul manual (see ECi Class Reference Manual for parts eligibility).

### 10.7 Weld Repairs

#### 10.7.1 Minor Welds:

**10.7.2.1** Minor welds are defined as welds to the following areas

10.7.2.1.1 Intake and exhaust port faces

10.7.2.1.2 Rocker cover flanges and threaded holes

10.7.2.1.3 Cooling fins

**10.7.2.2** The welding process must be based upon FAA-acceptable data and must be performed by a properly rated FAA Certified Repair Station or foreign equivalent. Filler rod AA4043 or equivalent, correctly work hardened, is approved for minor repairs.

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

**10.7.2.1** The welding process must be based upon FAA-approved data and must meet all of the requirements of FAA Advisory Circular 33-6 dated December 20, 1994 or later approved revision.

**10.7.2.2** The welding must be performed by a properly-rated FAA Certificated Repair Station.

**10.7.2.3** The filler rod must be heat treatable and have the same strength and ductility of the parent casting alloy.

**10.7.2.4** After welding, the repaired casting must be solution heat treated and overaged.

**10.7.2.5** After machining and assembly, the hardness of the weldment must be Brinell 60–75 (HB/500/10).

### 11.0 CYLINDER BARREL:

**11.1 Material:** A cylinder barrel manufactured by ECi is made from AISI 4140 steel, which may be thru-hardened or coated with a corrosion- and wear-resistant coating (Nickel+Carbide™).

**11.2 Disassembly and Reassembly:** (see section 10.4 above)

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

**11.4 Oversizing:** ECi thru-hardened barrels may be oversized to .015 inch to accommodate oversize pistons and rings or .020 inch prior to applying a metal-additive process.

**11.5 Plating:** ECi thru-hardened barrels may be plated back to standard using FAA-approved data. Consult the plating source for the proper ring material to be used with the bore coating.

**11.6 Bore Inspection:** Whenever a cylinder is removed from an engine, the barrel bore diameter and out-of-round condition must be measured, and visual checks of the bore surface must be performed to determine if there are scoring, galling, low spots, and ring breakage. Inspection results should be compared to the dimensions provided in Figures 2 & 3 below and to the data provided in the OEM's current overhaul manual (ECi data will prevail in the event of a conflict). A repairable or rejected tag shall be affixed as appropriate to any cylinder that does not meet the service limit (or properly oversized) bore criteria.

**12.0 PISTON RINGS:** SEE ECI SERVICE INSTRUCTION 94-4-1 FOR PROPER FITTING OF PISTON RINGS.

Figure 2  
Typical Cross Section of  
470/520/550 Cylinder Bore

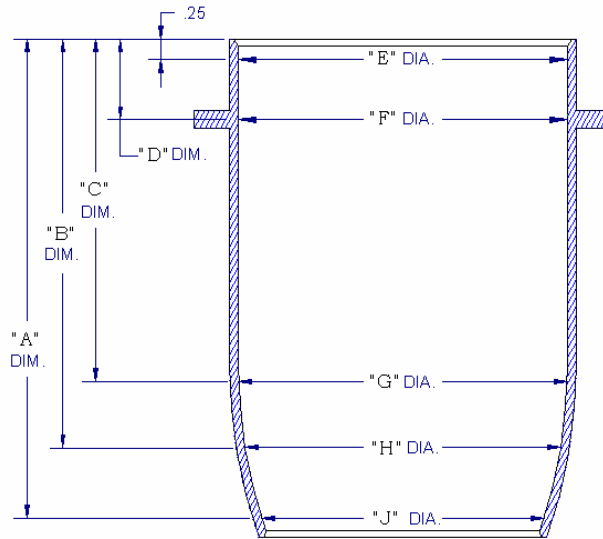


Figure 3  
Bore Dimensions

ENGINE TYPE	"A" DIM.	"B" DIM.	"C" DIM.	"D" DIM.	"E" DIA.	STANDARD		MAX SERVICEABLE STANDARD		ALLOWABLE TAPER FROM "F" TO "G"	AMOUNT OF CHOKE FROM:		TOTAL CHOKE
						"F" DIA.	CIRCULARITY T.I.R.	"F" DIA.	CIRCULARITY T.I.R.		"G" TO "H"	"H" TO "J"	
520/550	6.500	5.750	4.500	1.150	5.2540/5.2510	5.2530/5.2510	.002	5.256	.004	-.000/- .001	-.001/- .003	-.003/- .006	-.004/- .009