

T-048 Repair Limits

Repair Limits

P/N(s): E6851531 & E23061922

Revision: E

Issued: 2/04/16

Rework of E6851531 & E23061922 4TH Stage Turbine Nozzle Blade Paths

Engine Application(s):	Allison 250-Series II Engines.
Subject:	Rework of E6851531 and E23061922 blade paths.
Compliance:	As required by blade path wear or damage.
Revisions:	N/C Dated: 6/08/99 Original issue. A Dated: 2/18/03 ECO#1209: Added E23061922. B Dated: 6/26/03 Added PAR 7, PAR 8, PAR 9 for repair of lugs, flange faces, and vanes. C Dated: 5/07/08 Added PAR10 for EFA Measurement D Dated: 9/03/09 Updated EXTEX to TIMKEN. E Dated: 2/04/16 Updated Timken to EXTEX Engineered Products.

REASON:

To define procedures for restoration of blade path diameters for E6851531 and E23061922.

DESCRIPTION:

This rework procedure defines the following:

1. Pre-machine limits.
2. FPI requirements.
3. Surface preparation.
4. Metallize plasma spray.
5. Machining limits for finished part.
6. EFA Measurement.

ACCOMPLISHMENT INSTRUCTIONS:

1. Machine blade path as necessary to maintain .002" - .007" plasma spray thickness after machining.
Maximum pre-machine limits:
 - 1.1 3rd stage blade path: 7.548 diameter
 - 1.2 4th stage blade path: 8.400 diameter
 - 1.3 Localized wall thickness .035" minimum.
2. Fluorescent Penetrant Inspect per ASTM E 1417 (supersedes MIL-STD-6866). No linear indications are allowed. Note that indications less than .015" are considered uninterpretable and can be ignored. Rounded indications (i.e. porosity) up to .030" Dia. are acceptable. Multiple round indications must be separated by at least twice the diameter of the larger indication.
3. Prepare surface for metallize per recommendations of metal spray vendor. Should include as a minimum:
 - 3.1 Degrease
 - 3.2 Grit Blast
 - 3.3 Mask
 - 3.4 Clean surface to be sprayed
4. Plasma Spray surface to be restored with METCO 443, 444, or 450NS.
 - 4.1 Spray parameters to be established using manufacturer's recommendations
5. Remove Masking

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6. Machine to finished blade path diameters:
 - 6.1 3rd stage blade path: $7.533 \pm .001$
 - 6.2 4th stage blade path: $8.355 \pm .001$
 - 6.3 Finished blade path diameters must runout within .002" to inside seal diameter and to tang pattern.
 - 6.4 Blade path diameters may be machined undersize to allow for optimum fit with turbine wheel.
7. Lug Repair: Just prior to welding, all surfaces to be welded should be cleaned with a carbide burr. Weld build-up as necessary via Gas Tungsten Arc (GTA) welding, also known as Tungsten Inert Gas (TIG) welding. It is recommended to use .030" to .045" diameter weld filler. Weld filler may be AMS 5789 or AMS 5801, Minimize heat input to avoid cracking.
8. Lug Flange (Both Sides): Degrease the part. Mask the part to prevent overspray of adjacent surfaces. Brush surface to be metallized with lacquer thinner or methyl ethyl ketone. Metallize per Plasma Spray Coating Nickel-Aluminum Composite (METCO 443, 444 or AMDRY 960) or Nickel Plate per MIL-C-26074. Remove masking carefully and clean off overspray. Remachine to Figure 1 and 2, inspect.
9. Vane and Band Braze Repair: Furnace brazing AMS 2675 is an excellent method to repair cracks or to fill shallow voids on the vane ring features such as airfoils and inner/outer bands. Furnace brazing can fill cracks up to .020" wide and creates less distortion than welding. A high temperature braze must be used to repair the vane ring in order to ensure that the braze alloy does not remelt when rejoining the vane ring to the diaphragm assembly.

Surfaces to be braze repaired must be cleaned. Cracks cannot be cleaned via abrasive media or carbide burrs because the crack would be opened beyond the bridging capability of the braze alloy. Instead, cracks should be cleaned in a reducing atmosphere. Examples of reducing atmospheres include heating the vane ring in hydrogen atmosphere up to 2100°F in some kind of furnace or retort. An alternate and better method, known as Fluoride Ion Cleaning (FIC), places the part to be brazed in an atmosphere of hydrogen fluoride at very high temperature (i.e. 2050°F - 2150°F).

All brazing must be performed in a reliable vacuum furnace, which is capable of controlling temperature to within $\pm 10^\circ\text{F}$. This measure of control is necessary to insure melting of the braze alloy while avoiding melting of the base metal

Braze filler can be applied via a simple syringe or can consist of precut preforms. Extex recommends that an appropriate "stop off" be used to contain braze to those areas being repaired. Following brazing, hand finishing should be employed to restore part to its original dimensions and features.

10. EFA Measurement: If the Vane and Braze repair is done, the nozzle must be airflow tested after repair. The acceptable EFA range for the Fourth Stage Turbine Nozzle is 14.00 – 14.60 square inches.

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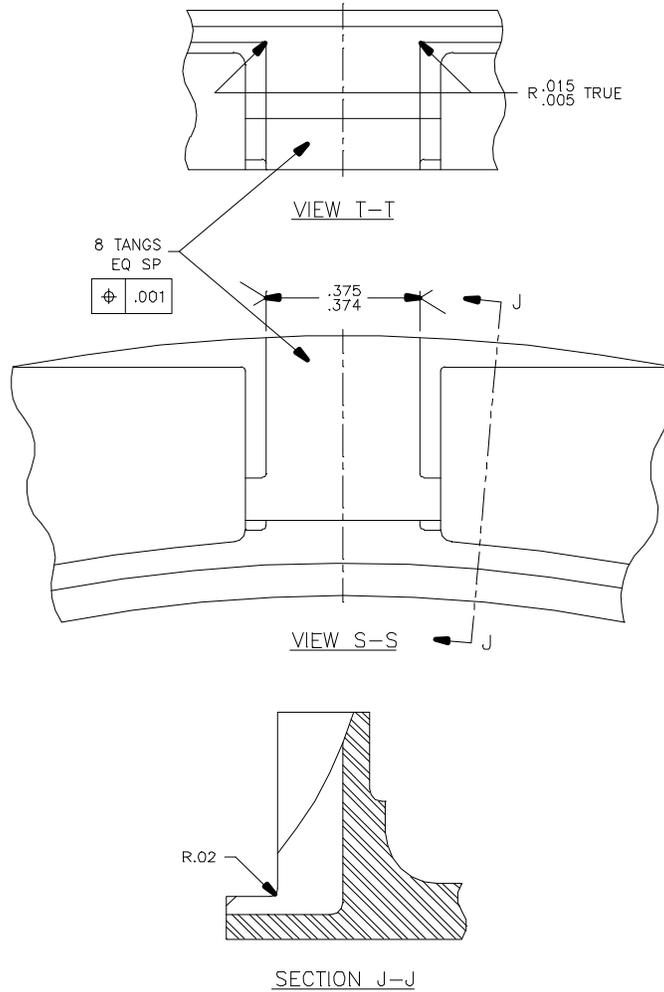


Figure 1

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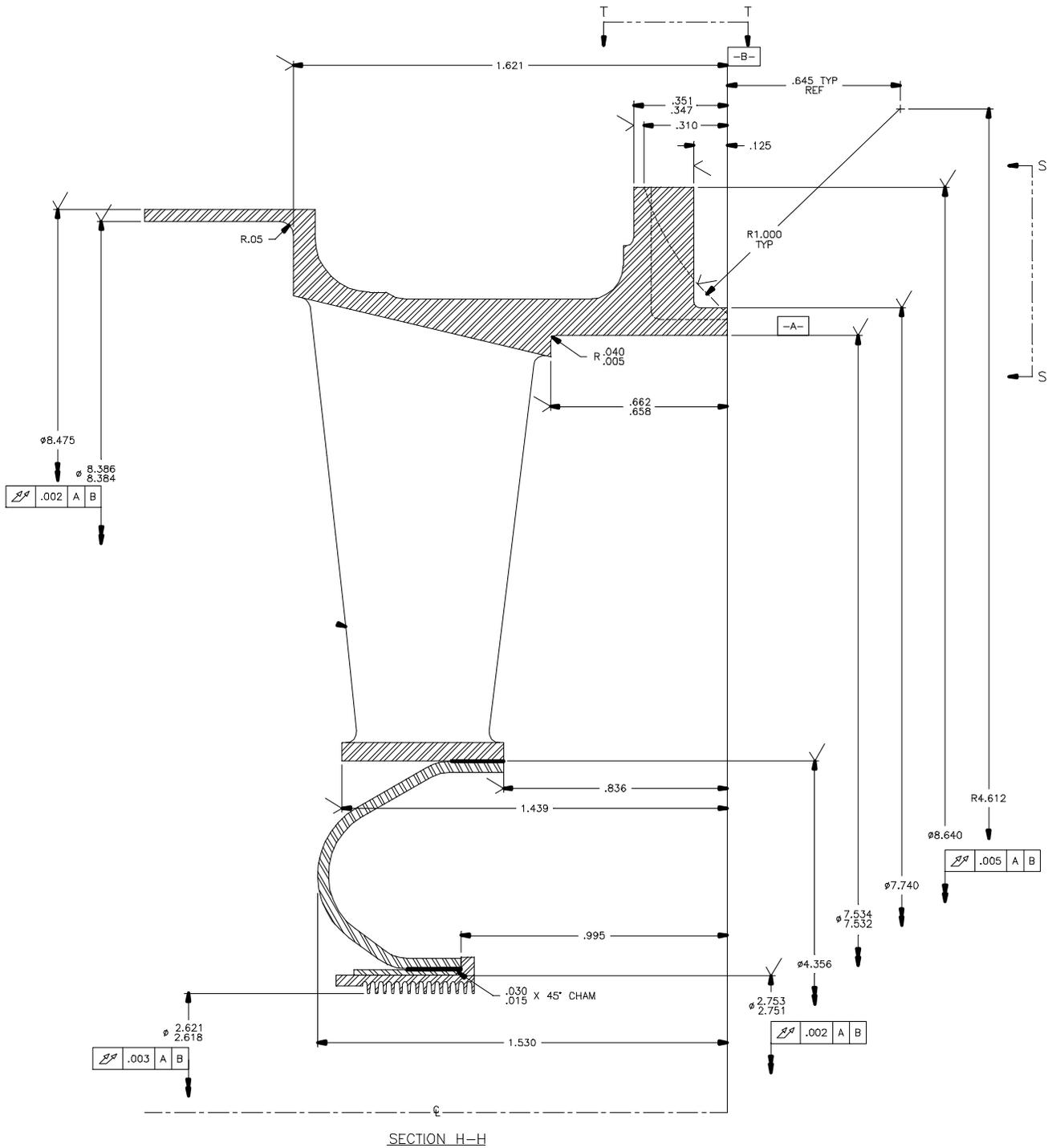


Figure 2