

# TAM International, Inc.

## ES-7.3-32 Specifications for Heat Treating of Combo Tool Dogs

Approved by Department Manager

Signature/Date: *Brett Guillory 07/06/2009*

Revision Level: A

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Reviewed by ISO Management Representative

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Review date: 08/12

### 1.0 Scope

- 1.1 This specification defines the requirements for heat treatment and post inspection of TAM Combo Tool Dogs.

### 2.0 Status and Records

- 2.1 Changes in these instructions shall be documented in accordance with EI-7.3-03 Instructions for the Control of Engineering Drawings.

### 3.0 General Requirements

- 3.1 Vendor process procedures and quality control requirements shall be approved by the Director of Engineering or designee prior to shipment of Dogs for heat treating.
- 3.2 Dogs shall be shipped in a manner that ensures they will remain dry and movement between parts is minimized to prevent damage.
- 3.3 Parts shall be pre-inspected by the vendor for suitability of heat treating.
- 3.4 The vendor shall ensure that traceability marking is maintained throughout the processes or replaced immediately after completion of the process.
- 3.5 Dogs returned after completion of heat treating shall be selected and hardness tested.
- 3.5.1 Hardness sampling shall be performed on a calibrated hardness tester. Verification of the tester's accuracy to the hardness standard shall be recorded, along with the hardness of the sample on form QF-16.
- 3.6 100% of all Dogs after completion of heat treatment shall be subject to Wet Fluorescent Magnetic Particle inspected per ES-7.3-16
- 3.7 Dogs shall be inspected per QI-8.2.4-07 "Instructions for Inspection and Receiving of Outside Supplier Processed Parts".
- 3.8 A certificate attesting to the heat treatment performed and test results shall be provided by the vendor and reviewed by TAM Inspection for acceptance.

#### 4.0 Heat Treat Specification for TAM Combo Tool Dogs.

4.1 Dogs will be provided in the finished machined state.

4.2 HEAT TREAT:

4.2.1 Heat treats each batch of Dogs in a Close Quench Furnace with a standard endothermic heat treating atmosphere. The furnace must be equipped with automatic carbon potential control, maintaining a carbon content in the furnace atmosphere that nearly matches the carbon content of the material being heat treated.

4.2.2 Each batch Heat treat cycle shall consist of:

- a) Normalize @  $1600^{\circ}\text{F} \pm 25^{\circ}$ , hold for minimum 1/2 hour per inch of heaviest cross section, air cool to ambient
- b) Austenitize @  $1550^{\circ}\text{F} \pm 25^{\circ}$ , hold for minimum 1/2 hour per inch of heaviest cross section, oil quench
- c) Temper @  $875^{\circ}\text{F} \pm 25^{\circ}$  for minimum 1 hour per inch of heaviest cross section, air cool to ambient.

**Note:** Vendor to confirm temperature using thermocouple.

#### 5.0 HARDNESS TESTING:

5.1 Hardness testing shall be performed on 10% of each batch of Dogs being heat treated. Testing shall be done on the flat bottom between the blind holes and performed in accordance with ASTM E18, latest revision and shall check between 38 – 42 Rc Rockwell.

5.2 Dogs which do not meet hardness requirements of the drawing shall be re-tempered and re-tested.

#### 6.0 REPORTS:

6.1 Material ordered to this specification shall be accompanied by a Heat Treat Test Report. Reports shall contain the following minimum information which will be subject to inspection upon receipt.

- 1) Process Followed
- 2) Test Results

6.2 All requirements are subject to verification at the discretion of TAM International.