



**American Metal Treating**

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**The Induction Hardening Experts**

**Quality Assurance Manual**

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## Company Description

American Metal Treating Company, Inc. is a commercial heat treat company specializing in induction hardening. American Metal Treating was founded in 1929, occupies 14,000 square feet, and employs twenty people.

American Metal Treating Co. performs induction hardening services for the gear, mining, heavy machinery and other industries throughout the United States and Canada.

A majority of American Metal Treating's business is performing contour gear hardening for gears from .5 diametrical pitch to 10 diametrical pitch. Contour gear hardening greatly increases wear resistance and strength while minimizing

distortion when compared with other heat treating methods. We also perform more conventional scan induction hardening services for pins, shafts and sprockets.



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## **1.0 Quality System Requirements**

### **1.1 Management Responsibility**

#### **1.1.1 Quality Policy**

It is the mission of American Metal Treating Company to provide the highest quality induction heat treating services that meet the requirements of our customers' specifications and produce timely deliveries that meet the needs of our customers' manufacturing schedules.

#### **1.1.2 Organization**

##### **1.1.2.1 Responsibility and Authority**

All employees have the responsibility and authority to recognize and initiate corrective and preventative actions when any non-conformity occurs. The non-conformity shall be identified and recorded. All employees may initiate, recommend, or provide solutions for the non-conformity to management. Management will evaluate the non-conformity and implement solutions based on all of the available information. A regular review of non-conformities will be made by management to verify that the non-conformity has been corrected.

##### **1.1.2.2 Resources**

American Metal Treating Co. ensures that all employees receive adequate training, including on the job training, prior to being assigned to a job. All new hires shall receive sufficient on the job training. Training hours vary depending on the complexity of the work. Management will supply resources to regularly monitor the quality system.

##### **1.1.2.3 Management Representative**

The responsibility of establishing and maintaining an effective quality system will be assigned to a member of the company's executive management team (designated quality assurance manager). Any employee can report deficiencies in the quality assurance system to this representative or to the president of the company.

#### **1.1.3 Management Review**

Management shall review the quality assurance system on a periodic basis to determine its effectiveness.

### **1.2 Quality System**

American Metal Treating Company's quality assurance system consists of this quality manual and its supporting documents, operating procedures and work instructions.

### ***1.3 Contract Review***

Before a customer order is accepted, a purchase order or packing slip describing the requirements of the heat treating service is required. This may or may not include blueprints and/or specifications that lists customer requirements.

If an order arrives with incomplete information, the shipping supervisor or management shall contact the customer for clarification. If a deviation from customer purchase orders, packing lists, blueprints and/or specifications is necessary, the customer will be notified by the shipping supervisor and/or management. All orders with deviations shall list the reason for the deviation on the customer order and returning packing slip.

All customer orders are subject to the "MTI Statement of Limited Liability" found on American Metal Treating quotes, packing lists and invoices.

### ***1.4 Document and Data Control***

The quality assurance system, as described in this manual and its supporting work instructions and documents, is approved by the president of the company and is under document control as described in this procedure.

#### **1.4.1 Document and data approval and issue**

All documents relating to this quality assurance system are written, modified and/or approved by the president of the company and/or the quality assurance manager. The revision status of each document is identified by the date of the last release as well as the previous release date. Master copies of all documents relating to the quality assurance system are maintained on a personal computer and backed up on disks or tapes.

#### **1.4.2 Document and data changes**

Copies of operating procedures are distributed to shipping and receiving, quality control, and the production department. Obsolete documents are removed whenever revisions are issued.

### ***1.5 Product Identification and Traceability***

Every order received by American Metal Treating Company will be issued a work ticket which includes a part number and a description of the part as well as the quantity received. The container the parts were received in or on shall be labeled with the customer name, where applicable.

## **1.6 Process Control**

Manufacturing processes consists of providing induction heat treating services in the motor generator, radio frequency, gear scanner, and contour hardening departments. Tempering is required to relieve stresses caused by the induction process and to meet the customer's specified hardness. Shipping and receiving process control is described in the document "Procedure--shipping and receiving". Specific process control procedures are outlined in the "Work Procedures" notebook which is distributed to shipping.

All persons performing setup operations shall use appropriate tooling and fixtures based on the job history and their previous training and experience. Setup operations are to be performed based on the job router issued with the work ticket. Orders without a job history will be set up based on similar part routers and the setup person's previous training and experience. Setup times will be documented on the job ticket immediately after setting up a job.

All operators will run machines based on their prior training and experience. Operators are required to stay at the machine while a part is running. If an operator sees any possible non conformity with the order or processing parameters, he shall report his observations to a setup person and/or management. Plant personnel will document their hours worked by filling out a "Labor Distribution Sheet" each day.

All orders will be stress relieved and tempered in a gas fired, recirculating air furnace after induction hardening. Tempering temperature and time is to be determined by the required hardness, type of steel, tempering temperature of the previous order, final hardness results of the previous order and the thickness of the material. A tempering chart is used to determine the tempering temperature for all new orders. The tempering temperature is written on the job router ticket and initialed when the order is placed in the draw furnace. The customer name, machine number, and tempering temperature is written on the draw board outside of the Q.C. office.

Production equipment and working environment are adequate to perform all tasks.

All processes are in compliance with the quality assurance manual and work instructions. All order processes are in compliance with customer requirements and/or specifications and are to be performed based on the job router and/or similar part routers.

Workmanship standards are performed according to customer specifications and can be monitored by all personnel.

Preventative maintenance is performed by operators and set up personnel. All preventative maintenance is documented on daily time sheets and recorded in the manufacturing computer system by office personnel.

Records of documented processes, including, but not limited to, orders, invoices and quotes are kept for seven years. Computer records are backed up on tape and stored.

## **1.7 Inspection and Testing**

### **1.7.1 General**

All inspection and testing is performed by the Quality Control department in a manner consistent with the training and experience of its personnel and in compliance to customer blueprints, specifications and/or purchase orders. Customers may enhance the framework of inspection and testing with additional requirements upon request. Inspection and testing procedures of American Metal Treating Company consist of the following:

### **1.7.2 Receiving Inspection and Testing**

Incoming material is inspected by the shipping and receiving department according to procedures outlined in "Procedure--shipping and receiving". If the shipping and receiving supervisor notifies the Q.C. department of a possible non conformity, the Q.C. department will visually inspect the material. If a possible non conformance is found, additional necessary non destructive testing will be performed. If the subsequent testing confirms a non conformance, the customer will be immediately notified by management. After a non conformance is confirmed, parts will be processed only if it is authorized by the customer in writing. Any material not authorized to process will be returned to the customer.

Any non conformance will be documented on a "Non Conformance Report".

### **1.7.3 In-process Inspection and Testing**

*In-process inspection and testing for the gear scanner and contour hardening departments will consist of the following:*

- The first tooth run will be etched with a nital solution on the tips of the tooth and both end faces of the gear or sprocket to check for an acceptable hardness pattern.
- The first tooth run will be checked for hardness on the flank and/or the root of the gear using a Wilson gear tester or portable superficial hardness tester, depending on the part configuration. Hardness will be determined acceptable if blueprint and/or customer hardness requirements are met.
- Any gear that exceeds one hour in processing time will have the first tooth on the "second pass" around the gear nital etched to re-check the hardness pattern. The first gear processed will be magnetic particle inspected for any orders exceeding a quantity of six gears.

*In-process inspection and testing for the motor generator and radio frequency departments will consist of the following:*

- The first production piece will be inspected for hardness, case depth (if destructive testing is required, see 1.7.5), hardening length and magnetic particle inspected for indications. Parts will be released to process when all of the above meet blueprint and/or customer requirements. After the setup is approved,

production pieces will be inspected for hardness, hardening length and magnetic particle inspected every hour.

Results of hardness tests, time of inspection, magnetic particle inspection results and case depth will be written on the job router ticket.

#### **1.7.4 Final Inspection and Testing**

All orders will be inspected using representative lot sampling after final tempering. The final hardness and inspector's initials will be written on the job router ticket. After final inspection, orders are released to the shipping and receiving department and job tickets and accompanying certifications (if required) will be given to the shipping and receiving supervisor.

#### **1.7.5 Destructive Testing**

Destructive testing to certify case depth will be performed only when authorized by the customer. The only way to certify effective case depth is with a destructive test. Destructive testing will be performed using an abrasive cut off saw, band saw, and/or any other necessary equipment. After cutting, the sample will be nital etched and hardness tested to certify the effective case depth.

One section of the sample will be returned to the customer and one section will be kept for A.M.T. records when possible. The A.M.T. section will be labeled with the customer's name and order number and kept for two years.

#### **1.7.6 Inspection and test records**

All inspection and test records are documented on the job router ticket and attached to the customer's order.

### ***1.8 Control of Inspection, Test and Tempering Equipment***

Indentation hardness testers and measuring equipment will be calibrated and certified by an independent factory technician every six (6) months. Indentation hardness testers will be deemed out of calibration when readings deviate by more than .5 Rockwell points from the test block.

Indentation hardness testers are to be tested weekly on Rockwell test blocks and results written on a "Weekly Hardness Report". Any machines that are out of calibration will be taken out of service until a factory representative recalibrates the machine.

All portable superficial hardness testers are to be calibrated with Rockwell test blocks before each test on a production piece.

Gas fired recalculating air furnaces will be calibrated and certified by an independent factory technician on a quarterly basis.

All calibration certifications will be kept in the Q.C. department and in the upstairs office.

## ***1.9 Inspection and Test Status***

After final inspection, all orders will be tagged with an "OK to Ship" tag listing the customer's name, job number, quantity and the inspector's initials. Any order that does not meet customer requirements will be tagged and placed in the designated non conforming area until it is determined whether to release the material to the customer.

After tempering, any order that requires additional processes including, but not limited to, magnetic particle inspection, partial orders, or parts requiring additional operations, will be tagged accordingly.

## ***1.10 Control of Nonconforming Product***

The shipping and receiving supervisor and/or Q.C. inspectors are responsible for identifying any nonconformity found during receiving inspection. Setup personnel, operators and/or inspectors are responsible for identifying any nonconformity while parts are in-process. Inspectors are responsible for identifying any nonconformity during in process or final inspection.

All non conformities will be reviewed by management, inspectors and/or production before it is disposed. All nonconforming material will be tagged and placed in the designated nonconforming area. After a nonconformity is reviewed, management will notify the customer of its findings. The customer will decide whether to accept the work with the nonconformity or scrap the material.

All non conformities will be documented on a "Nonconformity/Corrective Action" form as well as on the customer order and return packing slip.

## ***1.11 Corrective and Preventative Action***

### ***1.11.1 Corrective action***

Corrective actions can originate from a variety of inside and outside sources including, but not limited to, customer complaints, management review and employee suggestions.

Management is responsible for investigating and reviewing all corrective actions.

Solutions for corrective actions are tested, implemented, by management, inspectors, production, and/or operators, depending on the circumstance. All corrective actions are documented on a "Nonconformity/Corrective Action" form.

### ***1.11.2 Preventative Action***

All employees can initiate a preventative action with management. Management will review the suggestion using all available information before implementing any changes.

## ***1.12 Handling, Storage, Packaging, Preservation, and Delivery***

### **1.12.1 Handling**

All material is handled in such a way as to prevent damage to customer parts. Where appropriate, proper lifting devices will be used. Handling of customer parts is kept to a minimum.

### **1.12.2 Storage**

All customer orders are stored within the plant in such a way as to prevent damage to the parts before processing and shipping.

### **1.12.3 Packaging**

All customer orders are packaged in such way as to prevent any damage in shipping. Parts are packed in the same containers or on skids as they were received.

### **1.12.4 Preservation**

All parts are dipped or sprayed with a rust inhibitor prior to shipping.

### **1.12.5 Delivery**

All orders are delivered according to the customer's preferred courier.

## ***1.13 Control of Quality Records***

All records relating to the quality assurance system are identified, collected and indexed by management and stored in the appropriate departments or the office. Quality assurance records are kept for seven years.

## ***1.14 Internal Quality Audits***

Internal quality audits of the quality assurance system are conducted once per year by management. Internal audits are to be conducted using a "Quality Audit" form. Should corrective actions be required, management will be responsible for implementing changes in the most expeditious manner. All audit reports are reviewed by the company president.

## ***1.15 Training***

All personnel are sufficiently trained to perform the work that they are assigned. On the job training with mentors is required for all personnel performing new tasks. Periodic outside training is available for all personnel on a need to know basis. Outside training records are kept in the office.