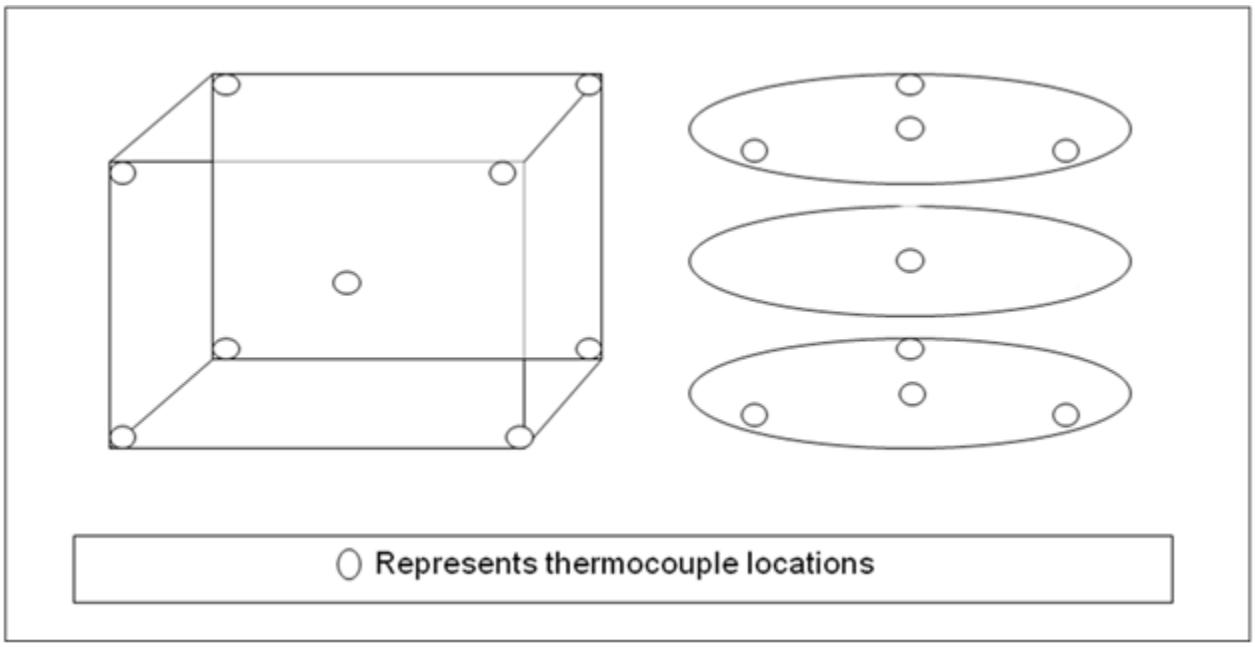
ERRATA SHEET FOR

CQI-9 Special Process: Heat Treat System Assessment, 3RD EDITION

1) Figure 3.4.1 -- The 12 thermocouple locations in the cylindrical furnace is changed to 9 thermocouple locations as shown below.



2) Cover Sheet Form – typographical error on CD
   - The Header on the top right side should read, Version 3, Issued 10/2011.
   - Process Table G is listed twice and should read,
     - Process Table G – Sinter Hardening
     - Process Table H – Ion Nitriding
   - Directions for correction typographical error on CD:
     - When using the CD the first time, save the file to your computer
     - From the Cover Sheet, click on Page Layout tab, click the arrow in the bottom right corner of the Page Setup group to display the Page Setup dialog box
     - Click on Header/Footer tab and select the Custom Header button
     - Change to Version 3, Issued 10/2011, click OK.
     - Locate cell C- 40, change Process Table G to Process Table H

3) Process Table E – Annealing / Normalizing Stress Relieving – E4.1 changed as shown below.

4.0		IN-PROCESS/FINAL TEST FREQUENCIES	Batch Furnace	Continuous Furnace
E4.1	1.4 2.15	When specified - Microstructure shall be checked at a minimum magnification of 100x and, 400x or above 400x. Microstructural visual references shall be available.	Daily per furnace unless specified by customer to be checked with greater frequency, e.g., each batch.	Daily per furnace unless specified by customer to be checked with greater frequency, e.g., each batch.

4) Process Table G – Sinter Hardening; G3.1, The Process Monitor Frequencies for Atmosphere Generation was corrected as shown below (red circles).

3.0		PROCESS MONITOR FREQUENCIES	Batch Furnace	Continuous Furnace	Atmosphere Generation
G3.1	1.4 2.14	Monitor primary temperature control instrument(s).	Continuous recording with sign-off every 2 hours or each batch for processes under 2 hours. Alarm systems (if set per limits in G2.5) satisfy the sign-off requirement.	Continuous recording with sign-off every 2 hours or each lot for processes under 2 hours). Alarm systems (if set per limits in G2.5) satisfy the sign-off requirement	One of the three options is required. (1) Record temperature 2x per shift and after any change. (2) Continuously record temperature and sign-off 2x per shift and after any change. (3) Alarm system on temperature controller.

NOTE: G4.5 IS DELETED AND REPLACED BY G4.1 AS SHOWN ABOVE.

5) Process Tables A, B, and G – Microstructure inspection frequency changed to below.

PROCESS TABLE A – Carburizing / Carbonitriding / Carbon Restoration / Neutral Hardening / Austempering/Martempering/Tempering/Precipitation Hardening – Aging

4.0		IN-PROCESS/FINAL TEST FREQUENCIES	Batch Furnace	Continuous Furnace
A4.1	1.4 2.15	Microstructure shall be checked at a minimum magnification of 100x and, 400x or above 400x. Microstructural visual references shall be available.	Daily per furnace unless specified by customer to be checked with greater frequency, e.g., each batch.	Daily per furnace unless specified by customer to be checked with greater frequency, e.g., each batch.

PROCESS TABLE B – Nitriding (Gas) and Ferritic-Nitrocarburizing (Gas or Salt)

4.0		IN-PROCESS/FINAL TEST FREQUENCIES	Batch Furnace	Continuous Furnace
B4.1	1.4 2.15	Microstructure shall be checked at a minimum magnification of 100x and, 400x or above 400x. Microstructural visual references shall be available.	Daily per furnace unless specified by customer to be checked with greater frequency, e.g., each batch.	Daily per furnace unless specified by customer to be checked with greater frequency, e.g., each batch.

PROCESS TABLE G – Sinter Hardening

4.0		IN-PROCESS/FINAL TEST FREQUENCIES	Batch Furnace	Continuous Furnace
G4.1	1.4 2.15	Microstructure shall be checked at a minimum magnification of 100x and, 400x or above 400x. Microstructural visual references shall be available.	Daily per furnace unless specified by customer to be checked with greater frequency, e.g., each batch.	Daily per furnace unless specified by customer to be checked with greater frequency, e.g., each batch.

6) Process Table D - D4.2 typographical error changed as shown below.

4.0		IN-PROCESS/FINAL TEST FREQUENCIES PER COIL	
D4.2	1.4 2.15	Total or Effective Case depth	1 part at start-up, end of production run, and 1 part per 8 hours minimum, and 1 part pre and 1 part post tool change, equipment repair, station alarm (shutdown, malfunction, etc.).

ERRATA SHEET –

Items 7 through 10 were added April 2012 to Errata Sheet released January 2012

7) System Accuracy Test referenced in Table item #'s: A2.3, B2.3, C2.3, E2.3, F2.3, and G2.3.

   Current reading: CQI-9 requires a System Accuracy Test (SAT) check of the control thermocouple in the Qualified Work Zone per Section 3.3

   New reading: CQI-9 requires a System Accuracy Test (SAT) check of all control thermocouple per Section 3.3. Also, any recording or monitoring thermocouple(s) more than 5 centimeters from the controlling thermocouple in the zone, for example thermocouples in continuous belt furnaces near the drop point to quench used for recording or monitoring the hardening temperature (this does not include the "over-temperature" thermocouples that are used to protect the furnace from overheating).

8) Change Glossary definition of "Resident Thermocouple" to:

   A test thermocouple that is not removed from its test location, and is used for the SAT Comparative Method. The resident thermocouple shall meet the requirements of Section 3.3.4.3 and Table 3.3.1.

9) Illustrations 3.3.1 (page 50), 3.3.2 (page 52), and 3.3.3 (page 54) were not labeled. The temperatures in the graphics did not match the temperature values in the Example. These corrections are show below.

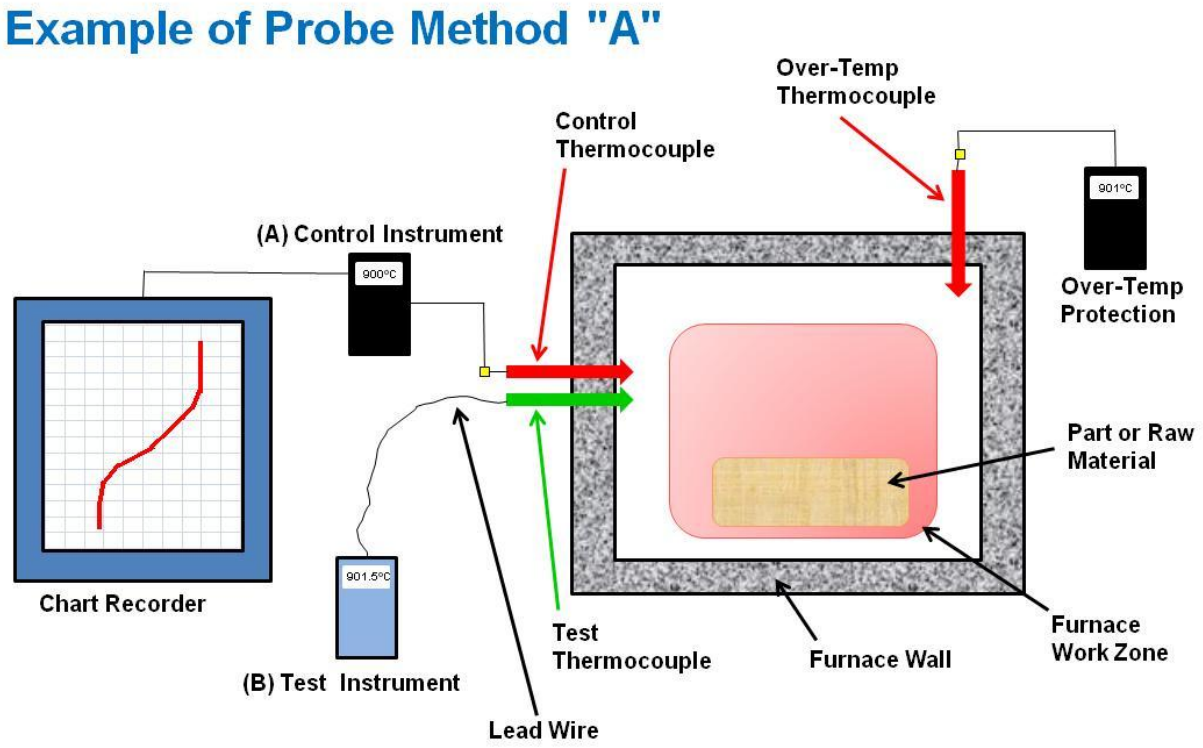


ILLUSTRATION 3.3.1

EXAMPLE OF ACCEPTABLE SYSTEM ACCURACY TEST (SAT) PROBE METHOD - A

CONTROL INSTRUMENT TEMPERATURE (A)	TEST INSTRUMENT TEMPERATURE (B)	TEST THERMOCOUPLE CORRECTION FACTOR (C)	TEST INSTRUMENT CORRECTION FACTOR (D)	TRUE TEST TEMPERATURE (E)=(B)+(C)+(D)	CALCULATED SAT DIFFERENCE (A) – (E)
900°C (1652°F)	901.5°C (1655°F)	-0.5°C (-1.0°F)	+0.1°C (+0.2°F)	901.1°C (1654.2°F)	-1.1°C (-2.2°F)

Example of Probe Method "B"

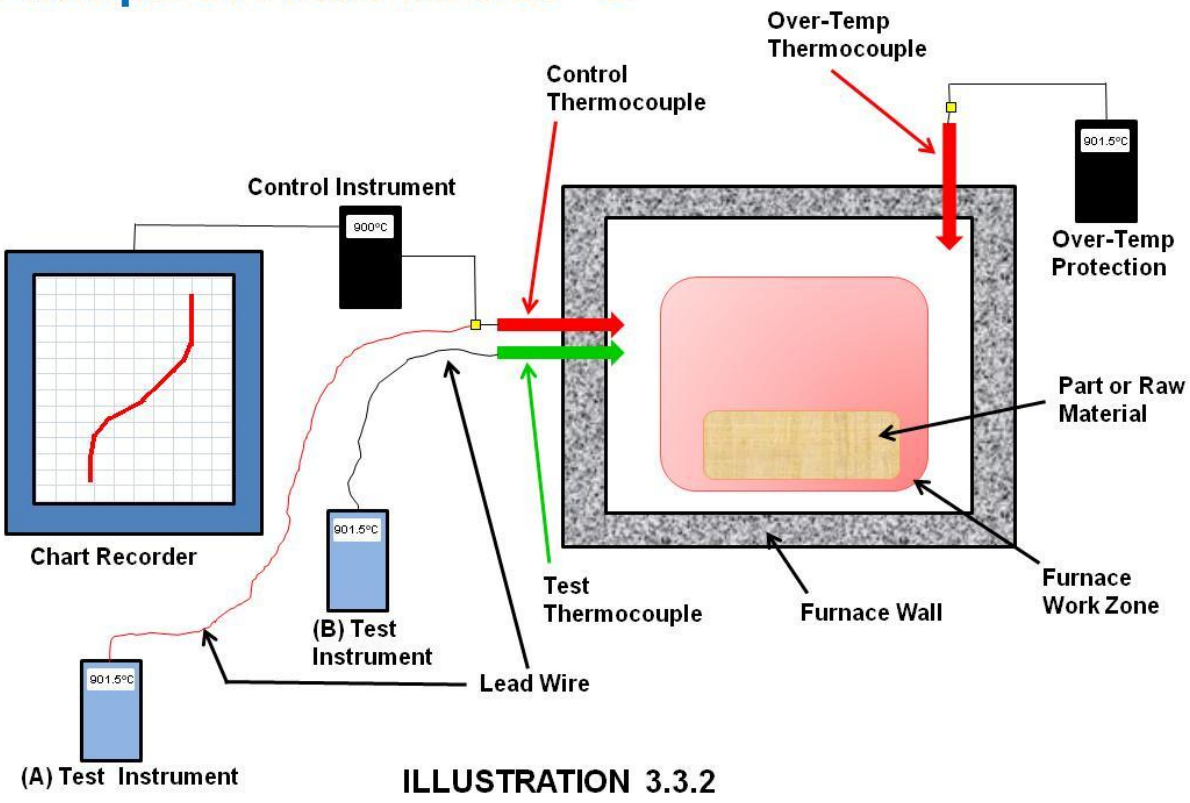


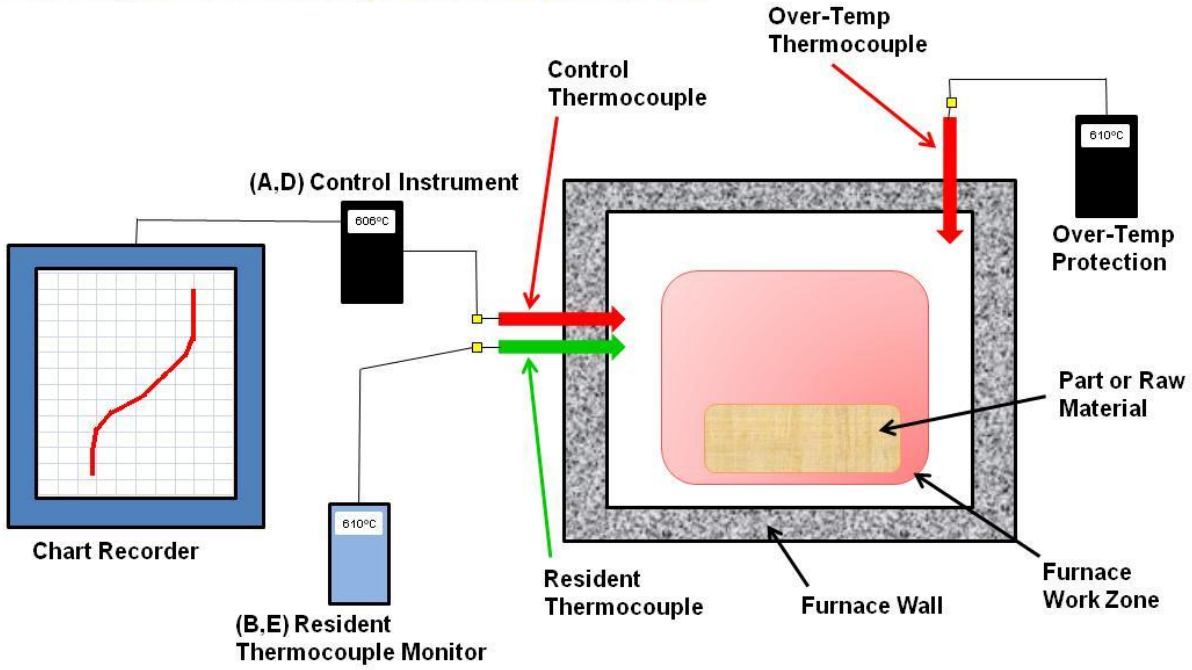
ILLUSTRATION 3.3.2

EXAMPLE OF ACCEPTABLE SYSTEM ACCURACY TEST (SAT) PROBE METHOD - B

CONTROL THERMOCOUPLE TEMPERATURE INDICATED ON TEST INSTRUMENT (A)	TEST INSTRUMENT TEMPERATURE (B)	TEST THERMOCOUPLE CORRECTION FACTOR (C)	TEST INSTRUMENT CORRECTION FACTOR (D)	TRUE TEST TEMPERATURE (E)=(B)+(C)+(D)	CALCULATED SAT DIFFERENCE (A) – (E)
900°C (1652°F)	901.5°C (1655°F)	-0.5°C (-1.0°F)	+0.1°C (+0.2°F)	901.1°C (1654.2°F)	-1.1°C (-2.2°F)

Note: Test Instrument A and Test Instrument B are typically the same test instrument.

Example of Comparative Method



Note 1: It is recommended that the comparative check be performed at or near the initial temperature at the time of instrument calibration (See A & B temperature in example below).

Note 2: Resident thermocouple and over-temp thermocouple may be the same thermocouple

ILLUSTRATION 3.3.3

EXAMPLE OF ACCEPTABLE SYSTEM ACCURACY TEST (SAT) COMPARATIVE METHOD

CONTROL TEMPERATURE AT TIME OF INSTRUMENT CALIBRATION (A)	PERMANENTLY INSTALLED MONITORING TEMPERTURE AT TIME OF CALIBRATION (B)	INITIAL DELTA (C) = (B) – (A)	CONTROL TEMPERATURE AT TIME OF MONTHLY CHECK (D)	PERMANENTLY INSTALLED MONITORING TEMPERTURE AT TIME OF MONTHLY CHECK (E)	DEVIATION FROM INITIAL DELTA [SHALL BE ≤ 1°C (≤ 2°F)] (E)-(D)-(C)
600°C (1112°F)	605°C (1121°F)	+5°C (+9°F)	606°C (1123°F)	610°C (1130°F)	-1°C (-2°F)

Deviation from the initial delta = **E – D – C**

10) Process Table C, Item #C2.4 states minimum and maximum temperature shall be “defined”. “Defined” should be replaced with “tested” as shown below.

2.0		PYROMETRY	OK / NOK / NA
C2.4	3.4	Temperature Uniformity Survey (TUS) TUS frequency shall be quarterly and after major rebuild per Section 3.4. Temperature Uniformity tolerance for solution and aging furnaces shall be +/- 5°C (+/- 10°F). Temperature Uniformity tolerance for annealing furnaces shall be +/- 15°C (+/- 25°F) Minimum and maximum temperature of the operating range shall be tested. Exception: If the operating range of the Qualified Work Zone is equal to or less than 85°C (155°F) then only one temperature is required to be tested. The test temperature shall be within the operating range of the Qualified Work Zone. **For Continuous Furnaces, this requirement applies to the Qualified Work Zone.**	

Items 11 and 12 were added Nov 2013 to Errata Sheet released January 2012

11) Note on page 10 is intended to be placed under the heading of "**Process Table E – Annealing, Normalizing, and Stress-Relieving"** on page 9.

Note: *Heat treatment of primary or raw materials or any intermediate thermal treating process step(s), e. g. a normalizing heat treatment of a forging prior to machining and final hardening, may have an effect on the characteristics of the final part, e. g. distortion. Therefore, the part design responsible automotive engineering, and the OEM shall decide the heat treatment chain conformity to CQI-9. The receiving company may also require their supplier in the supply chain to conform to CQI-9*

12) Question 1.14 should read:

*Has the **organization** a process describing the responsibilities for the handling of nonconforming products and disposition of material being in quarantine status?*

Requirements & Guidelines:

The organization must describe a process with responsibilities for the handling of nonconforming products and disposition of material from quarantine status. The most common practice is to have a quality manager and quality department with authorized personnel dealing with these requirements.