

# PROCESS SPECIFICATION

## DELPHI SAGINAW STEERING SYSTEMS

TITLE Tool Material Heat Treatment NUMBER E-2655  
ISSUED BY D. Nicholas DATE 22APR02 APPROVED BY \_\_\_\_\_  
REVISION A REV. DATE 08JL2003 SHEET 1 OF 1

- A. Material to be heat treated: **H13**
- B. Heat treatment for vacuum furnace capable of at least 5 bar nitrogen pressure.
- C. Heat treat as specified:  
Please note: A part with a similar cross-section must be run with each order.  
A thermocouple (T.C.) will be buried in the part.
1. Preheat slowly at a rate not to exceed 400 degrees per hour to 1100 - 1200°F
  2. Hold at heat until furnace T.C. temperature equals the part T.C. temperature.
  3. Continue preheat at a rate not to exceed 300 degrees per hour to 1350 to 1550°F.
  4. Hold at heat until furnace T.C. temperature equals the part T.C. temperature.
  5. High heat at a rate not to exceed 300 degrees per hour to 1825 to 1875°F
  6. Hold at heat until furnace T.C. temperature equals the part T.C. temperature.
  7. Hold at heat for 30 minutes.
  8. Gas quench under nitrogen pressure at a rate of at least 50 degrees per minute to 1000°F and hold until temperature equalize between furnace T.C. and part T.C.
  9. Continue quench to 150°F or less
  10. Triple temper immediately, 4 hours minimum at 1000 to 1200°F for each temper with an air cool to room temperature between tempers.
- D. Stress relieve after final machining at 50 °F below last tempering temperature.
- E. Using heat treatment shown above will give a hardness range of 38 to 54 Rockwell C. Required hardness will be noted on print. Heat treat accordingly.
- F. No carburization or decarburization allowed.
- G. Heat treatment certification, when requested, shall include:
1. Heat treat shop number
  2. P.O number accompanying job
  3. Type of material heat treated
  4. Size and quantity of tooling batch heat treated
  5. Resulting hardness
  6. Xerox copy of material tracking chart containing furnace times and temperatures.
  7. Date when hardness tester last calibrated.
- H: Heat treatment per this specification is to be carried out only by approved sources as listed in specification E-2600.
- I: All printed copies of this specification are FOR REFERENCE ONLY. The latest revision can be viewed on-line at: [http://www.delphisuppliers.com/vendor\\_documents/delphi-s/index.html](http://www.delphisuppliers.com/vendor_documents/delphi-s/index.html)

Revision	Revision Description	By	Date
A	Note H revised. Note I added.	DN	08JL2003

Note: The above specifications were developed without considering whether patents may or may not be involved.  
In all cases, therefore, the supplier shall be required to assume patent liability.