

**SUPPLIER QUALITY ASSURANCE MANUAL
FOR PARTS AND RAW MATERIALS**

***** QUALITY ASSURANCE FOR TRIAL PRODUCTION *****

SECTION 14 - CHECKING FIXTURES, GAGES, AND TEST EQUIPMENT

PURPOSE: To specify requirements for equipment to be used to evaluate production parts for compliance to drawings or inspection standards, process control, quality improvement, or other quality requirements.

SCOPE: Applies to Suppliers of production parts when specified on the Notification of Quality Assurance Requirements. Covers all checking fixtures, gages, and test equipment used for the verification of finished part quality. (Note: This section does not apply to in-process gages).

SUPPLIER RESPONSIBILITIES:

1. The Supplier must provide a means to verify all quality characteristics specified on the drawing and inspection standard.
2. At the beginning stage of the project, DENSO will determine and advise if and how checking fixtures, gage or test equipment will be developed for the supplied part. In some cases, at the discretion of DENSO QA/QC, they may be furnished to the Supplier by DENSO.
3. If the Supplier is responsible for obtaining and preparing the necessary checking fixture, gage or test equipment, the Supplier should meet with DENSO QA/QC to establish the design concept before detailed design begins. See following pages for information on how to develop checking fixtures, gage, or test equipment. (Note: The Supplier can select the fabricator.)
4. All checking fixtures, gages, and test equipment shall be accurate according to recognized automotive industry standards (Reference AIAG supplemental manual "Measurement Systems Analysis- MSA"). The word accurate here refers to the relative degree of errors associated with bias, repeatability, reproducibility, stability, and linearity. The device should include documentation to the appropriate national/international standard.
5. For dimensional checking fixtures and gages, the Supplier must submit the gage drawing and specification along with the DENSO Supplier Procured Check Fixture, Gage, and Test Equipment Request/ Approval form to DENSO QA/QC for review and obtain approval prior to manufacturing the checking fixture, gage, or test equipment.

On the DENSO Supplier Tool Progress Report the Supplier should provide a construction schedule. (Reference Section 15 Quality Assurance Schedule (QAS) and Tool Progress Report (TPR)).

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6. The Supplier must ensure that parts are located on checking fixtures and gages per the datum scheme agreed upon during the design/development meeting (as in 3 above). Fixtures must reference car position if drawing references car position.
7. The Supplier is responsible for performing appropriate analysis of the measurement system to ensure performance is acceptable for its intended purpose. The AIAG supplemental manual "Measurement Systems Analysis- MSA" is the recommended reference for appropriate methods.

At a minimum, Gage Repeatability and Reproducibility (R&R) must be conducted and maintain a target of $\leq 10\%$ error to tolerance maximum. If the Supplier cannot achieve this target, they must consult DENSO QA/QC. Gage R&R is to be verified by the Supplier using production metrology equipment and gage operators using no later than the first-off tool sample. **At minimum, all characteristics designated on the NQAR as critical must be evaluated for R&R.**

8. The Gage R&R must be done using the long method of study. The criteria required of this method enables separation of error due to the gage and operator. Gage R&R data should be submitted in the format specified in the MSA Manual.
9. The Supplier is responsible for maintenance and calibration of all checking fixtures, gages and test equipment. They must be re-certified on a planned basis which includes Gage R&R studies. Certification must be traceable to a national or international certifying body.
10. The checking fixture, gage, or test equipment must be identified with the part number, ECI level, certification date, and re-certification due date.
11. **Checking fixtures, gages and test equipment are to be completed, qualified and available to evaluate no later than first off-tool sample parts.**
12. The Supplier must receive final approval for the checking fixture, gage or test equipment from DENSO QA/QC before the device can be used to inspect parts to be sent to DENSO. For final approval the Supplier must attach the following information to a Checking Fixture, Gage, and Test Equipment Approval Request form and submit to DENSO QA/QC.
 - A. Calibration certification data.
 - B. R&R study results for critical characteristics.
 - C. Maintenance and re-certification schedule.
 - D. Instructions on how to use gage.
 - E. Photo of device.

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13. If during maintenance or calibration of the checking fixture, gage or test equipment, it is found to be out of calibration the Supplier is responsible for:
- A. Notifying DENSO via submission of a Supplier Deviation Request (Reference Section 38 - Deviation Request/ Reply).
 - B. Repairing the device to within standard.
 - C. Having a method to assess the effect on parts measured on an out of calibration device.
 - D. Notifying DENSO QA/QC department of the results of the above assessment. *

* Note: Requirements A and D are required only if the Supplier suspects that non-conforming product has been sent to DENSO as a result of an out-of-calibration checking fixture, gage, or test equipment.

14. Operators must be properly trained and documentation of their skill level must be available to DENSO QA/QC upon request. Instructions must be affixed to the device.
15. The Supplier must keep checking fixtures, gages and test equipment (including those supplied by DENSO) updated to the latest parts ECI level.
16. Checking fixtures, gages and test equipment shall not be changed without written approval from DENSO QA/QC. The Supplier should follow the procedure for Process Change Requests and obtain approval prior to implementing any changes (Reference Section 40 - Process Change Request (PCR), Reply/ Design Change Request (DCR)/ Engineering Change Instruction).

Changes may be needed as a result of:

- A. Engineering Change Instruction (ECI).
 - B. Problem countermeasure activity.
 - C. Part Inspection Standard change.
 - D. Fixture workability.
 - E. Process change.
 - F. Repair.
17. For DENSO-supplied devices (see Flowchart: For Sourcing Checking Fixture, Gage, and Test Equipment on page 5), the Supplier must:
- A. Provide shipping instructions (e.g. address, recipient, etc.).
 - B. Provide a Gage Receipt and Condition Report to DENSO QA/QC within one week of gage receipt.
 - C. Ensure all checking fixture, gage, and test equipment requirements are met and submitted to DENSO QA/QC.

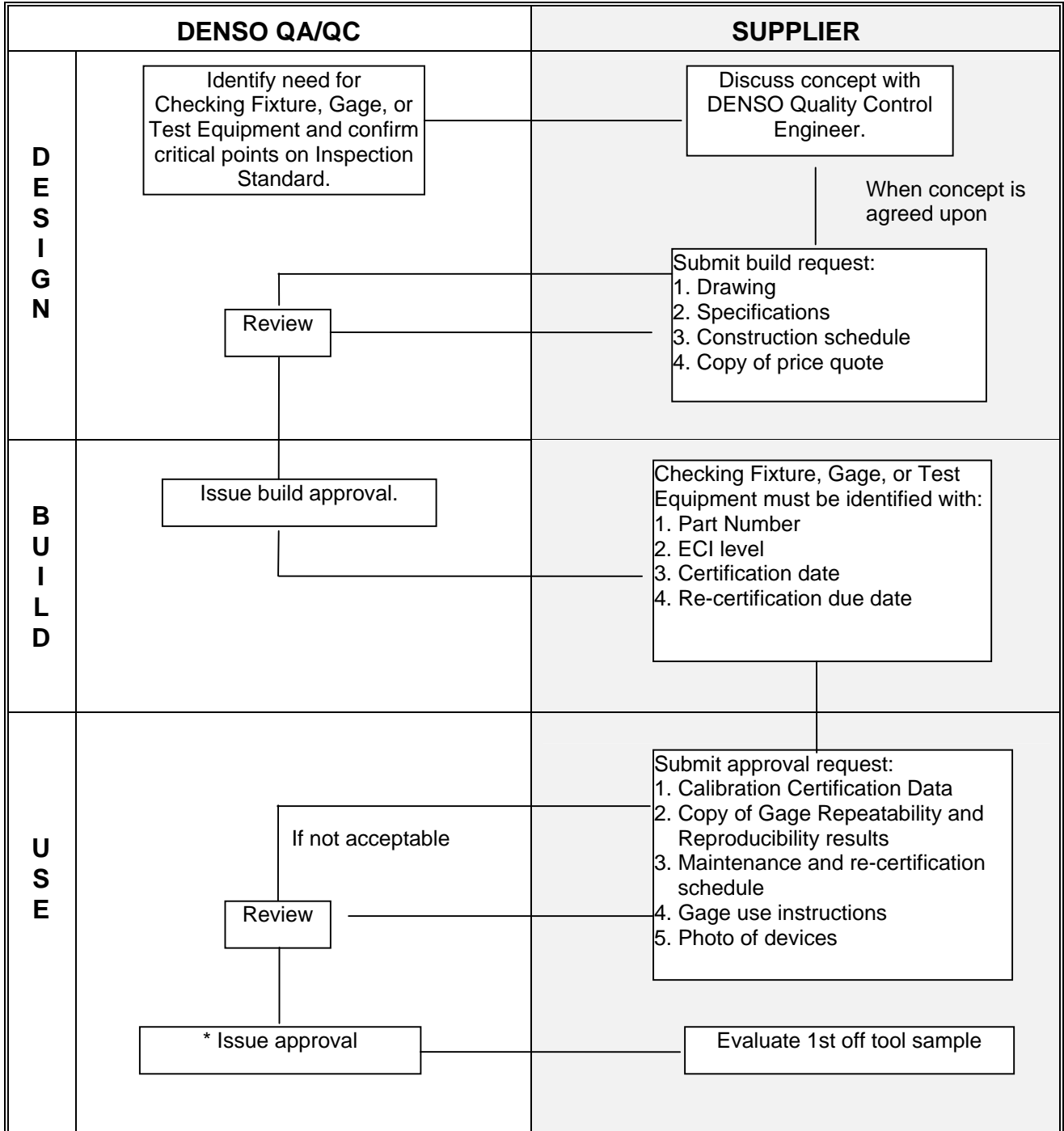
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18. The Supplier must contact the DENSO Purchasing Department for instruction and approval before disposal of checking fixtures, gages and test equipment.

Flowchart: For Sourcing Checking Fixture, Gage, and Test Equipment



* (Should be completed by 1st off-tool sample)

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Table: Guidelines for Making Checking Fixtures, Gages, and Test Equipment

Datum Position	<ul style="list-style-type: none"> • Datum fixing point should be same as Parts Drawing. • Datum surface should be appropriate size. • Clamps should be appropriate size. • Clamp pressure should not distort or damage the component.
Measuring Positions	<ul style="list-style-type: none"> • There should be an appropriate gap between part and fixture/device to aid easy measurement. • Datum reference surfaces should be large enough to aid measuring instrument location. • The nominal dimension should be shown on fixture if applicable. • All points on Inspection Standard should be easily measured.
Workability	<ul style="list-style-type: none"> • Part should be easily loaded and removed from device without damage. • Clamps and datum pins should be easy fitting. • There should be no interference between fixture and part.
Durability	<ul style="list-style-type: none"> • Must be rigid enough to last model life. • High usage areas must be strong sections. • Clamps should be reliable. • Datum contact surfaces should be wear resistant.
Interchangeability	<ul style="list-style-type: none"> • Multiple common parts should be able to be measured. • Mating/matching parts should use gages/fixtures which can be fixed together.
Housekeeping of Gage/ Fixture	<ul style="list-style-type: none"> • Discrimination marks, color points should be clear. • Loose parts should be wired or stored in a box to prevent loss.