Revision	Revision date	Description of change
1.0	17-July-2023	• Initial Release
2.0	21-November-2024	• 4.28 Go / No Go Pins update dimensions • Spelling corrections

Prepared		Approved	Released
Process Leader	Subject Matter Expert	Process Champion	BOS Regional Team
Tony Evans	Tony Evans	Katherine Kimberlin	Tracy Piller Signature
Approval records maintained by BOS Administrator / Champion			

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1.0 Purpose

This guideline defines the methodology used for the design, manufacture, and approval of Checking Gages and Checking Fixtures.

2.0 Scope

This guideline applies to the following Adient locations:	Plant	Tech Center	PG
Adient owned operations	Yes	Yes	All SS&M Americas locations
Adient majority-owned subsidiaries	Yes	Yes	
Consolidated joint ventures and affiliates	Yes*	Yes*	
Unconsolidated joint ventures and affiliates	*	*	

* Required in accordance with JV business agreement

3.0 Responsibility

The Costing team is responsible for Gage Program costing budget.

The Gage SMTE (Subject Matter Technical Expert) is responsible for gage technical standard, and support of drawing reviews, gage design reviews and approval, Gage R, Gage approval.

The Program AQE is responsible for Process flow for gaging requirements, MSA Gage plan, RFQ for Gage Vendor, Issue PO and approve invoice, Gage timing plan, Gage tracking, Gage design review, parts for Gage R, Gage review at vendor, approve Gages to ship to equipment integrator.

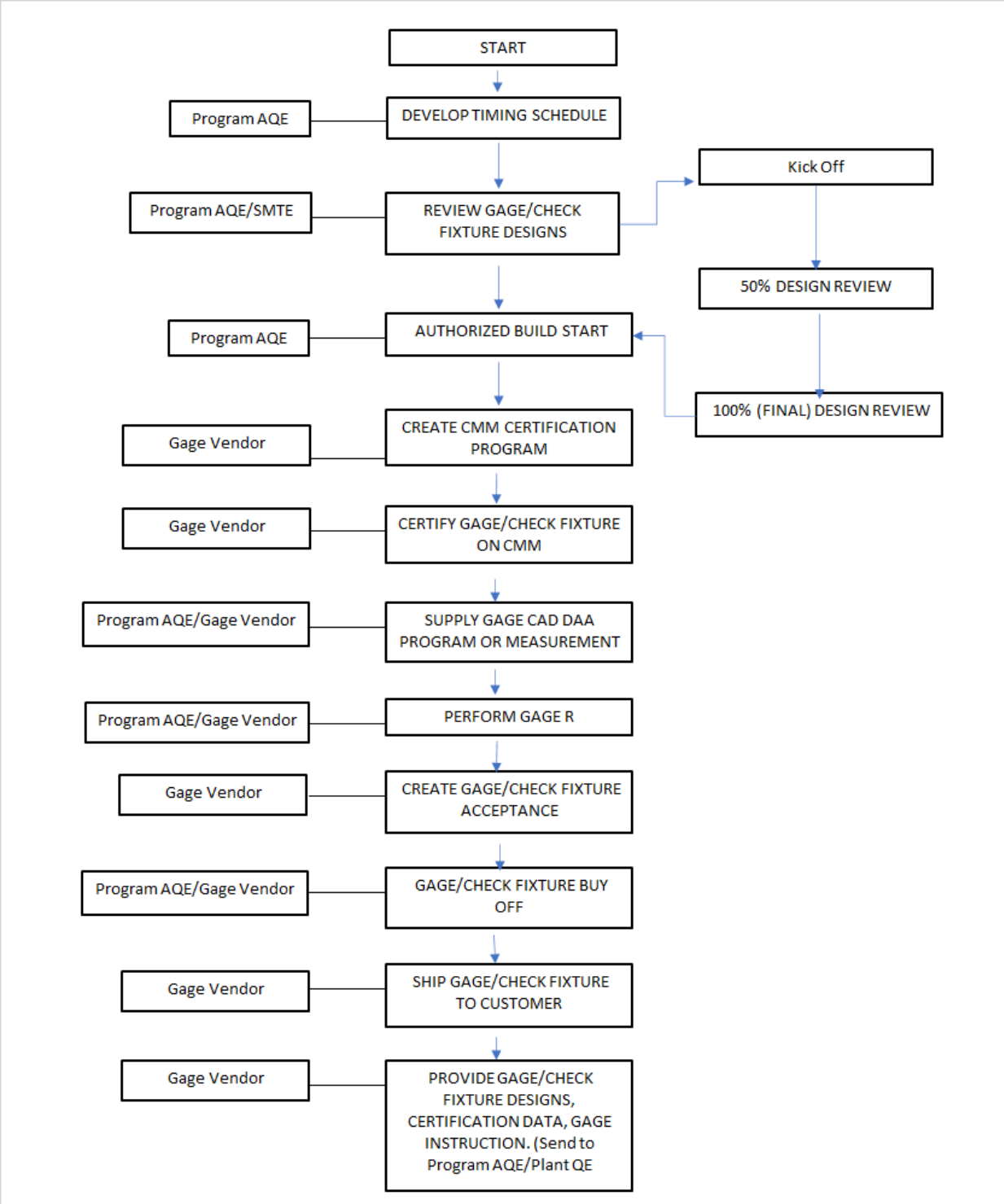
The Plant Quality Engineer is responsible for coordinating shipping gages from equipment integrator to the plant, add to plant gage tracking system, Gage RR, release gages for production use.

The Buyer is responsible for Gage sourcing decision.

The Gage Vendor is responsible for Gage feasibility and concept, 3D CAD and 3D Gage design, support review of Gage design, manage Gage build and schedule, preliminary Gage work instruction.

The Product Engineer is responsible for CAD data distribution to Gage Vendor.

4.0 Process Flow

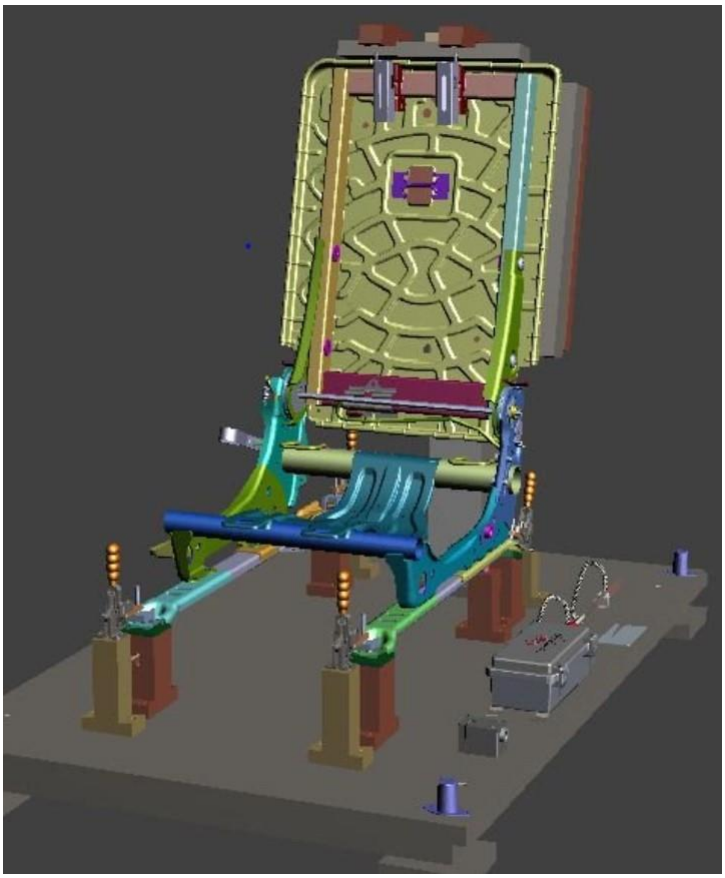


4.1 Definitions

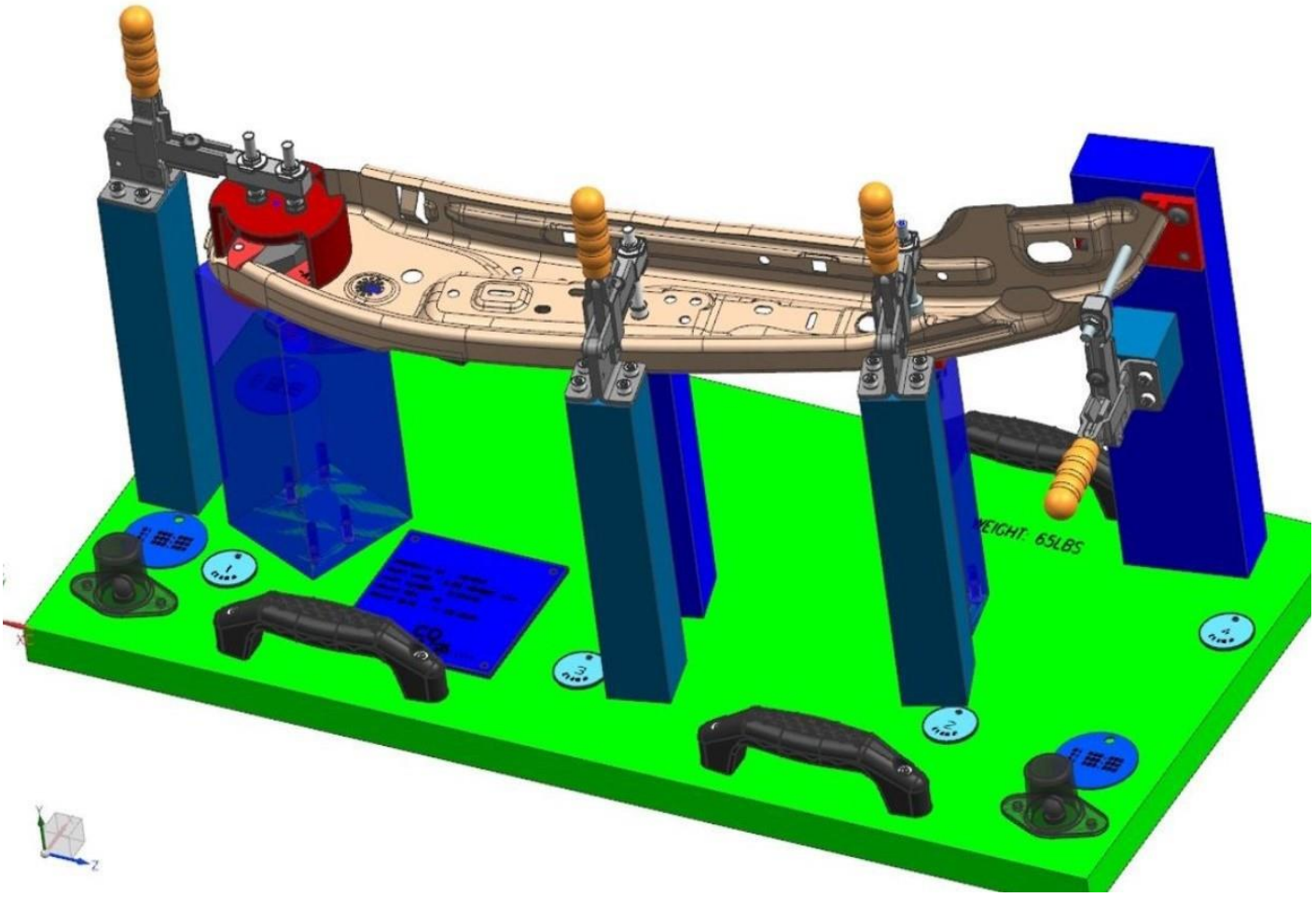
The following terms are defined to clarify this Gage Standard.

Term	Definition
Checking Fixture	A tool used to hold a part in a fixed position for CMM checks. It is sometimes referred to as CMM or H Point fixture.
Checking Gage	An inspection tool used to check a work piece against it allowed tolerance.

4.2 Gage



4.3 Checking Fixture



4.4 Safety and Ergonomic Requirements

4.5 SAFETY:

The Gage Vendor must take all necessary steps to avoid safety incidents on the fixture or gage. The following safety requirement is the minimum safety expectation of Adient fixture or gage. If there is any deviation from this minimum safety requirement it is the responsibility of the Gage Vendor to consult Adient SMTE or Program AQE for written approval.

- The entire gage and cart must be free of sharp edges/ burrs.
- Use clamps such as Brauer toggle clamps to prevent pinch points.
- Toggle Clamps and hinged drops must have mechanisms installed that prevent free falling onto the operator. Examples of such mechanisms are handle stops, toggle clamp lockout, hinge drop lockout, and gas springs.
- The Gage Vendor must ensure that any hand apply detail does not exceed 40 lbs. In the case where the weight exceeds 22 lbs., assist devices such as counterbalances must be used.

PLEASE NOTE THE FOLLOWING WEIGHT RESTRICTIONS OF ADIENT FOR GAGES AND FIXTURES:

- A weight less than 40 pounds must have two (2) handles installed that meet the expected weight required to safely lift.
- A weight greater than 40 pounds but less than 65 pounds must have (4) handles installed and should be labeled not for lifting.
- A weight greater than 65 pounds must have a dedicated cart, eyebolts or forklift sleeve installed, lift areas called out on the label and shown in the design.

4.6 ERGONOMIC:

Gage Vendor is required to design and build ergonomics into the gage. The Gage Vendor responsibility is to build the gage considering the following:

- Arm reach: The horizontal neutral reach zone is defined as the area that is easily reached with a sweep of the forearm across the workspace.
- Arm elevation: The vertical neutral reach zone describes the area 5 to 8 inches above and below appropriate work height.
- Gage working height: Is recommended that the center of the gage be between 32 and 48 inches, and not to exceed height of 68 inches.
- The gage shall be user-friendly to the operator to prevent and/or minimize unnecessary ergonomic motions and bad posturing.

4.7 Quotation Requirements

4.8 Checking Gages and Checking Fixtures need to be robust enough to maintain dimensional Integrity during the life cycle of the program.

4.9 Use of steel or aluminum or stainless steel for risers, support members, brackets, and checking details, should be based on the following factors:

- vehicle volumes, (high vs low)
- material cost,
- structural requirements,
- weight,
- ability to machine
- corrosion resistance.

4.10 Assumptions and /or exceptions that affect cost and timing must be clearly identified on the quotation.

The gage and fixture design are the property of Adient LLC or their customer. It is required for the Gage vendor to send the 3D and 2D CAD data in native format (i.e., Solid Works, Mechanical Desktop Pro-E Catia V5, NX) of the checking gage and checking fixture or both to Adient LLC using AdientDX file transfer.

The following information is required on the quotation:

- Adient LLC program name.
- Part number, Rev level, and description.
- Buyer and SMTE/Program AQE name must be listed.
- Payment terms based on Adient purchasing requirements.
- Detail description of the work to be completed.
- The Lab accreditation ISO/IEC 17025. Note if gage vendor is not ISO/IEC 17025 certified must provide 3rd part certification from ISO/IEC 17025 lab accredited company.
- Total cost.
- Detailed timing plan to include the following (quote terminology to align with below):
    - Timing is based on Final CAD/Drawings/Approvals/Purchase Orders.
    - Design.
    - Build and other peripheral activities required.
    - Certification.
    - Shipping.

4.11 Gage and Checking Fixture Design Requirements

4.12 – Gage Design

The design should reflect GD&T tolerances on released product drawing, the datum type, and location, customer requirements, and any special requirements reviewed during the quotation stage.

1. The part position in relationship to the gage base.
   a. Body position: The positioning of the part in the gage in the identical orientation the part will have in the final vehicle assembly. This is the preferred orientation; however other orientations may be appropriate to maximize part/gage usage.
   b. 90-degree increments should be used when deviating from print position.
      - CAD is in body position, but vendor rotates to match the drawing.
   c. Note that any deviation from orientating the part in body position must be approved by Adient SMTE and/or the Program AQE.
      - Insure you have two sets of tooling balls tags. One in work line and one in body.
2. Location of datums should be shown. The datum scheme must be consistent with the part specified GD&T.
3. Location and orientation of clamps, and proposed clamping techniques (e.g., standard clamping and / or using fasteners) must be shown in design.
4. Gage design should include acceptable construction materials based on gage usage and environment to ensure functionality, repeatability, and reproducibility throughout the length of the program.
5. Approval of the gage design authorizes the ordering of materials and components. If gage materials have been ordered prior to final design approval, and changes are made to the gage design that affect these materials, the material costs for the unusable stock will be absorbed by the vendor.

4.12 continued - Gage Design

The checking gages used to check the fit, form, and function of the part to the vehicle will be designed in a cooperative effort between the Gage Vendor, customer, and Adient Program Team. Based on commodity and plant location differences, any specific requirement(s) could be requested by the customer and Adient Program Team.

1. The gage design is intended to be an accurate representation of the gage. It should reflect how the gage will be constructed and must include the basic information such as, base size and type, part orientation, location, size, and orientation of all stanchions, details, pin sizes, go-no go sizes, clamp style, location of datums and flush rails / feeler rails, and location of SPC ports.
2. The environment in which the gage is to be used should be considered when choosing the material, slides, pins, clamps, etc. to ensure that they remain functional throughout the program life and including service requirements. It is the Gage Vendor's responsibility to inquire the usage location of the gage and the program life span.
3. All designs shall be submitted and reviewed in 3d format. Gage design should be submitted in 3d pdf.
    a. If there are model change or interchangeable areas on the check fixture, then they are to be identified with part number or tool number and clearly called out in design using phantom lines with a different color other than the color of the part.
    b. Gage design should include a representation of the part shown in its gaging position.
    c. Gage design details should be drawn separately from the gage assembly only when needed for build clarification.
    d. All dimensions should be in metric.
    e. Commercial items (i.e., angle brackets, risers, hinge drops, slides, screws, dowels, etc.) should consist of standard commercially available materials whenever possible.
    f. In all cases unless otherwise specified the drawing is master for GD&T. The CAD data may be used for dimensions not on drawing(s).
    g. The Gage Vendor is responsible to ensure gage detail(s) to part interference does not happen.
    h. Gage designs must be generated electronically approved software (CATIA, NX, etc.).

4. The datum scheme(s) shall be applied to the gage design. The general concept is to locate the part in three dimensions by use of datum locators referred to as “primary,” “secondary,” and “tertiary” datums.

a. Datums that are located on or near parting lines, gates, ejector pins, welds, or any similar features must be brought to the attention of the responsible SMTE and Program AQE. If the datum cannot be re-located then clearance shall be provided on the gage detail to facilitate Gage R, and GRR.

1. Datum Hole Locator(s):
   a. Gage pins that are not used as datum locators shall not restrict part movement in any direction not specified as a datum. This condition may be addressed by utilizing precision slides and/or movable detail(s) allowing movement in the non-datum direction. The slide and moveable details must not affect the specified location tolerance for the datum locator.
      - Note ALM slides are not to be used for Adient gages. The IKO are the preferred method of precision slide(s).

   b. For attribute and variable gaging all datum locators are Regardless of Feature Size (RFS) and shall be used to positively locate the part in the datum direction specified. This locating feature should be attached to a precision slide or movable details to allow free of movement in the non-datum direction.

5. All datum surfaces and locators must be labeled on the design with the respective GD&T datum call out.
6. All design records shall have the part number, CAD rev level, drawing rev level, and all parts listed that will be verified on the gage.
7. The design must show the storage locations for removable or interchangeable details, and loose components (SPC Indicator, GO/NO GO pins, and Plug gages). When loose details or components are needed a general note for tethering is required with the design.
8. The Adient SMTE and the Program/Plant team should meet to approve whether initial gage design or subsequent design changes are ok.
9. The design does not have to be approved at the 50% milestone but must be at the 100% completion.
10. The Adient SMTE/Program AQE/Plant Quality Manager/QE, along with the Gage Vendor should sign the final design.

4.12 continued – Gage Design

12. All gage details must be confined within the boundaries of the base, including details that move (toggle clamps, hinge drops, etc.) To minimize base size, if the unit does overhang the base in fully open position, provide a stop pin. Part load and unload consideration must be made with all open details.
13. When there are similar removable details used on the same gage, the details must have a unique locating scheme for each. Each detail and storage location must be clearly labeled or color-coded.
14. All feature controls on part drawing are required check features in gage design.
15. General notes feature control frames are not to be included as check features in the gage design unless identified as SC & CC.

4.13 Gage Build Requirements

4.14 - Bases

1. All fixture details including fixture bases, datums, and inspection details shall be manufactured using the recommended specifications. Any deviation shall be approved by Adient SMTE.

   It is the responsibility of the Gage Vendor to ensure that the base of a checking gage meet the flatness, parallelism, and the profile of a surface tolerances as specified below. The flatness/profile/parallelism is defined as the base surface as it sits in the horizontal position.

   Base Specifications

   Profile of surface variation within 300mm square ..... ± 0.05 mm
   Profile of surface variation over entire surface ..... ± 0.10 mm
   Parallelism between top and bottom surface ..... ± 0.10 mm
   Overall, Flatness..... ± 0.10 mm

   Note: All dimensions should be in metric.

2. All edges must be machined square and beveled.
3. The base must have the J-Corner identified.

4. All bases smaller than 200 in^2 require four (4) jig feet, one at each corner. Bases between 200 in^2 and 400 in^2 require five to six jig feet, one at each corner and one in the center of longest leg on each side. Bases larger than 400 in^2 a welded cast aluminum base is required.
4. All bases smaller than 400 in^2 cast aluminum plate with a thickness of 25mm up to 30mm shall be used.
5. For parts that require bases bigger than 400 in^2, a Wolverine or equivalent is required. Welded cast aluminum bases must be stressed relieved prior to machining.

4.14 Continued - Bases

All bases must be of uniform thickness. It is the Gage Vendor responsibility to inspect the base for uniformity before construction. If the gage is constructed and the base is found to be varying in thickness, the base will have to be replaced and reconstructed at the expense of the Gage Vendor.

a. A metal identification tag shall be affixed to each fixture with the following information at a minimum and updated as required:
b. Supplier Name, Address, and Phone Number
c. Supplier Job Number
d. Adient Gage Number (Tool #)
e. Gage Description
f. Part name(s)
g. Part number(s)
h. Engineering Rev level
i. Part CAD Rev level
j. Program Model Name and Model Year
k. Gage Vendor name
l. Property of Adient and/or Customer.
m. 3rd party source Name, Address, Phone Number and certification date.
n. If part checks multiple parts must note part numbers and names.

4.15 – Tooling Bushings/Tooling Balls

1. Three (3) Tooling balls or Tooling bushings must be located and identified with the start coordinates on the base of the gage. These features will be used to establish the origin of the fixture for certification and part layout.

4.16 – Tooling Bushings

1. The use of (3) tooling bushings shall be 12 mm diameter I.D. with a 40 mm diameter scribed circle around the bushing to be used as a known clean surface area alignment.
2. Each 40 mm diameter scribed circle shall have removable protective covers.
3. Covers must not interfere with the start coordinate labels.
4. Tooling bushings shall be recessed into the fixture base approximately 2mm from the fixture base surface.

4.17 – Tooling Balls

1. Tooling ball size will be 0.500 inches (12.7mm), tooling hole size will be a minimum of 10 millimeters.
2. Each Tooling ball must have a protective cover. The cover must not interfere with the start coordinate labels.
3. The design must reflect the CAD part coordinate of X, Y, Z system.
4. If the part is to be positioned in a different coordinate system than the CAD model (tool die draw or work line versus body position), the design must be labeled in a distinct manner with the appropriate rotation points and angles to reflect the original position.

4.18 – Stab Pins/Plug Gage/Feeler Pin/Flush Block

1. All pin(s) and block(s) used for part inspection (i.e. go/no-go pin, plug gage) must be labeled on the design with their respective size as well as the calculation(s) used to obtain that size.
2. All pin(s) and feeler(s) are to be color-coded. Check pin(s) and go/no go pins used for the same hole should be coded the same and stamped with the sizes. See color chart page 16.

4.19 – Gage and Check Fixture Color Chart

CHECK FIXTURE COLOR CODE CHART

STAB PIN / PLUG GAGE		
#	COLOR CODE	
1	Dark Blue	
2	Red	
3	Orange	
4	White	
5	Purple	
6	Pink	
7	Light Blue	
8	Brown	
9	Black	
10	Yellow	
11	Light Green	
12	Silver	
13	Gold	

FEELER PIN / FLUSH BLOCK		
#	COLOR CODE	
1	Yellow	
2	Green	
3	Red	
4	Light Blue	
5	Dark Blue	
6	Purple	
7	Pink	

4.20 – Risers and Stanchions

1. The risers and stanchions must be attached to the base securely with a minimum of two (2) dowels and two (2) cap screws unless specified in the design as a removable detail.
2. Risers and stanchions may be relieved or cut away in certain areas to gain access to the part for dimensional inspection. It is the Supplier's responsibility to ensure the area(s) that are removed do not affect the integrity or stability of the gage.

4.21 – Details

1. All details must be attached to the base securely with dowels (no blind dowels) and cap screws. It is the Gage Vendor's responsibility to ensure that the correct quantities of dowel and cap screws are used. If the quantity is substandard, the Gage Vendor must fix or replace the detail without costs to Adient.
2. All datums, inspection details, clamps, and interchangeable details shall be identified on the fixture in a visible location as shown on the design.
3. The use of shims or shim stock is not an acceptable practice for the construction of Adient checking gages and checking fixtures.
4. Details used as net surfaces must be made of hardened steel. Nets should be held in place by a minimum of (2) flat head screws if space allows. The heads of the screws must fall below the net surface. Steel plates located on aluminum details may be used.
5. Flush rails and sheet metal representations must be constructed of aluminum or fixture plank or 3D printed. Fixture plank or 3D printed must be sectioned into details no larger than 400 mm in length each.
6. A 6 mm gap distance is to be used for feeler rails unless otherwise specified or approved by the Adient SMTE. The feeler rails less than 100 mm shall be hardened steel at a Rockwell Hardness of 62-68. If over 100 mm is required they shall be hard anodized aluminum.
7. Each feeler rail must have an associated go/no go feeler pin that reflects the proper tolerance.

4.21 continued – Details

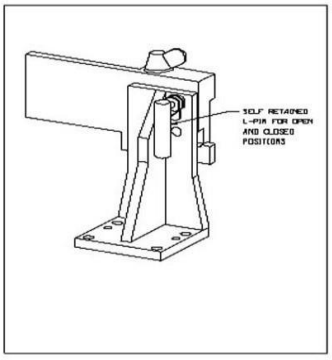
1. The Gage Vendor is supposed to warranty the gage for normal wear and tear for the life of the program.
2. All loose and interchangeable details such as hand knobs, plug gages, and check pins shall be permanently attached to the fixture using Car-Lane cable, plastic coil or retractable spring-loaded cases with cable lockouts depending on the quantity and location of attachments. Self-storing (restrained) devices or recoil type cables are preferred. Chains are not recommended.
3. All non-circular plug gages must be keyed for orientation.
4. When a single point datum target is required, it is suggested tooling ball or dowel can be used. The associated clamp must be adjusted to not over-constrain the part.

4.22 – Removable Details

1. All removable details must use hardened bushings and bullet nose or slide fit dowels. The bushings must be in the detail and the slide fit dowels must be in the mating component.

4.23 – Hinged Details

1. Hinge drop details must be counterbalanced and made of steel or a gas assist shock system as necessary to prevent a pinch point and have a lock out mechanism installed.
2. Hinge drop details must have rubber stops installed to prevent damage.
3. Any swing bracket having a SPC bushing mounted to it, must have a captive type of locator, or “T” handle pin, with bushings as a positive locator (captive pins are preferred). (Figure below).



4.24 – Locating Pins

a. Datum pins shall be Regardless of Feature Size (RFS) tapered spring loaded for 4-way and 2-way. The MMC pins must have Adient SMTE approval.
b. All tapered Regardless of Feature Size (RFS) pins must locate the part approximately at the midpoint of the taper.
c. All locating pins must be made of hardened steel.
d. For locating pin(s) that are locked out to load the part, the lockout mechanism must be positive.
e. The locating pin spring pressure must be strong enough to locate the part without distortion when clamped.
f. Spring loaded locating pins must move freely in all directions except the locating direction.

4.25 – Clamps

1. All clamps must have a clamp direction of 90° to the part surface. Additionally, clamp contact point shall be centered to the net block.
2. Adient preferred clamp is a Brauer.
3. Clamps that are spring loaded must have a positive lockout mechanism.
4. The clamp it must not interfere with the part or any other detail(s) on the gage.
5. The clamp pressure must be the minimum required to locate the part, but stronger than the opposing spring-loaded features. The clamp should not distort or damage the part in its clamped state.
6. All clamp feet must not damage or scratch the part.
   The use of rubber, neoprene or nylon is the best material for a clamp foot, but in case of metal parts steel or brass clamp ends are preferred.
   If metal clamp feet are required, they must be free of burrs and sharp edges and have a mar-proof coating for painted part(s).
7. The gage design shall be such that no detail overhangs the gage base when the detail is in any position.

4.26 – Scribe Lines and Tolerance Bands

1. All scribe lines and tolerance bands must be scribed or milled into the surface. Painted lines on the surface are not acceptable.
2. All scribe lines and tolerance bands must be identified with a distinct color to ensure good visibility for measurement. If a nominal line is included in the tolerance band, the nominal line must be contrasting color within the tolerance band.
3. The expectation for the scribe lines and tolerance bands shall insure that scribe is true and/or perpendicular to the surface.
4. As required by the Customer or Adient SMTE and/or Program AQE, gage bases may have bodylines scribed on them for gages designed in body position. It is recommended that the bodylines are scribed every 100 mm for smaller fixtures and 200 mm for larger fixtures.
   These bodylines must be labeled with the appropriate body coordinate and left hand (-) or right hand (+) signification.

4.27 - SPC Indicators

a. The SPC indicator type to be used on all gages supplied to Adient will be Mitutoyo series 543 or 575 or customer specific requirements. The specific indicator features (resolution, discrimination, travel, and sensitivity) will be dictated by each application.
b. Design shall also include clearance to utilize a wireless transducer for SPC measurements.
c. Master set blocks will be at a length of 55 mm. Any areas that cannot fit this standard, must be approved by Adient SMTE.
d. All indicators must be set up to zero out in the approximate center of its travel length. For instance, if an indicator has a 1-inch travel, the indicator must be zeroed out at .5 inch.
e. All data collection bushings are to be located 55 mm from the head of the bushing to the part. If it needs to be adjusted, it must be approved by Adient SMTE.
f. Bushing shall be a Carr-Lane head type P.F. bushing #H-40-12 x 9.52mm I.D. or equivalent.
g. Bushing I.D. must be 9.52mm + .0127 - .000 after assembly in fixture.
h. Any bushing used for data collection that had the head ground down must have a 0.75mm x 45-degree chamfer incorporated on the I.D. of the bushing to ensure that the SPC probe will seat properly.
i. All SPC bushings must be identified with a sequence number and the corresponding point ID from the part/GD&T CAD model.
j. The check direction of each indicator must be 90º to the surface it is measuring.

4.27 continued – SPC Indicators

1. The proper indicator tip must be used for each application. Examples are listed below:
   a. Ball point/spherical/conical tip – used to check a point on a compound surface or overall length indicating on a Micro slide.
   b. Flat tip – used to check a part edge that has a radius at the checkpoint.
   c. Knife blade (chisel) tip – used to check a part edge must be a flat blade.
2. If more than (1) type of tip/indicator is used on a fixture an error proofing method must be incorporated to ensure the wrong indicator cannot be used.
3. Indicator extensions should be used sparingly or only as the application dictates. Extensions must be kept to the shortest length possible to obtain an accurate measurement.
4. All indicator extensions and tips must be tightened without using Loctite or other chemical fasteners.
5. A feather-light indicator must be used if the inspection point on the part is flexible or touch sensitive.

4.28 Build Tolerances

1.0 Tolerances are established using the following gage certification datum scheme - the primary datum is the surface plane established by the tooling balls or tooling holes, the secondary datum is the longer line established by the tooling balls or tooling holes, and the tertiary datum is the shorter line established by a single tooling ball or surface target.
The check direction is defined as the direction(s) in which the part is to be held.
The non-check direction is defined as the direction(s) that the part is not to be held.
All tolerances are in millimeters unless otherwise noted.

Surfaces

Net Pads (datum surfaces) ± 0.05 mm

Net Pads (boundary location/non-working axis) …. ± 1.00

mm SPC Bushings (check direction)..... ± 0.05 mm

SPC Bushings (locations) ± .25 mm
SPC Bushings (perpendicular to surfaces) ± 1.0°degree

Feelers and Templates .....± 0.15 mm *

Flush Surfaces.....± 0.15 mm **

*Not to exceed .25 mm zone in 100 mm.
**Not to exceed .30 mm zone in 100 mm.

Unless otherwise specified, all templates are to be located perpendicular to surfaces within ± 1.0° degrees.

Holes

Locator Pins (locations)..... ± 0.05 mm
Locator Pins (size) ..... + 0.00 mm / -0.02 mm
Go Pins (size) ..... + 0.00 mm / - 0.002 mm
No – Go Pins (size) ..... + 0.00 mm / - 0.002 mm
Pin Check Bushings (location) ..... ± 0.10 mm
Pin Check Bushings (perpendicular to surfaces) …± 1.0°
Pin Check (size)..... + 0.00 mm / - 0.02 mm
Sight Check (location) ..... ± 0.20 mm
Sight Check (size) ..... ± 0.12 mm
Units or Sub-Bases (location)..... ± 0.05 mm

4.29 – Labeling

1. All labeling on the Checking Gages/Fixtures must be legible and descriptive. The labeling must be placed in such a manner that it is readable when the part is on the gage. Labels may be engraved, printed, or stamped. If tags are used, they must be permanently attached to the gage**.**
2. The following detail types must be labeled on the gage:
   d. All datums (net surfaces and locators)
   e. Clamp sequence
   f. Flush rail location and offset measurement
   g. Feeler rail location and offset measurement
   h. Go/No-go pin sizes
   i. Indicator port reference number
   j. Master set block offset measurement
   k. Body line references (appropriate customer references – XYZ or LWH)
   l. Specific measurement locations
3. Dimple pin handle and its corresponding storage position on the base of the check fixture.
4. Dimple and label corresponding bushing area on the check fixture and fill with paint to coordinate with Color Code Chart page 17.
5. Assign each hole (slot/feature) an alpha numeric value and stamp both pin handle and storage position with the number assigned to the hole. This should be coordinated with the Color Code Chart page 17.
6. Tooling balls or tooling bushings on the base must be clearly stamped with the appropriate coordinates. If there are more than three (3) tooling balls or tooling bushings on the base, the three (3) that are used to certify the gauge must be stamped with the appropriate coordinates. Coordinates will be assumed to be in body position, but if they are in work line or other, they must be clearly identified with the coordinate system used.
7. Each Checking Gage/Fixture must have a Supplier and Customer Identification tag permanently attached to it.

Continued 4.29 Labeling

GAGE VENDOR IDENTIFICATION TAG:

A. Supplier Name
B. Address
C. Phone number
D. Job Number

CUSTOMER IDENTIFICATION TAG

A metal or plastic identification tag shall be affixed to each Checking Gage/fixture with the following updated information at a minimum. The information shall be updated as required:

A. Gage/Fixture ID: i.e. # 1529
B. Part name(s).: i.e. Cushion Lower X Tube ASM
C. Engineering change level.
D. Product line, year, and usage: i.e. GMT 17x
E. Program Name: i.e. Cushion Lower X Tube ASM
F. Build source name: i.e. Gage Vendor
G. "Property of OEM Customer." If applicable. i.e. GM

If the Checking Gage / Checking fixture is utilized to inspect additional parts or assemblies, a separate tag containing the drawing numbers, engineering levels, and dates may be required.

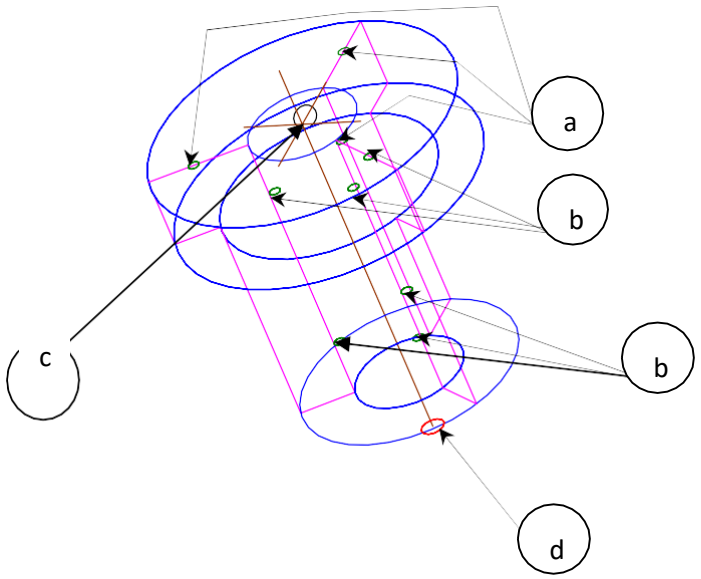
4.30 – Corrosion Protection

a. All steel or stainless-steel components shall be protected by black oxide coating.
b. All non-mating surfaces must be painted with the customer-required color. If a color is not specified, safety blue is to be used.

4.31 – Gage Certification

1. All Checking Gages must be certified. The Certifying Laboratory must be ISO/IEC 17025 accredited. The accreditation certificate must be the current level and valid (Check the Expiring date). It is the responsibility of Adient Checking Gage Vendor to ensure that accredited laboratory is used to certify the Checking Gage and their certificate is not expired.
2. A Third-Party Certification is required on all gages that are manufactured by a Gage Vendor whose certification department IS NOT accredited to a nationally recognized laboratory or inspection standard (i.e. ISO/IEC Guide 17025:2005). This accreditation must be performed by a duly recognized accreditation body (American Association for Laboratory Accreditation – A2LA or equivalent).
3. The accuracy of the Checking Gage / Fixture must be verified using a certified CMM (traceable to a national standard). Step blocks or thickness feelers may be certified with traceable handheld equipment such as Micrometers and Vernier Calipers. Purchased inspection details and devices (gage pins, scales, protractors, and indicators) may be certified by including the certification report from the manufacturer.
4. The certification must include (at a minimum) the following: datums, and functional gage features such as data collection devices, feeler checks, flush checks, nets, gage pins, pin locations, mating part representations, construction balls, etc. The certification must also include to multiple locating schemes (e.g., with / without fasteners).
5. The number of certification masters developed for each detail is dependent on the size and complexity of the detail. It is the Gage Vendor's responsibility to develop enough points to demonstrate that the gage is dimensionally correct. As an example, on a typical 25 mm x 25 mm net block, it is recommended that a minimum of five (5) masters be used. There must be enough masters to evaluate any single or combination of elements of size, location, orientation, and profile.
6. The construction source shall develop an easily comprehensible X Y Z and vector type CMM certification report. The check sheet should be sufficiently documented to easily relate the check points back to the part drawing.
7. All gage certifications must include a “road map” of the certification points.
8. If during shipping it is suspected there could be damage a new certification is required.

9. Certifying the Location of SPC Bushings:
    a. All SPC bushings will be certified using a coordinate measuring machine (CMM).
    b. The CMM operator will create a plane, using three (3) points that portray a true representation of the surface, off the top ground surface of the SPC bushing (see figure below).
    c. The CMM operator will create a cylinder using six (6) points that portray a true representation of the surface approximately 5mm from the top and bottom of the bushing, inside of the cylinder of the SPC bushing.
    d. The CMM operator will construct a point that will fall on the plane constructed by using the top ground surface described in Step A (page 28) and on the center of the cylinder described in Step B (page 28) and check for perpendicularity and location.
    e. The CMM operator will construct and project the point down the vector of the cylinder located 55mm away from the point described in Step C (page 28), to the target point normal to the surface of the plane described in step 1, in the direction of the intended part surface on the gage. Check for perpendicularity and location.



10. The following results must be reported:
    a. The X, Y, Z, and perpendicularity of the point in Step C (page 27) (actual & nominal).
    b. The X, Y, Z, and perpendicularity of the point in Step D (page 27) (actual & nominal).
    c. Acceptable tolerance for the non-check direction are as follows:

X = ± 0.15mm
Y = ± 0.15mm
Z = ± 0.15mm

Any deviation from this procedure requires the written approval of the assigned SMTE to satisfy gage certification requirements.

4.32 - Gage Instruction

1. All Checking Gages must have the Instructions attached to the gage. An electronic copy must be supplied to the Program Advance Quality Engineer and Plant Quality Engineer.
2. The gage instructions must be detailed and understandable. The Checking Gage must be clearly labeled to reflect the reference(s) of the instructions. The instruction should help an inspector / operator to load, clamp, inspect and unload the part. The instructions must include all part configurations. They must include a picture of the gage with the appropriate references identified (locators, net surfaces, check points, etc.).
3. Gauge instruction templates are required for each check fixture and should follow this order:
    a. Additional Operator Instruction sheets shall be used to capture information regarding removable details, location of L-pin placements, etc.
    b. The Operator Instruction Sheets shall be plastic laminated and attached to the Gage and Check fixture base.
    c. The Operator Instruction Sheets shall have the correct clamping sequence as determined by an acceptable Type 1 Gage R and/or GR&R Type 2 study.
    d. All SPC measurement points shall be numbered and shown in the Operator Instruction Sheets.

4.33 – Gage Evaluation

1. A function check must be performed prior to delivery of the Checking Gage / Checking Fixture using sample part provided by Adient Representative. The Gage Vendor may utilize their own completion checklist, but they must complete the Adient Checking Gauge Completion Check sheet before buy-off. The functional check of the gauges must consist of the following steps as a minimum requirement.
    - Evaluate the gage against the gage design.
    - Functional check of all components on the gage.
    - Using the gage instructions to load the part on the gage.
    - Type 1 Gage R study
    - Identify and remove all interferences
    - Document the results.
    - Correct any discrepancies.

4.34 - Shipping and Transportation

1. All Checking Gages/Fixtures must be completely protected from the environment when being shipped.
2. All Checking Gages / Fixtures must be secured to avoid damage when shipping.
3. Adient receiving location will not accept the Checking Gage/Fixture if it is delivered with damage or defect.

4.35 – Preventative Maintenance Instructions

All Checking Gages/Fixtures must have Preventive Maintenance instructions supplied electronically to the Program Advance Quality Engineer and Plant Quality Engineer prior to delivery.

1. The Preventive Maintenance instructions must be detailed and understandable with references to the gage clearly labeled. They must identify the maintenance instructions, recommended frequency of maintenance, recommended chemicals/solutions to use for maintenance and long-term storage preparation instructions.
    - NOTE: If the chemicals/solutions cannot be purchased “over the counter”, then a hardcopy of the MSDS sheet must be included with the gage upon delivery.

4.36 – Documentation

1. The Gage Vendor is responsible to provide timing for each Checking Gage / Fixture from initial kickoff and review with Adient SMTE and Program Advance Quality Engineer throughout the project on a set periodic basis. Delays in program timing must be reported immediately and update the gage project timeline.
2. Gage Vendor is responsible to provide two (2) electronic copies of the latest documents each time the gage is modified. One copy will be attached to the Checking Gage / Fixture and the other will be delivered to the SMTE and Program Advance Quality Engineer.
3. The approved (signed) design is the property of Adient and will be stored at the Gage Vendor location while a copy shall be delivered to Adient SMTE or Program Advance Quality Engineer. Electronic copy and hard copy as required by the Adient SMTE or Program Advance Quality Engineer must be supplied with the Checking Gauge / Fixture each time the design is updated.
    q. Native CAD model
    r. Checking Gauge / Fixture Design
    s. Checking Gauge / Fixture Certification
    t. Measurement Device Certification (device used to certify fixture)
    u. Checking Gauge / Fixture R&R and/or Gauge R or Attribute study or studies
    v. Checking Gauge / Fixture Instructions
    w. Checking Gauge / Fixture Preventive Maintenance Instructions
    x. Digital picture of the Checking Gauge / Fixture
    y. Any other pertinent documents as required Final Checking Gauge / Fixture timeline - OPTIONAL
    z. Final Gage / Fixture Check Sheet
4. Adient will supply all CAD models in its native format (CATIA, UNIGRAPHICS, etc.). Every effort will be made to minimize the file size while ensuring all the critical data is supplied.
5. All documents that require signed approval will be in original hard copy format and kept at the Gage Vendor.

4.37 – Gage and Check Fixture Approval Record

1. For final approval of a Checking Fixture, by the program/business unit team and plant quality engineer, a signed check fixture buyoff approval will be provided by the Adient SMTE and Program Advance Quality Engineer prior to check fixture/gage shipping.

5.0 Records/Logs

10.1 An archival version of documentation(s) is stored by respective team.

10.2 Retention: Records must be retained in accordance with Control of Documents, Data and Record Procedures and Record Retention Schedule Standard.

6.0 References

Gage Program Tracker Form (SMAM-PLUS-FR-04-01-E)

Gage Work Instructions (Vendor Created/Local Plant formatted)

Record Retention Schedule Standard (AE-LOS-ST-39)

Control of Documents, Data, and Record procedure (AE-LOS-PR-13)

Gage / Fixture- Acceptance, Maintenance & OK to Ship (SMAM-PLUS-FR-03-01)

Phase 2- Design & Development Procedure (AE-PLUS-PR-02)