

Vesuvio 081.
Data Sheet.
Checking Fixture for Automotive Industry.

October 14, 2017



Contents

1	Abstract	2
2	Introduction.	2
3	Scope	3
4	Purpose	3
5	Project Development	4
6	Conclusion	4

1 Abstract

The concept design of checking fixtures for Automotive Industry parts is a highly complex process that requires a technical design and a careful engineering process. By exploiting recent advances in optics and electronic techniques, that provide a non destructive measurement. In this Data Sheet, a go/no go method to measure critical points on a Chevy C1 grille is proposed. This method attempts to ensure that each critical point meets regulations using datums and an infrared sensor.

2 Introduction.

For a process of manufacturing quality components it is often necessary to keep a close vigilance on the dimensions and tolerance compliance of output parts. Thus, there is a need for an efficient inspection system which could constantly monitor the manufacturing process and provide corrective feedback useful in maintaining the process parameters within acceptable limits. An important element of such a system is its ability to characterize the geometric variations in the parts, from their detected dimensional errors using a measuring device called Checking Fixture.[1]

Checking fixture is one name of inspection tooling. It is a scale to measure complicated shape parts. It is an order made item. To be used as a correct scale, three important characteristics are required in construction of its specific area is pre-decided.

1. Shape of scale to be correct
2. Shape of scale must not change
3. Positioning between scale and checking item must not change.

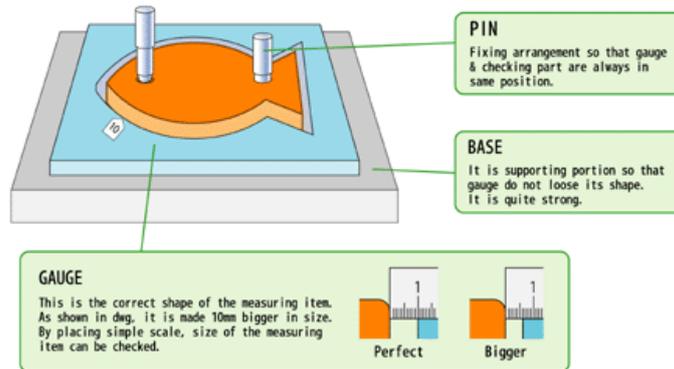


Figure 1: Checking Fixture Example [2]

Usage is explained with image. Fish toy is placed on the gauge and fixed with 2 pins to align position of gauge and fish toy. Next, fish toy is measured using gauge. To accommodate even a bigger size fish toy, gauge is being made bigger with constant dimension. To measure, gap is measured between fish toy and gauge.[2]

The piece to measure is a Chevy grille C1 launched in 1994 within the Opel Corsa B, in Mexico with the name of Chevy Swing or Joy with 5 and 3 doors respectively, years later in 2004 the car was renewed to Chevy C2 making Swing known as C1.(The piece can be observed in the following figure).



Figure 2: Chevy C1 Grille

Originally the front grille of an average car had a function, to allow cool air through the radiator to assist in cooling the

engine down. But after time, the grille became a key feature to the design of the car in question. [3]

Modern vehicles are more likely to have a front grille made out of plastic, sometimes integrated to the front bumper and other times a separate unit. Often chrome frames and features are added, but much lighter than those of older cars. The grille can also form part of the crumple zone playing a part in safety test for head on accidents [3]. Different shaped grilles can optimize this experience, but in general any styling cues beyond that are tailored to good looks and style.

A typical measuring device uses destructive methods of evaluation, usually with the so-called dial indicator (Figure 3). Which, when having contact with the surface to be measured, damages it in small portions in each measurement. In the measuring device used was chosen to make a non-destructive measurement that is a wide group of analysis techniques used in science and technology industry to evaluate the properties of a material, component or system without causing damage. NDT methods rely upon use of electromagnetic radiation, sound and other signal conversions to examine a wide variety of articles for integrity, composition, or condition with no alteration of the article undergoing examination. The NDT method used is a infrared sensor, that works by using a specific light sensor to detect a select light wavelength



Figure 3: Dial Indicator

in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold. [4]

The IR sensor used is ... (cosas del sensor)

Using the NDT method of the IR sensor and the Datums, to measure the critical points of a Chevy C1 Grille we present the Checking Fixture "Nombre de Aparato"

3 Scope

Includes all suppliers of prototype and production of checking fixture to all GM subsidiaries and divisions.

4 Purpose

The standars are intended as a guiede for the construction of cheacking fixtures for GM Fixture Standards for Suppliers of Production Material.

Cheacking Fixtures must:

- Have readily accessible features which allow dimensional data to be obtained and provide conformance to design and manufacturing requirements.
- Provide consistent and accurate locating points to achieve maximum repeatability and reproducibility
- Be accurately and economically constructed while exhibiting sufficient durability and stability for intended use.

The fixture manufacturer is responsible for verifying and certifying that the checking fixture is constructed within tolerances unless otherwise specified.

5 Project Development

The development was done in the next way:

- The first thing that was done was analyse the functionality of the piece on a real car, parallel to the 3D design of the piece
- After the critical points were found it began the design of a system of go/no-go detection in 3D for the points and a sensor that could detect variations of 0.1 mm in distance. Infrared sensor QRD1114 was chosen on account of affordability and size.

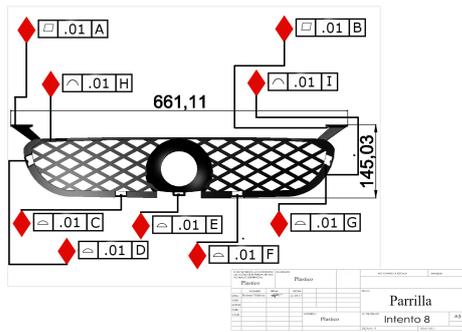


Figure 4: Piece with Datums



Figure 5: Vecuvio

- The sensor has a continuum measure that is linear from 0mm to 20mm distance of separation converting the distance to a voltage. However the variation in voltage is small for very small variations in distance.
- To correct this problem the signal from the sensor is stripped from it's mayor components to leave only the small variations wich where amplified so the controller could read them.
- Next thing to do was to control the motors that would move the sensors so that the two of them could move at the same time.
- The go/no-go system was printed in 3D and assembled with the electronic components.

6 Conclusion

This checking fixture is an innovative proposal with the mayor benefit of being cheaper than the dial indicators commonly use in practice. Another advantage our system presents is the sensors can be used indefinitely if the measurements are done within the designed parameters of the dispositive

References

- 1 : Wang, Y.andNagarkar, S.(1999).LocatorandSensorPlacementforAutomatedCoordinateCheckingFixtures.[ebook]Maryland DepartmentofMechanicalEngineering, UniversityofMaryland.Availableat : <https://manufacturingscience.asmedigitalcollection.asme.org/manufacturingscience/article-pdf/35/3/351/1351611>
- 2 : Greenfix.co.jp.MeaningofcheckingfixtureGREENFIX.[online]Availableat : <http://www.greenfix.co.jp/eng/gauge/gauge.html>
- 3 : Scrap-car.co.uk.(2017).WhatCarGrillesAreAllAbout.[online]Availableat : <http://www.scrap-car.co.uk/opinion/what-grille-about/>[Accessed7Oct.2017].
- 4 : Education.rec.ri.cmu.edu.(2017).IRSensor|WhatisanIRSensor?.[online]Availableat : http://education.rec.ri.cmu.edu/content/electronics/boe/ir_sensor/1.html[Accessed7Oct.2017].