RCAR TECHNICAL CRITERIA FOR THE CERTIFICATION OF BODY REPLACEMENT PARTS

October 2013

CONTENTS

1 INTRODUCTION

The sector responsible for the manufacture and distribution of replacement parts for vehicles must adapt to the demands of the market, providing quality products to users.

One of the means used by society to disseminate and demonstrate the quality of products is through certification. This activity serves to demonstrate and ensure that products sold in the market comply with the requirements from a rule or regulation standpoint.

The parts industry through certification can demonstrate the quality of their products, thus ensuring the quality of parts and components used in vehicle repairs. In addition, certification can be considered as a distinctive aspect in their goal to better identify products within the broad market options available to the user.

Another objective of the certification of replacement parts is to indirectly raise the standard of the automotive parts industry, improving products and services.

RCAR, aware of the importance to the insurance sector of the field of automotive parts, decided to set up the Aftermarket Parts Working Group, which has prepared this manual of technical criteria for certification of body replacement parts, to achieve the following objectives:

- To stimulate the parts industry to achieve desired quality levels through standards;
- To encourage improvements in the quality systems in industry;
- To protect consumers by certifying that parts reach certain levels of quality

2 OBJECTIVE

The purpose of this document is to define the aspects or qualities to be checked regarding replacement parts, as well as to develop procedures to perform this verification, and the technical requirements to be met by parts to obtain the right to use the mark "certified part " issued by certification bodies who adopt this manual.

The certification is for the part and the company applying for certification, subject to various checks conducted by the certification authority. These checks include:

a) Product testing;
b) Assessment of the production process and quality control production facility;
c) Monitoring of the level of product quality and conformity with production through periodic tests performed on samples taken at the production site and market.

3 SCOPE

This manual of technical criteria is applicable to those new replacement parts characterised by passive behaviour in the movement of motor vehicles and lack of core structural responsibility throughout the body.

Excluded from the scope of this manual are those parts that are produced with design and construction differences to the corresponding original part, as provided by the vehicle manufacturer.

4 DOCUMENTATION

The documents taken as a reference are the test methods and / or international standards ASTM, DIN, EN and ISO, used to determine characteristics or qualities of parts and components.

The names of the documents taken as reference are indicated in the description of the test methods listed in Annex B.

5 DEFINITIONS

Accreditation: Procedure by which an authoritative body gives formal recognition to an organization or person on their competence to carry out specific tasks.

Aftermarket Part: Part produced by an independent manufacturer to replace an original part which has been damaged.

Analyse: Action to examine or study the properties or characteristics of something (product, management systems, etc.).

Applicant for a certification company: Company manufacturer or marketer seeking certification of a part.

Aspect or attribute: The general characteristic that distinguishes a product.

Certifying entity / Certification authority: Company that verifies compliance with the requirements under a rule; for example, this manual of criteria.

Check: Check or examine that a condition is met.

Claim: Complaint or disagreement on the quality of a product which is issued by a user.

Competent Authority: A business accredited by another to provide Quality Management Systems Certification.

Commercialising company: The name given to a company that sells parts manufactured for others.

Compliance or Approval: Compliance with the requirements specified in a standard.

Essay: Experimental test involving submission of a sample to determine its properties. The test can be destructive or non-destructive; the difference being whether or not destruction or deterioration of the material occurs during the course of the test.

Functionality of a part: Aspect or feature that refers to the role assigned to the piece as an integral component of the vehicle.

Inspection: Examining a sample to recognise the quality it has, noting if it contains any defect or error.

Laboratory: Body accredited or validated to perform certification tests on body replacement parts.

Monitoring certification: The set of actions to check and ensure compliance with quality specifications of a company and its certified product over the term of certification.

Nonconforming product: Parts or components that do not meet certification requirements.

Obtaining or granting certification: Recognition documentation that a part meets the minimum specifications required by a standard.

Original Part: Part supplied by the manufacturer of the vehicle intended to replace another piece similarly supplied.

Part Manufacturer: The name given to the company manufacturer of replacement parts.

Passive behaviour: The manner or way of behaving of a product, so that it has no cause or effect on anything.

Passive part: Part which demonstrates passive behaviour in the displacement of motor vehicles, i.e. does not involve causing or producing an effect in their displacement.

Penalty: Burdensome action taken by the certification entity against a company that owns the certification of a part.

Product certification: Action taken by an entity in the form of a statement that a duly identified product displays adequate compliance with specific rules.

Quality: Property or set of properties of a product or service involving the ability to satisfy predetermined express or implied conditions, which allows for the evaluation of its value.

Quality Assurance: A set of planned and systematic actions to obtain adequate confidence in the quality of a particular product or entity.

Quality Management Systems: The entire structure, responsibilities, activities, resources, and procedures of the organisation of a company, designed to carry out its quality management.

Rate: Recognise or estimate the degree of utility or fitness of a product.

Reference value: Value obtained from a test result that is taken as the minimum quality requirement to fulfil.

Requirement or condition: Circumstances or conditions required by a standard.

Standard: Rule to be followed in adjusting activities or products.

Structural responsibility part: A part that has to withstand the mechanical and dynamic efforts of the vehicle.

Technical criteria: Aspect or attribute involved in verifying the product or manufacturing process in order to assess its quality.

Test method: Working procedure which describes the operations to be taken for a test.

Vehicle manufacturer: The name given to the company that designs and manufactures the entire vehicle and replacement parts for it.

Vehicle origin: Vehicle make, model and style for which a replacement part is targeted. This vehicle is used as a template for the test of adaptability of the part.

6 QUALITY SYSTEM REQUIREMENTS

Each applicant for certification of a replacement part must have implemented a system of quality management -- ISO 9000 family or equivalent -- whose model ensures the quality of their production, installation, and service, and is certified by a competent authority.

The organization, facilities, manufacturing process, and customer service of the company manufacturing the part to certify, will be verified by conducting a conformity of production audit to assess the system of quality management and production control implemented in the company. This audit will be repeated on an annual basis.

This audit will review and confirm the compliance with the requirements laid down in the ISO 9000 family or equivalent, as well as inspect those aspects that are considered influential to product quality and performance.

The certification authority shall prepare a report which will indicate the requirements and aspects verified during the audit, the final assessment obtained by the system of quality management -- "fit or approval" or "failed" -- and the description of non-conformities detected, if any.

The audit will be carried out by competent staff accredited by the certification authority, adopting this manual and criteria for the certification of replacement parts.

7 TECHNICAL CRITERIA

The technical criteria are those aspects or attributes to check in a replacement part to certify its quality. There are two types: general, relating to the performance characteristics of parts, and individual,that are specific to certain parts and their functionality.

To evaluate these aspects, the parts to certify are subject to a series of trials and tests that provide information about the qualities needed to be analysed. These aspects will be verified in both the replacement parts to be certified as well as the original parts they replace, subjecting both to the tests listed in Annex A "Tests and inspections for the certification of body parts."

The tests will be carried out following the method described in Annex B "Test Methods."

The tests will be carried out by laboratory testing of the certification entity, or failing that, by a laboratory external to it, satisfying in both cases the requirement of having tests accredited by ISO / IEC 17025.

7.1 TECHNICAL CRITERIA FOR METAL PARTS

Technical criteria for metal parts will be applied to replacement parts manufactured with metallic materials.

Metal replacement parts are subject to a set of essays collected in Annex A "Table A1: Tests and inspections for metal replacement parts", through which the testing process examines and comments on the aspects described in paragraphs 7.1.1. to 7.1.6.

7.1.1. Material

The performance of a replacement part depends directly on the material with which it is made.

The manufacturer of the replacement part to certify will provide to the certification entity a report or certificate of the material used in the manufacture of the part, indicating the type of material and its technical characteristics.

To assess the quality and mechanical properties of the material, it will be analysed according to the information contained in the report of the material, and it will also be verified by testing the following aspects:

7.1.1.1 Steel Quality:

Will be assessed on the following properties:

- *Mechanical characteristics*: The mechanical behaviour of materials will be analysed through the value obtained as the yield strength of 0.2 (R p0, 2), that is, the tension at which the material has a plastic strain of 0.2%. This value is obtained by subjecting the material to a tensile strength test.

- *Deep drawability*: The ability of the material to allow deformation without actually breaking will be analysed by subjecting the material to a drawing test. This test provides the ability to evaluate the deformation and the reparability of the material against the potential damage caused to the part.

- *Chemical composition*: The content of certain elements in steel such as carbon, sulphur, phosphorus, manganese, titanium, or niobium, will be analysed, in terms of their existence and the percentage present, which will yield quality information on the steel used and its classification. This information is obtained by subjecting the material to tests of chemical analysis, and will be used as a complement to the other available information about manufacturing materials.

7.1.1.2 Thickness and mass of the part:

Both properties are linked, and influence the mechanical performance of the part, as well as some factors related to the vehicle as a whole, such as fuel consumption and emissions into the atmosphere.

Both characteristics will be measured by determining the test wall (thickness) and the mass of the part.

7.1.2. Part

The size, shape and appearance of the replacement part to certify must be such that it will fit the vehicle which it was intended to fit.

When the replacement part is mounted on the vehicle, the set piece-body image should retain the original design of the vehicle.

To verify these aspects, the following characteristics will be assessed:

7.1.2.1. Appearance

By visual inspection of the part, it will be verified that the shape and overall dimensions are similar to the original one, as well as the final finishing of that particular part.

The part shall be tested by visual inspection which assesses the following characteristics:

- *Identification*: Verify identification data added to the part. These data allow us to know the vehicle for which it is intended, and access product traceability in its manufacturing process.

- *Geometry and shape:* It will be verified that the shape of the replacement part to certify is similar to the original one.

- *Finishing the part:* The level of finish achieved in the part will be checked by verifying the existence of imperfections (burrs, deformations, cracks, marks, etc.) adversely affecting its valuation.

- *Coatings*: We will check the level of finish involving coatings applied to parts to verify the existence of imperfections (colour, blisters, sags, etc.) adversely affecting its assessment.

7.1.2.2. Adaptability

There will be part assembly to the vehicle (make, model, and version), through processes stipulated by the vehicle manufacturer, to verify that the end result is aesthetically appropriate, preserving the original image of the vehicle.

The test to be performed is adaptability, which will be measured according to the following aspects or features:

- *Replacement Time*: This will be obtained by measuring the time required for mounting the replacement part by following the appropriate I.L.O. recommendations.

- *Working process*: This will ensure that the installation was carried out as instructed by the manufacturer of the vehicle in its Manual, both in relation to the work process as well as to the tools used.

- *Positioning of the piece*: This will verify that the position occupied by the part on the vehicle with respect to the adjacent parts is appropriate, maintaining the separation distances between parts, and preserving the image and outside line of the vehicle.

- *Mounting accessories*: This will verify that the accessories attached to the part have the correct adaptability.

7.1.3. Covering

Control of the organic coating will be measured by evaluating and comparing properties such as protection systems and corrosion resistance, enabling certification of the replacement part.

The properties to check are:

7.1.3.1. Thickness of the organic coating layer

This will be verified by measuring via the test for determining film thickness.

7.1.3.2. Adhesion of the organic coating

This will be used to evaluate the adhesion of the organic coating on the substrate on which it is applied, by subjecting the coating to a cutting lattice test.

7.1.3.3. Hardness of organic coating layer

This will be measured by analysing the resistance to penetration offered by the coating through an indentation test.

7.1.3.4. Resistance to cracking and / or detachment of the organic coating layer

This will analyse the level of resistance to cracking and / or evolution of the organic coating layer, by subjecting the replacement part to a drawing test.

7.1.3.5. Corrosion resistance of coating layer to salt spray

This will analyse the corrosion resistance of the replacement part when exposed to the effects of salt spray atmosphere for a certain time, by subjecting the piece to corrosion tests in artificial atmospheres.

7.1.4. Bonding systems

The replacement part may consist of several pieces connected through various systems such as welding, adhesives, crimping, clipping, or otherwise.

When this occurs, we will verify the effectiveness of the various bonding systems by submitting each relevant union to its corresponding test (union test by adhesive, by crimping, by clipping, etc.). The aspects to check are:

7.1.4.1. Appearance of the union

This will involve checking how the union looks visually, based on the connection system used (spot welds, adhesive, crimping, etc.), and confirming that there are no defects or imperfections in the union.

7.1.4.2. Location and size

This will confirm by visual check or by measuring instruments (calipers, meters) that the location and/or position, and the size and/or dimension of the bonding system is right for the pieces to fit together.

7.1.4.3. Resistance or quality of the joint

Where appropriate, the part will be subjected to a mechanical test to verify the effectiveness of the union. This is the case for the following types of union:

- spot welds which shall be checked for bond strength points by means of a tensile test involving peeling.
- in the case of hoods, the unions will be checked according to the instructions in Section 7.1.6.

7.1.5. Substructures

When the replacement part incorporates some internal substructure or reinforcement, to consider the functionality of that element, it will be necessary to verify the following:

- The quality of the manufacturing material
- The thickness and mass of the substructure

These aspects will be verified by following the instructions in Section 7.1.1.

7.1.6. Specific technical criteria: Hood

To verify the effectiveness of systems of union between parts or substructures that make up the hood, and fastening systems to the vehicle hood, a mechanical behaviour trial will be used.

7.2. TECHNICAL CRITERIA FOR PLASTIC PARTS

Technical criteria for plastic parts apply to replacement parts manufactured with plastic materials.

Plastic replacement parts will be subject to a set of essays collected in Annex A "Table A2: Tests and inspections for plastic replacement parts", which examine and consider the aspects described in paragraphs 7.2.1. to 7.2.6.

7.2.1. Material

The performance of a replacement part depends directly on the material with which it is made.

The manufacturer of the replacement part to certify will provide to the certification entity a report or certificate of the material used in the manufacture of the part, indicating the type of material and technical characteristics.

To assess the quality and mechanical properties of the material, it will be analysed according to the information contained in the report of the material and it will also be verified by testing the following aspects:

7.2.1.1. Quality of plastic

Will be assessed from the following properties:

- *Resistance to accelerated aging:* If the part has no decorative or protective coating, its resistance to accelerated aging will be analysed by subjecting the part to a test for resistance to colour change.

- *Heat resistance:* This will analyse the behaviour of the plastic from the effects of high temperatures by subjecting the material to a heat resistance test.

- *Impact resistance at low temperatures:* This will analyse the impact resistance presented by the plastic in a low temperature environment by subjecting the test material to a test for impact resistance.

- *Resistance to fuels:* This will analyse the behaviour of the plastic in cases involving different types of fuel spills on the surface of the part, to determine its ability to withstand the test fuel.

7.2.1.2. Thickness and mass of the part

Both properties are linked, and influence the mechanical performance of the part, as well as some factors related to the vehicle as a whole, such as fuel consumption and emissions into the atmosphere.

Both characteristics will be measured by determining the test wall (thickness) and the mass of the part.

7.2.2. Part

The size, shape and appearance of the replacement part to certify must be such that it will fit the vehicle which it was intended to fit.

When the replacement part is mounted on the vehicle, the set-piece body image should retain the original design of the vehicle.

To verify these aspects, the following characteristics will be assessed:

7.2.2.1. Appearance

By visual inspection of the part, it will be verified that the shape and overall dimensions are similar to the original one, as well as the final finishing of that particular part.

The part shall be tested by visual inspection which assesses the following characteristics:

- *Identification*: Verify identification data added to the part. These data allow us to know the vehicle for which it is intended, and access product traceability in its manufacturing process.

- *Geometry and shape*: It will be verified that the shape of the replacement part to certify is similar to the original one.

- *Finishing the part*: The level of finish achieved in the part will be checked by verifying the existence of imperfections (burrs, deformations, cracks, marks, etc.) adversely affecting its valuation.

- *Coatings*: We will check the level of finish involving coatings applied to parts to verify the existence of imperfections (colour, blisters, sags, etc.) adversely affecting its assessment.

7.2.2.2. Adaptability

There will be part assembly to the vehicle (make, model and version), through processes stipulated by the vehicle manufacturer, to verify that the end result is aesthetically appropriate, preserving the original image of the vehicle.

The test to be performed is adaptability, which will be measured according to the following aspects or features:

- *Replacement Time*: This will be obtained by measuring the time required for mounting the replacement part by following the appropriate I.L.O. recommendations.

- *Working process*: This will ensure that the installation was carried out as instructed by the manufacturer of the vehicle in its Manual, both in relation to the work process as well as to the tools used.

- *Positioning of the piece*: This will verify that the position occupied by the part on the vehicle with respect to the adjacent parts is appropriate, maintaining the separation distances between parts, and preserving the image and outside line of the vehicle.

- *Mounting accessories*: This will verify that the accessories attached to the piece have the correct adaptability.

7.2.3. Covering

A test for the quality of the decorative metallic coating (chrome, brass, nickel) or non-decorative coating (primer) used in full or in part in the replacement part will involve certifying and verifying the following aspects:

7.2.3.1. Decorative metal coating

- *Resistance of the coating layer to high pressure wash:* There will be an assessment of the adhesion of the coating to the substrate on which it is applied, by testing the resistance of the coating to the projection of high-pressure water washing.

- *Corrosion resistance in a salt spray chamber of the acetic cupro-layer coating:* A test for the corrosion resistance of the coating will be performed by exposing it to the effects of an atmosphere of cupro-acetic salt fog in a spray chamber for a specified period of time. .

7.2.3.2. Non-decorative coating

- *Adhesion of the coating layer:* There will be an assessment of the adherence of the coating on the substrate on which it is applied, by subjecting the coating to a cutting lattice test.

- *Resistance of the coating layer to high pressure wash:* There will be an assessment of the adhesion of the coating to the substrate on which it is applied, by testing the resistance of the coating to the projection of high-pressure water washing.

- *Resistance of the coating layer to solvents*: The behaviour of the coating layer when exposed to the effects of most common solvents found in the environment of the workshop will be checked by subjecting the coating to a test of resistance to solvents.

7.2.4. Bonding systems

The replacement part may consist of several pieces connected through various systems such as welding, adhesives, crimping, clipping, or otherwise.

When this occurs, we will verify the effectiveness of the various bonding systems by submitting each relevant union to its corresponding test (union test by adhesive, by crimping, by clipping, etc.). The aspects to check are:

7.2.4.1. Appearance of the union

This involves checking how the union looks visually, based on the connection system used (spot welds, adhesive, crimping, etc.), and that there are no defects or imperfections in the union.

7.2.4.2. Location and size

This confirms by visual check or by measuring instruments (callipers, meters) that the location and/or position, and the size and/or dimension of the bonding system is right for the pieces to fit together.

7.2.4.3. Resistance or quality of the joint

Where appropriate, the piece will be subjected to a mechanical test to verify the effectiveness of the union.

7.2.5. Substructures

When the replacement part incorporates some internal substructure or reinforcement, to consider the functionality of that element, it will be necessary to verify the following:

- The quality of the manufacturing material
- The thickness and mass of the substructure

These aspects will be verified by following the instructions in Section 7.2.1.

7.2.6. Specific technical criteria: Bumper

The bumper is the part whose main function is to absorb the energy produced in a vehicular collision to prevent or reduce damage to the vehicle. To test this functionality, the bumper will be subjected to a test of mechanical behaviour.

8. REFERENCE VALUES

A body replacement part will obtain certification if the values or results obtained in each of the tests set forth in this manual are within the range between minimum and maximum values set out by the certification entity, according to the specific requirements of each market. These values will be available to the AMPWG for revision and analysis as necessary.

9. CERTIFICATION TRACKING

The certification entity will monitor the quality of certified parts and their manufacturing process, in order to verify continued compliance with the requirements set forth in this manual.

10. NON-CONFORMING PRODUCTS, CLAIMS, AND PENALTIES

The certification of a part requires the manufacturer to implement and maintain a system of control of incidents. This system shall provide for the identification, treatment, and resolution of incidents, including a record of all complaints and corrective actions relating to that part.

Furthermore, certification involves the establishment of a communication process between the manufacturer of the part and the certification entity, in order to share information about incidents that may affect the assurance of the quality requirements required for the part. Likewise, the manufacturer shall notify the certifying entity of any third-party claims pertaining to the use of the product license.

In case of detection of non-conformities or irregularities relating to certification, the certifying entity may initiate a penalizing procedure, including provisional or permanent suspension of certification, and may require new assessments of the replacement part and/or its quality system.

11. ANNEXES

ANNEX A: TEST AND INSPECTIONS FOR THE CERTIFICATION OF BODY PARTS

- Table A1: Tests and inspections for metal replacement parts.
- Table A2: Tests and inspections for plastic replacement parts.

ANNEX B: TESTS METHODS

ANNEX A:

Test and inspections for the certification of body parts

TABLA A1: TESTS AND INSPECTIONS FOR METAL REPLACEMENT PARTS. GENERAL ASPECTS.				
Aspects to value			**Tests and inspections**	**Document of reference**
MATERIAL	**Steel quality**	**Mechanical characteristics**	Tensile strength test	ME-Tensile-01
		Deep drawability	Erichsen cupping test	ME-Ductility-01
		Chemical composition	Chemical analysis test	** Test method used by laboratory accredited*
	Thickness		Test measurements of wall	ME-Thickness-01
	Mass		Determination of mass test	ME-Mass-01

TABLE A1: TESTS AND INSPECTIONS FOR METAL REPLACEMENT PARTS. GENERAL ASPECTS.				
Aspects to value			**Tests and inspections**	**Document of reference**
PART	**Appearance**	**Identification**	Visual inspection test	ME-Visual-01
		Geometry and shape		
		Finishing the piece		
		Coatings		
	Adaptability	**Replacement time**	Adaptability test	ME-Adaptability-01
		Working process		
		Positioning of the piece		
		Accessories assembly		

TABLE A1: TESTS AND INSPECTIONS FOR METAL REPLACEMENT PARTS. GENERAL ASPECTS.			
Aspects to value		**Tests and inspections**	**Document of reference**
COVERING	**Thickness of organic coating layer**	Test for determining film thickness	ME-Coating thickness-01
	Adhesion of the organic coating	Cutting test lattice	ISO 2409
	Hardness of coating layer organic	Indentation test	ME-Indentacion-01
	Resistance to cracking and/or detachment of organic coating layer	Cupping test over organic coating layer	ME-Cupping-01
	Corrosion resistance in salt spray coating layer	Corrosion test in artificial atmospheres	ME-Corrosion-01

TABLE A1: TESTS AND INSPECTIONS FOR METAL REPLACEMENT PARTS. GENERAL ASPECTS.			
Aspects to value		**Tests and inspections**	**Document of reference**
BONDING SYSTEMS	**Appearance of the union** **Location and size** **Resistance or quality**	Test for adhesive joints	ME-Adhesive union-01
		Test for clipping joints	ME-Clipping-01
		Test for crimping joints	ME-Crimping-01
		Test for spots welded joints of electrical resistance	ME-Spot welds-01

TABLE A1: TESTS AND INSPECTIONS FOR METAL REPLACEMENT PARTS. GENERAL ASPECTS.					
Aspects to value				**Tests and inspections**	**Document of reference**
SUBSTRUCTURES	**Material**	**Steel quality**	**Mechanical characteristics**	Tensile strength test	ME-Tensile-01
			Deep drawability	Erichsen cupping test	ME-Ductility-01
			Chemical composition	Chemical analysis test	** Test method used by laboratory accredited*
		Thickness		Test measurements of wall	ME-Thickness-01
		Mass		Determination of mass test	ME-Mass-01

TABLE A1: TESTS AND INSPECTIONS FOR METAL REPLACEMENT PARTS. PARTICULAR ASPECT: HOOD.			
Aspects to value		**Tests and inspections**	**Document of reference**
PART	Fastening systems	Test for determining the mechanical behaviour in the systems union: Hood	ME-Hood unions-01

TABLE A2: TESTS AND INSPECTIONS FOR PLASTIC REPLACEMENT PARTS. GENERAL ASPECTS.				
Aspects to value			**Tests and inspections**	**Document of reference**
MATERIAL	**Plastic quality**	**Resistance to accelerated aging**	Test for resistance to color (accelerated aging)	ME-EAcelerado-01
		Heat resistance	Heat resistance test	ME-Heat-01
		Impact resistance at low temperatures	Impact resistance test in plastic material	ME-Impact-01
		Resistance to fuels	Test for resistance to fuels	ME-Resistance to fuels-01
	Thickness		Test measurements of wall	ME-Thickness-01
	Mass		Determination of mass test	ME-Mass-01

TABLE A2: TESTS AND INSPECTIONS FOR PLASTIC REPLACEMENT PARTS. GENERAL ASPECTS.				
Aspects to value			**Tests and inspections**	**Document of reference**
PART	**Appearance**	**Identification**	Visual inspection test	ME-Visual-01
		Geometry and shape		
		Finishing the piece		
		Coating		
	Adaptability	**Replacement time**	Adaptability test	ME-Adaptability-01
		Working process		
		Positioning of the piece		
		Accessories assembly		

TABLE A2: TESTS AND INSPECTIONS FOR PLASTIC REPLACEMENT PARTS. GENERAL ASPECTS.			
Aspects to value		**Tests and inspections**	**Document of reference**
COVERING	**Resistance of the coating layer at high pressure wash**	Test of resistance to high pressure washing	ME-Pressure wash-01
	Corrosion resistance in salt spray chamber acetic cupro-layer	Corrosion test in cupro-acetic salt spray	CASS UNE-EN ISO 9227
	Adhesion of the coating layer	Cutting test lattice	ISO 2409
	Resistance of the coating layer to solvents	Test of resistance to solvents	ME-Resistance to solvents-01

TABLE A2: TESTS AND INSPECTIONS FOR PLASTIC REPLACEMENT PARTS. GENERAL ASPECTS.			
Aspects to value		**Tests and inspections**	**Document of reference**
BONDING SYSTEMS	**Appearance of the union** **Location and size** **Resistance or quality**	Test for adhesive joints	ME-Adhesive unions-01
		Test for clipping joints	ME-Clipping-01
		Test Weld in plastic	ME-Plastic welds-01

TABLE A2: TESTS AND INSPECTIONS FOR PLASTIC REPLACEMENT PARTS. GENERAL ASPECTS.					
Aspects to value				**Tests and inspections**	**Document of reference**
SUBSTRUCTURES	**Material**	**Plastic quality**	**Resistance to accelerated aging**	Test for resistance of colour (accelerated aging)	ME-Eacelerado-01
			Heat resistance	Heat resistance test	ME-Heat-01
			Impact resistance at low temperatures	Impact resistance test in plastic material	ME-Impact-01
			Resistance to fuels	Test for resistance to fuels	ME-Resistance to fuels-01
		Thickness		Test measurements of wall	ME-Thickness-01
		Mass		Determination of mass test	ME-Mass-01

TABLE A2: TESTS AND INSPECTIONS FOR PLASTIC REPLACEMENT PARTS. PARTICULAR ASPECT: BUMPER			
Aspects to value		**Tests and inspections**	**Document of reference**
PART	Functionality	Test for determining the mechanical behaviour in a part: Bumper	ME-Bumper functionality-01

ANNEX B:
Test methods

Name of test methods	Identification code
Adaptability test	ME-Adaptability-01
Chemical analysis test	* *Test method used by laboratory accredited*
Corrosion test in artificial atmospheres	ME-Corrosion-01
Corrosion test in cupro-acetic salt spray	CASS UNE-EN ISO 9227
Cupping test over organic coating layer	ME-Cupping-01
Cutting test lattice	ISO 2409
Determination of mass test	ME-Mass-01
Erichsen cupping test	ME-Ductility-01
Heat resistance test	ME-Heat-01
Impact resistance test in plastic material	ME-Impact-01
Indentation test	ME-Indentacion-01
Tensile strength test	ME-Tensile-01
Test for adhesive joints	ME-Adhesive union-01
Test for clipping joints	ME-Clipping-01
Test for crimping joints	ME-Crimping-01
Test for determining film thickness	ME-coating thickness-01
Test for determining the mechanical behaviour in a part: Bumper	ME-Bumper functionality-01
Test for determining the mechanical behaviour in the systems of union : Hood	ME-Hood unions-01
Test for resistance of color (accelerated aging)	ME-EAcelerado-01
Test for resistance to fuels	ME-Resistance to fuels-01
Test for spots welded joints of electrical resistance	ME-Spot welds-01
Test measurements of wall	ME-Thickness-01

Name of test methods	Identification code
Test of resistance to high pressure washing	ME-Pressure wash-01
Test of resistance to solvents	ME-Resistance to solvents-01
Test weld in plastic	ME-Plastic welds-01
Visual inspection test	ME-Visual-01

TEST METHOD

ADAPTABILITY TEST

ME-Adaptability-01

INDEX

1. SCOPE AND PURPOSE

The adaptability test checks and assesses the assembly of parts in vehicles.

This method is applicable to “passive parts”, as defined in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ILO. Taking time procedures are in accordance with the techniques described by the International Labour Organization.

3. GENERALITIES

The functionality of a part can only be measured after its assembly into a car is completed, in keeping with the design line and the general aesthetics of the vehicle.

Through the adaptability test, the similarity in shape and dimensions between the part supplied by the vehicle manufacturer and the part to be certified will be verified.

The adaptability test is a comparative test between the part supplied by the vehicle manufacturer and the part to be certified (manufacturer).

4. TEST EQUIPMENT

The area where visual checks are carried out should be uniformly illuminated with a light that ensures an average level of illumination of 500 lux, a colour rendering index of 80, and a colour temperature (ºK) from 3500 to 4000.

The photographic equipment used should have at least a resolution capacity of 3.2 megapixels, and the pictures should be taken with a minimum resolution of 640 to 480 pixels.

The vehicle used to assemble the parts should be free of damage or defective repairs, and should be matched with the brand, model, and version from which the part to verify is applicable.

Standard tools should be used to assemble the parts to the vehicles.

The parts shape should be measured using the following tools:

- Thickness gauges with 0.5 mm intervals.
- Caliper.
- Tape measure.
- Profile gauge.

A chronometer that measure time in thousandths of an hour will be used for taking work times.

5. TEST PIECES

One sample from the vehicle manufacturer and one sample from the manufacturer that applies for the certification are to be tested.

In case the outcome of the part to be certified is unfavorable, a second test should be carried out with a second sample from the manufacturer that requests the certification.

The pieces' samples are to have been produced by the same method used in mass production, and are to be taken from a manufacturing batch of at least 100 pieces.

The samples are to be provided by the same means of transport, and with the same wrapping, commonly used in their distribution to the market; moreover, they should not have any shape deformities.

6. EXECUTION

The part should be assembled in the corresponding position on the vehicle, together with the accessories that may fit to the part. Appropriate adjustments to the settings specified in the part design are to be carried out in order to keep the proper gaps, parallelisms, alignments, and flushes, and to get the best possible adaptability of the part to the vehicle.

The aspects to be verified in the assembly process of the part are established in paragraphs 6.1 to 6.3

6.1 REPLACEMENT TIME

The total time used in the replacement of the part in the vehicle should be measured, making notes of specific works corresponding to each time taken.

The taking time procedure will be carried out in accordance with International Labour Organisation (ILO) specifications.

The steps involved in replacement time are the following:

A) Preparation and tidying up of the job site and the tools.

B) Disassembling the original part and the accessories from the vehicle.

C) Assembling the spare part to certify.

D) Assembling the accessories to the spare part to certify.

E) All adjustments that are necessary to get the part-bodywork set as aesthetically acceptable as possible, keeping the symmetry between both sides of the bodywork site.

6.2 WORK PROCESS

The working procedure used for assembling the parts and accessories will be as specified in the “Manual for Vehicle Repair” of each vehicle.

Adjustments of movement of the part to be tested regarding their accessories and adjacent parts will be allowed.

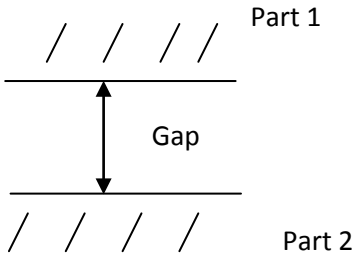
Unless otherwise indicated within the manual for vehicle repair, the following methods should not be carried out:

- Reshaping the part.
- Machining the part.
- Utilising external elements to the assembly of the part in order to join components of the part to the body.

6.3 POSITIONING OF THE PIECE

Once the part has been assembled and fitted with its accessories to the body, the aesthetic finish of the vehicle will be checked and assessed, paying attention to the following characteristics:

A) Gaps and clearances. This is the distance between the part and the adjacent elements.



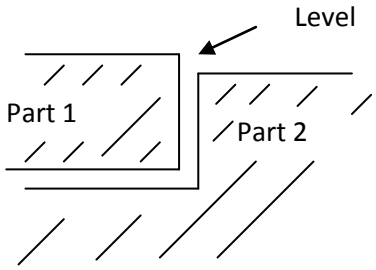
B) Parallelisms. The outlines of two adjacent parts usually should be parallel to each other, that is to say, a continuous distance from each other.

Parallelism

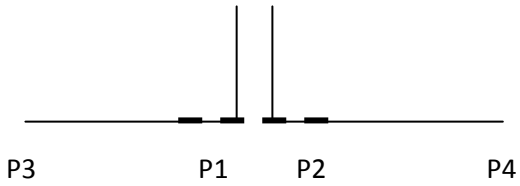
Not parallelism

C) Alignments and flushes. The part must keep in alignment with its adjacent parts. There are two types of alignments:

- Alignment in volume or flush between surfaces of two adjacent parts that have to be placed at the same or different levels. For instance: there is a difference in elevation between Part 1 and Part 2.



- Alignment between lines defined for the contour of two adjacent parts. For instance: there is alignment between the line defined by P1P3 and the line defined by P2P4.



Next, a comprehensive analysis of the previous characteristics will be carried out. To that end, the part will be divided into several sections depending on the length of the contour, marking points in order to measure the characteristics A), B) and C), in millimeters, using gauges or a caliper.

By means of a visual inspection, a check will be performed for the existence of burrs or defects in folded edges of the part, which will be visible when the part is assembled on the vehicle.

6.4 ASSEMBLY OF THE ACCESSORIES

A check should be performed for the suitable assembly of the accessories in the holes and their proper working, as well as the aesthetic of the part-body set, once its fitting is finished.

7. RESULTS

The total work time for the part replacement will be the sum of the split times a) to e) indicated in paragraph 6.1.

The assessment of different aspects observed in the test will be carried out according to a rating scale from 1 (poor) to 5 (excellent).

8. TEST REPORT

The test report must include at minimum the following information:

8.1 REPLACEMENT TIME REPORT

- Sample identification.
- Total working time of the replacement of the part to be certified.

8.2 ADAPTABILITY REPORT

- Samples identification and each of the photographs attached to them.
- Descriptions and photographs of those remarkable and different characteristics found between compared parts (part supplied by the vehicle manufacturer and the part to be certified).
- Final assessment of the sample along the following points:
    - Working process.
    - Part replacement: gaps, parallelism, alignments, flushes.
    - Accessories assembly.

8.3 PART POSITIONED REPORT

- Samples identification.
- Gaps and parallelisms measured at each point.

TEST METHOD

CORROSION TEST IN ARTIFICIAL ATMOSPHERES

ME-Corrosion-01

INDEX

1. SCOPE

This method only applies to metal parts with some type of coating, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 9227. Corrosion tests in artificial atmospheres. Salt spray tests.

ISO 21227-3. Paints and varnishes. Evaluation of defects on coated surfaces using optical imaging. Part 3: Evaluation of delamination and corrosion around a scribe.

ME-Coating Thickness. Test Method: Measurement of film thickness.

3. GENERALITIES

The constant concern for the technical and industrial sectors to provide quality service and finish work has resulted in the need to know in advance the future behaviour of metallic materials and safeguards used, as over time, , these protective coatings lose resistance properties and protection or isolation from natural or forced physical reactions, causing fatigue, corrosion, and degradation.

No corrosion test can absolutely predict the behaviour of a metal or coating in each possible corrosion condition or degradation that may arise in its application or service, since atmospheric types may be quite diverse (rural, urban, industrial, marine, tropical). Accordingly, corrosion tests should be used as a means of behavioural comparing of different metals and coatings under the same conditions.

4. TEST EQUIPMENT

Salt spray chamber, in accordance with ISO 9227.

A coating thickness measuring instrument, in accordance with ISO 2808.

Microscope, or similar.

5. TEST PIECES

At least two samples should be tested, with dimensions of 100x200mm.

6. EXECUTION

The corrosion test in artificial atmospheres will be carried out in accordance with ISO 9227.

The exposure period of the samples will last until the appearance of red rust is clearly visible. If there is no red rust present in the samples tested, the exposure period will be 720 hours.

Shore Hardness is to be measured before and after the specimen is subjected to heat.

The coating thickness measurement will be carried out according to ME-Coating Thickness.

Samples are to be subject to a microscopic inspection after the exposure.

7. RESULTS

The area affected by corrosion is to be determined in accordance with 21227-3.

8. TEST REPORT

The test report must include at minimum the following information:

- Samples identification.
- Equipment used.
- Coating thickness average with its associated uncertainty.
- Hours of testing until the appearance of red rust; failing that, total hours of testing.
- One picture per page, for each sample. The sample is to be photographed with a scale of 5 cm in order to allow its measurement and subsequent evaluation.

TEST METHOD

CUPPING TEST OVER ORGANIC COATING LAYER

ME-Cupping-01

INDEX

1. SCOPE

This method only applies to metal parts with some type of coating, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 1520. Paints and varnishes. Cupping test**.**

ISO 1514. Paints and varnishes. Standard panels for testing.

ME-Thickness. Test Method: Measurement of thickness.

ME- Coating Thickness. Test Method: Measurement of film thickness.

3. GENERALITIES

Among the different parameters used to define the quality of a coating, either protective or decorative, there is one that determines the adaptability of the coating when the substrate on which is applied is deformed. This involves checking that, with a significantly deform of the substrate, the coating is not to peel or crack, losing its protective or decorative characteristics. This parameter is important in those cases in which a coated material must be molded later.

4. TEST EQUIPMENT

Matrix, punch, and press, in accordance with ISO 1520.

A thickness measuring instrument, in accordance with method ME-Thickness.

A coating thickness measuring instrument, in accordance with ISO 2808.

5. TEST PIECES

Three samples are to be tested, in accordance with ISO 1520.

The samples are to be prepared in accordance with ISO 1514.

6. EXECUTION

The thickness measurement will be carried out in accordance with method ME-Thickness.

The coating thickness measurement will be carried out in accordance with method ME-Coating Thickness.

The cupping test will be carried out in accordance with ISO 1520, with the observation being by the naked eye (eyesight corrected).

If the samples are not perfectly flat, the radius of curvature thereof will be indicated. If the radius of curvature is greater than 7,500 mm, the sample will be considered flat.

7. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Equipment used.
- Individual thickness average.
- Individual coating thickness average.
- Radius of curvature of the samples, if applicable.
- Cupping index, and its associated uncertainty.

TEST METHOD

DETERMINATION OF MASS

ME-Mass-01

INDEX

1. SCOPE

This method is applicable to all metal and plastic parts, as listed in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The mass of a part or component is a quality that is noticeable, albeit subjectively, by anyone, making any major differences in the materials or in the structure between parts or components easily detectable.

3. TEST EQUIPMENT

The test must be executed with a precision scale.

4. TEST CONDITIONS

The samples are to remain at least half an hour under a temperature of (23 ±2) ° C and a controlled humidity of (50 ±5) % .

5. EXECUTION

A minimum of three weightings will be done for each sample.

6. RESULTS

The mass value will be the mean of the three measurements performed for each sample.

7. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Mass average value.

TEST METHOD

ERICHSEN CUPPING TEST

ME-Erichsen-01

INDEX

1. SCOPE

This method only applies to metal parts with or without some type of coating, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 20482. Metallic materials. Sheet and strip. Erichsen cupping test.

ME-Thickness. Test Method: Measurement of thickness.

3. GENERALITIES

A good result in cupping work mainly depends on the quality of the material, so much so that the metal mould designer must conceive the tools and set the number of operations that the pressing part has to undergo until its demise, based on the material quality which he is going to work with.

In most cases, embossment defects appear; due to the fact that the material used was not adequate for the work to be done. For this reason, it would be useful to have a means of evidence to ensure that the material tested is not going to experience problems in the moulding process.

4. TEST EQUIPMENT

Matrix, punch, and press, in accordance with ISO 20482.

A thickness measuring instrument, in accordance with method ME-Thickness.

5. EXECUTION

The thickness measurement will be carried out as indicated in method ME-Thickness, with an accuracy in accordance with ISO 20482.

The Erichsen cupping test will be carried out in accordance with ISO 20482.

If the samples are not perfectly flat, the radius of curvature thereof will be indicated. If the radius of curvature is greater than 7,500 mm, the sample will be considered flat.

6. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Equipment used.
- Individual thickness average.
- Radius of curvature of the samples, if applicable.
- Thickness average, with associated uncertainties.
- Erichsen cupping index, and its associated uncertainty.

TEST METHOD

HEAT RESISTANCE TEST

ME-Heat-01

INDEX

1. SCOPE

This method only applies to plastic parts, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 868. Plastics and ebonite. Determination of indentation hardness by means of a durometer (Shore hardness).

ISO 23529. Rubber. General procedures for preparing and conditioning test pieces for physical test methods.

3. GENERALITIES

When an injected plastic piece presents internal tensions due to an inadequate injection moulding process, they tend to become visible over time, leading to deformation of the part.

Similarly, when a plastic material has inappropriate content of additives such as plasticisers, lubricants, etc., volatility occurs over time, and manifests itself by varying the material properties, including hardness.

To detect these internal tensions and inappropriate content of additives in an accelerated fashion, a sample of the material will be submitted to elevated temperature, accelerating the process.

4. TEST EQUIPMENT

A Durometer Shore A or D, in accordance with ISO 868.

A drying oven or other device that reaches a temperature of 80 ºC, in accordance with ISO 23529

5. TEST PIECES

One sample will be tested, with dimensions of 60x60mm.

6. EXECUTION

The Shore hardness measurement will be carried out in accordance with ISO 868.

The sample will be subjected to a temperature of 80 ºC for 168 hours.

Shore Hardness will be measured before and after subjecting the sample to heat.

For partially coated parts, the measuring of the hardness is to be made in areas that are not covered.

Samples are to be subject to a visual inspection after the exposure to temperature.

7. RESULTS

The hardness value will be the mean of five measurements in each of the stages.

8. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Equipment used.
- Shore Hardness average initial.

- Shore hardness variation expressed in % from baseline data.
- Possible changes in volume, shape, colour, or brightness.

TEST METHOD

IMPACT RESISTANCE TEST IN PLASTIC MATERIAL

ME-Impact-01

INDEX

1. SCOPE

This method only applies to plastic parts, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 6603-1. Plastics. Determination of puncture impact behaviour of rigid plastics. Part 1: Non-instrumented impact testing.

ISO 23529. Rubber. General procedures for preparing and conditioning test pieces for physical test methods.

ME-Thickness. Test Method: Measurement of thickness.

3. GENERALITIES

Plastic materials, depending on temperature (Tg), have a relatively small transition zone, that defines its fragile or ductile behaviour. If the material is used in the fragile area, an impact of sufficient magnitude can break it, and in that case, rupture occurs in multiple pieces, as if it were glass.

The objective of this test is to verify that the material used in the pieces demonstrates proper ductile behaviour at room temperature and low temperatures, using an impact test.

4. TEST EQUIPMENT

Energy carrier (dart system), in accordance with ISO 6603-1.

Weights of 1 and 2 kg of mass, independent of each other.

Environmental chamber or other device capable of conducting a temperature test, in accordance with ISO 23529.

Thickness measuring instrument, in accordance with method ME-Thickness.

5. TEST PIECES

Four samples are to be tested, with dimensions in accordance with ISO 6603-1.

6. TEST CONDITIONS

The samples are to remain four hours under a temperature of (23±2) ° C and a controlled humidity of (50±5) %, unless the required temperature is otherwise indicated.

7. EXECUTION

The thickness measurement and the impact test will be carried out in accordance with ISO 6603-1.

The drop height of the dart of the energy carrier will be 0,62 m.

The first sample is to be impacted with the dart and the 1 kg weight. If no damage occurs, the remaining samples are to be tested with the 2kg weight. In the event of damage, all samples are to be tested with the 1 kg weight.

If damage occurs only in the first sample tested, the test will be repeated with new samples and a weight of 2 Kg, with only this second test being considered as valid.

8. RESULTS

The specific thickness value will be the mean of three measurements.

9. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Equipment used.
- The average value of thickness.
- The number of samples tested.
- The mass of the dart impactor.
- The results of each of the samples tested.

TEST METHOD

INDENTATION TEST

ME-Indentation-01

INDEX

1. SCOPE

This method only applies to metal parts with some type of coating, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 2815. Paints and varnishes. Buchholz indentation test.

ME- Coating Thickness. Test Method: Measurement of film thickness.

3. GENERALITIES

Among the different parameters used to define the quality of a coating, either protective or decorative, there is one that determines the hardness of the coating. The hardness of the coating is related to the scratch resistance presented to indentation and sliding ability.

The harder the coating, the smaller the mark when an indenter is introduced into it. The size of this mark is to be used as an indication of hardness.

4. TEST EQUIPMENT

A coating thickness measuring instrument, in accordance with ISO 2808.

Indenter and microscope, in accordance with ISO 2815.

5. TEST PIECES

If the shape and size of the sample allows testing without cutting the spare part, an area as flat as possible will be chosen for the tests. Otherwise, the samples are to be prepared in accordance with ISO 2815.

6. EXECUTION

The Buchholz indentation test will be carried out in accordance with ISO 2815.

The coating thickness measurement will be carried out in accordance with method ME-Coating Thickness.

7. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Equipment used.
- Coating thickness average with its associated uncertainties.
- Length of each mark.
- Test result, indicating the limits of the interval as deviations of the resistance to the Buchholz indentation test.

TEST METHOD

TENSILE STRENGTH TEST

ME-Tensile-01

INDEX

1. SCOPE

This method only applies to plastic parts with or without some kind of coating, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 6892-1. Metallic materials. Tensile testing. Part 1: Method of test at room temperature

ME-Thickness. Test Method: Measurement of thickness.

3. GENERALITIES

Steel is the material used for excellence in automobile manufacture; however, this material is in constant variation, incorporating new steels in each model, with different compositions and/or novel treatment.

The tensile strength test is a reliable way to determine if the steel in question is conventional, or if it is an alloy or pre-treated.

4. TEST PIECES

At least three samples will be tested, with dimensions in accordance with Annex B of ISO 6892-1 (test sample type 2).

5. TEST EQUIPMENT

Testing machine, in accordance with ISO 6892-1.

Thickness measuring instrument, in accordance with test method ME-thickness

Caliper.

6. EXECUTION

The tensile strength test is to be carried out in accordance with ISO 6892-1.

7. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Orientation and location of the samples in the part.
- Equipment used.
- Loading rate for each of the parameters measured
- Test results $Rp_{0.2}$ with their associated uncertainties.

TEST METHOD

TEST FOR ADHESIVE JOINTS

ME-Adhesive union-01

INDEX

1. SCOPE AND PURPOSE

The test for adhesive joints verifies the quality of bonded joints.

This method applies to “passive parts”, as defined in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The functionality of a piece is directly related to the resistance presented by the unions of the parts that compose it.

The test consists of verifying the bonded joints’ effectiveness existing in the piece.

The test for adhesive joints will be a comparative test between the part supplied by the vehicle manufacturer and the part to be certified (manufacturer).

3. TEST EQUIPMENT

The area where visual checks are carried out should be uniformly illuminated with a light that ensures an average level of illumination of 500 lux, a colour rendering index of 80, and colour temperature (K) from 3500 to 4000.

Tape measure.

Specific impact device for the piece (hood or bumper).

4. TEST PIECES

One sample from the manufacturer and one sample from the manufacturer that applies for the certification are to be tested.

The pieces' samples are to have been produced by the same method used in mass production, and they are to be taken from a manufacturing batch of at least 100 pieces.

5. EXECUTION

5.1 VISUAL INSPECTION

This test consists of a visual inspection of the aspect that shows the bonded joint, and verification if imperfections or irregularities in the union exist. Some of them are detailed below:

- An excess of adhesive in the union. The adhesive overflows along the surface to the joint.
- An excess of adhesive residue. The adhesive is applied incorrectly and there is unnecessary adhesive residue on the surface.
- A lack of adhesive in the joint. The adhesive bead applied is too small for the bond type designed and there is contact between the surfaces to be joined.
- Unbounded surfaces. The adhesive has not stuck to one of the surfaces and a gap appears between the surfaces.

5.2 ADHESIVE LOCATION

This test consists of a visual check of the position occupied by the adhesive.

5.3 STRENGTH OF THE BONDED JOINT

The strength of the adhesive bond on the piece will be verified by an impact test.

The bonded joints in hoods will be verified by assembling the hood in the impact hood device. The impact is to be carried out in accordance with test method ME-Hood unions.

The bonded joints in bumpers will be verified by assembling the bumper in the vehicle designed for the part. The impact is to be carried out in accordance with test method ME-Bumper functionality.

The behaviour of the bonded joints is to be subject to a visual inspection after the impact (with or without damage).

6. RESULTS

The assessment of point 5.1 and point 5.2 will be carried out in accordance with a rating scale from 1 (poor) to 5 (excellent).

7. TEST REPORT

The test report must include at minimum the following information:

- Samples identification.
- Rating point 5.1. and point 5.2..
- Union bond behavior in the impact test.

TEST METHOD

TEST FOR CLIPPING JOINTS

ME-Clipping-01

INDEX

1. SCOPE AND PURPOSE

The test for clipping joints verifies the quality of the joints.

This method is applicable to the different external elements of union that are used, such as screws, staples, clips, nuts, and so on.

This method applies to “passive parts”, as defined in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The functionality of a piece is directly related to the resistance presented by the unions of the parts that compose it.

The test consists of verifying the clipping effectiveness existing in the piece.

The test for clipping joints is a comparative test between the part supplied by the vehicle manufacturer and the part to be certified (manufacturer).

3. TEST EQUIPMENT

The area where visual checks are carried out should be uniformly illuminated with a light that ensures an average level of illumination of 500 lux, a colour rendering index of 80, and colour temperature (K) from 3500 to 4000.

Caliper.

Specific impact device for the piece (hood or bumper).

4. TEST PIECES

One sample from the manufacturer and one sample from the manufacturer that applies for the certification are to be tested.

The pieces' samples are to have been produced by the same method used in mass production, and they are to be taken from a manufacturing batch of at least 100 pieces.

5. EXECUTION

5.1 VISUAL INSPECTION

This test consists of a visual inspection of the aspect that shows the fixing elements and all clipped unions, and in verifying the existence of imperfections or irregularities in the area. Some of them are detailed bellow:

- Marks or distortion in the part. Bulges or hollows in the external surface of the part, caused by an incorrect clip.
- Fixing elements seen. The size of the fixing elements is not appropriate for the union and there are fixing elements visible that should not be.
- Rusting in metal elements of clipping. A lack of or an inadequate application of anti-corrosive coating on the clipping element.
- Defective clipping elements. The clipping elements have some type of breach or damage, which cancels or reduces the bond strength.

5.2 FIXING LOCATION

A visual inspection of the number, size, and position occupied by the clipping elements used.

5.3 STRENGTH OF THE CLIPPING JOINT

The strength of the clipping joint will be verified by an impact test on the piece.

The clipping joints in hoods will be verified by assembling the hood in the impact hood device. The impact is to be carried out in accordance with test method ME-Hood unions.

The clipping joints in bumpers will be verified by assembling the bumper in the vehicle which is designed for the part. The impact is to be carried out in accordance with test method ME-Bumper functionality.

The behavior of the clipping joints is to be subject to a visual inspection after the impact (with or without damage).

6. RESULTS

The assessment of point 5.1 and point 5.2 will be carried out in accordance with a rating scale from 1 (poor) to 5 (excellent).

7. TEST REPORT

The test report must include at minimum the following information:

- Samples identification.
- Rating point 5.1. and point 5.2..
- Union clipped behaviour in the impact test.

TEST METHOD

TEST FOR CRIMPING JOINTS

ME-Crimping-01

INDEX

1. SCOPE AND PURPOSE

The test for crimping joints verifies the quality of the joints.

This method only applies to metal parts as listed in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The functionality of a piece is directly related to the resistance presented by the unions of the parts that compose it.

The test consists of verifying the crimping union effectiveness existing in the piece.

The test for crimping joints will be a comparative test between the part supplied by the vehicle manufacturer and the part to be certified (manufacturer).

3. TEST EQUIPMENT

The area where visual checks are carried out should be uniformly illuminated with a light that ensures an average level of illumination of 500 lux, a colour rendering index of 80, and colour temperature (K) from 3500 to 4000.

Tape measure.

Hood impact device.

4. TEST PIECES

One sample from the manufacturer and one sample from the manufacturer that applies for the certification are to be tested.

The pieces' samples are to have been produced by the same method used in mass production, and they are to be taken from a manufacturing batch of at least 100 pieces.

5. EXECUTION

5.1 VISUAL INSPECTION

This test consists of a visual inspection of the aspect that shows the crimping joint, and in verifying if imperfections or irregularities in the union exist. Some of them are detailed bellow:

- Marks or distortion in the part. Bulges, hollows, or irregularities in the external surface of the part, caused by an incorrect crimp.
- Bending curvature. Radius of curvature applied is higher or smaller, resulting in metal sheet bending which is visually significant.
- Unsealed areas. A lack of sealing bead along the edge of the part that is crimped.
- Mobility existing between the parts to join. There is mobility between the areas intended for joining, due to a defective crimping process.

5.2 CRIMPING LENGTH

Part's length and crimping area visual check.

5.3 STRENGTH OF THE CRIMPING JOINT

The strength of the crimping joint will be verified by an impact test on the piece.

The crimping joints in hoods will be verified by assembling the hood in the impact hood device. The impact will be carried out in accordance with test method ME-Hood unions.

The behaviour of the crimping joints will be subject to a visual inspection after the impact (with or without damage).

6. RESULTS

The assessment of point 5.1 and point 5.2 will be carried out in accordance with a rating scale from 1 (poor) to 5 (excellent).

7. TEST REPORT

The test report must include at minimum the following information:

- Samples identification.
- Rating point 5.1. and point 5.2.
- Union crimped behavior in the impact test.

TEST METHOD

MEASUREMENT OF FILM THICKNESS

ME-Coating thickness-01

INDEX

1. SCOPE

This method only applies to metal parts with some type of coating, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 2808. Paints and varnishes. Determination of film thickness.

3. GENERALITIES

Among many others, one of the parameters that determines the quality of a coating is its thickness. It is true that the final coating thickness, when it is applied to a substrate, depends on many factors, such as the method of application, the volatile content, density, etc., and that is why a method to measure the coating thickness is required to be able to act on the variables that affect it, in order to maintain uniform quality.

4. TEST EQUIPMENT

Instrument for measuring, in accordance with ISO 2808. Method 7C or method 7D is recommended, with reproducibility as a standard.

5. TEST CONDITIONS

The sample is to remain for 16 hours under a temperature of (23 ±2) ° C and a controlled humidity of (50 ±5) %.

6. EXECUTION

The film thickness measurement will be carried out in accordance with ISO 2808.

The number of areas to be tested will be based on the size of the sample, with 16 areas per square meter being appropriate, but never less than 5.

7. RESULTS

The coating thickness value will be the mean of the measurements taken in each of the areas.

8. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Equipment used.
- Number of reference areas.
- Coating thickness average with its associated uncertainties.

TEST METHOD

TEST FOR DETERMINING THE MECHANICAL BEHAVIOUR IN A PART: BUMPER

ME-Bumper functionality-01

INDEX

1. SCOPE

This method only applies to front and rear bumper covers made of plastic, as listed in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The main functionality of bumper covers, front and rear, is to absorb the energy generated during a low-speed collision, such as a parking maneuver. One way to quantify the energy absorbed is by an impact test at low speed.

This test will also assess the correct use of union systems of substructures.

3. TEST AREA DESCRIPTION

The test area ought to be large enough to accommodate the propulsion system with the test equipment and allow for movement of the vehicle after impact.

The ground surface should not offer resistance to the movement of the vehicle after impact.

4. VEHICLE PLACEMENT

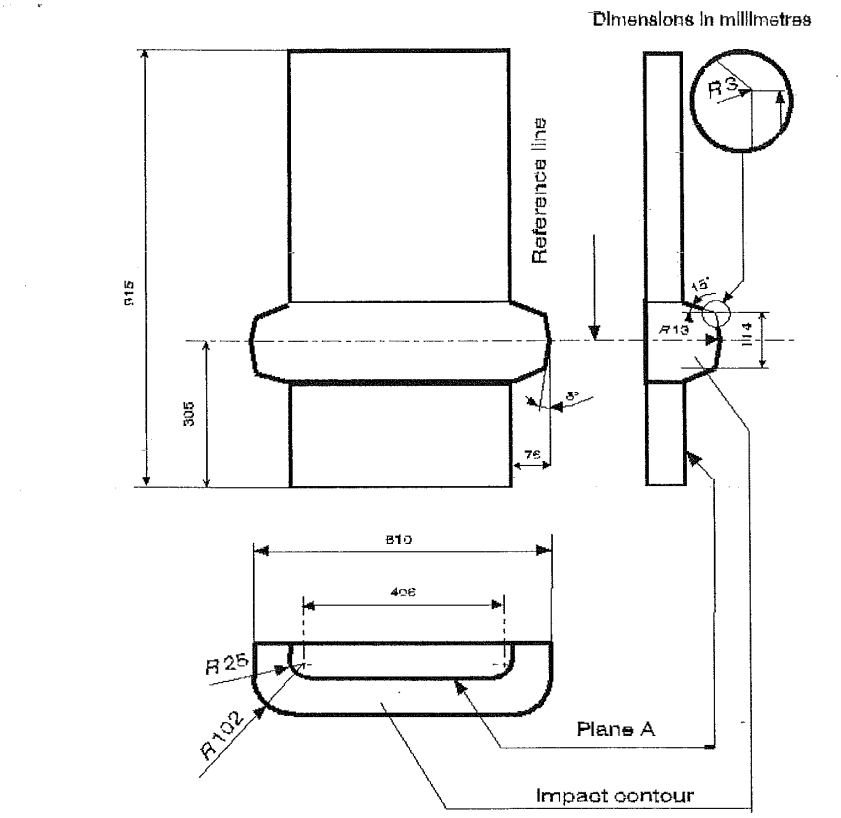
The vehicle will be is placed in a stationary position, in a straight direction, without depressing the brake, and with the gear in neutral.

The tire pressure should be as recommended by the manufacturer of the vehicle, while in the driving position.

The vehicle's fuel tank should be filled, or replaced by an equivalent weight.

5. IMPACTOR

The impactor should be rigid, with an outline of steel, according to the following figure:



The impactor axis height is to be 445 mm from the ground surface, both for front devices and rear devices.

The first contact of the impactor with the vehicle is to be between the edge of the impactor and the bumper cover.

The impactor can be part of a movable barrier or pendulum.

The effective mass (of the pendulum or of the moving wall) is to be equivalent to the vehicle mass, in running order.

Where a pendulum is used, the distance between the pivot and the centre of percussion should be at least 3.30 m. The reference line should coincide with the centre of percussion.

Where a suspended parallelogram pendulum is used, the path described by any point on the reference line should be constant, with a radius of at least 3.30 m.

6. EXECUTION

Each device will first be subjected to an oblique impact at one end, followed by a frontal impact at the other.

The choice of which end of the device should be used to carry out the first impact does not matter; however, the second impact must be executed on the opposite side from the first impact, 17.50 cm off-centre.

6.1 OBLIQUE IMPACT

The oblique impact is to be carried out with the vehicle in gear position and with a pendulum speed between 2.5 km / h and 2.6 km / h.

The vehicle should be aligned so that the impactor touches the protective device edge without moving it.

The plane A (see figure preceding) of the impactor should have an angle of 60 ± 5 ° with the longitudinal plane mean of the vehicle.

The first point in contact with the vehicle is to be in the vertical mean plane of the impactor, with a tolerance of ± 25 mm.

6.2 FRONTAL IMPACT

The frontal impact is to be carried out with the vehicle weighted down with the equivalent weight of three passengers of 75 Kg each, distributed in the driver's seat, the front passenger seat, and the rear seat.

The frontal impact is to be carried out with a pendulum speed between 4.0 km / h and 4.25 km / h.

7. EQUIVALENT METHODS

The functionality of the protective devices and the behaviour of the joining systems of their substructures can be verified by other test methods, which have been proven equivalent to this method.

8. TEST REPORT

The test report must include at minimum the following information:

- Impact speed.
- Damage to the protective devices, indicating the length of the crack and / or area of detachment.
- Damage to the vehicle, if any.
- Damage to the union systems of the substructures.

TEST METHOD

TEST FOR DETERMINING THE MECHANICAL BEHAVIOUR IN SYSTEMS OF UNION: HOOD

ME-Hood unions-01

INDEX

1. SCOPE

This method only applies to hoods, as listed in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The hood is made of several pieces joined together by soldering, crimping and / or adhesive. One way to verify that the union systems between the different parts of the hood are correct is by a mechanical behaviour test.

This test will also assess the correct fastening of the hood to the vehicle, by the lock and the hinges.

3. SUPPORT FOR ASSEMBLY HOOD

In order to carry out the mechanical test, a support (movable platform or similar) will be required, which is assembled to the hood, and placed in the same position and inclination as that of the vehicle.

The platform or similar should have a movable rod in the direction of impact, for a support to the hood lock. This rod should be able to move height-wise to adjust to the inclination of the hood.

The platform mass or similar should not exceed 200 Kg.

4. TEST AREA DESCRIPTION

The test area ought to be large enough to accommodate the propulsion system with the test equipment and allow for movement of the platform after being impacted.

The ground surface should not offer resistance to the movement of the platform after impact.

5. SUPPORT ASSEMBLY

The platform or similar should stand perpendicular to the propulsion system, without having braking mechanisms activated.

6. IMPACTOR

The impactor should be a flat and rigid surface.

The impactor surface should have a minimum width of 1200 ± 10 mm.

The impactor can be part of a movable barrier or a pendulum.

Where a pendulum is used, the distance between the pivot and the centre of percussion should be at least 3.30 m. The reference line should coincide with the centre of percussion.

Where a suspended parallelogram pendulum is used, the path described by any point on the reference line should be constant, with a radius of at least 3.30 m.

7. EXECUTION

The hood will be assembled with the same hinges used in the vehicle.

The lock should be fixed on the slide rod through a steel cable tie.

The impact is to be made in the centre of the hood.

The test speed will be adjusted according to the effective mass of the platform or similar, so that the strain energy absorbed by the hood is between

1600 and 1700 Joules (between 14.40 and 14.84 km / h for a support 200 Kg).

If, during the test, the hinges are damaged, these should be replaced with new ones.

The platform or similar should be aligned so that the front bonnet edge touches the impactor without moving it.

8. EQUIVALENT METHODS

Alternative test methods may be considered, providing these test methods ensure the accurate analysis of the union systems between the different parts that shape the hood, and the proper fastening to the vehicle.

9. TEST REPORT

The test report must include at minimum the following information:

- Impact speed.
- Strain energy
- Performance of fastening systems to the vehicle (hinges and lock).
- Performance of the different union systems between the different devices that shape the hood, indicating detached length and / or the broken number between unions.

TEST METHOD

COLOUR RESISTANCE TEST (ACCELERATED AGING)

ME-Colour-01

INDEX

1. SCOPE

This method only applies to plastic parts without any type of coating, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 4892-1. Plastics. Methods of exposure to laboratory light sources. Part 1: General guidance.

ISO 4892-2. Plastics. Methods of exposure to laboratory light sources. Part 2: Xenon-arc lamps.

3. GENERALITIES

External parts are subject to adverse effects from environmental conditions (heat, rain, humidity, freezing), and, obviously, solar radiation.

The ultraviolet radiation contained in sunlight seriously affects the structure of plastic materials exposed, degrading and spoiling them until they become useless.

The first sign that the material is changed by solar radiation is discolouration or tinging of, or damage to, its surface.

This test aims to verify the behaviour of materials tested under solar radiation, combined with rain effects.

4. TEST DURATION

Part Type	*Test Time (hours)*	*Number of Cycles*
Located in zones exposure directly to sunlight	1600	4 cycles of 400 hours
Located in zones without exposure directly to sunlight	800	2 cycles of 400 hours

5. TEST EQUIPMENT

Test chamber, in accordance with ISO 4892-2.

Microscope, or similar.

6. TEST PIECES

One sample is to be tested, with dimensions in accordance with ISO 4892-1.

7. EXECUTION

The colour resistance test (cycle test (sunlight exposure, spraying, darkness periods…)), will be carried out in accordance with ISO 4892-2.

Samples are to be subject to visual and microscopic inspection after the exposure.

8. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.

- Equipment used.
- Cycle's number.
- Possible changes in colour or brightness.
- Any variation in the shape of the surface.

TEST METHOD

RESISTANCE TO FUEL TEST

ME-Resistance to fuel-01

INDEX

1. SCOPE

This method only applies to plastic parts, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 868. Plastics and ebonite. Determination of indentation hardness by means of a durometer (Shore hardness).

3. GENERALITIES

Plastic parts may come into contact with and suffer effects from exposure to fluids in a vehicle. When it comes to contact with external parts, liquid fuels are the most common such fluids (gasoline and diesel).

This test is carried out to verify the extent to which these said parts are affected by being subjected to contact with fuels.

4. TEST EQUIPMENT

Durometer Shore A or D according to ISO 868.

Microscope, or similar.

Gasoline (95 octane) and diesel automotive fuel (commercial mixture).

5. TEST PIECES

At least three samples with dimensions of 20 x 250mm will be tested in gasoline, and three samples with the same dimensions will be tested in diesel oil.

A seventh sample will be prepared as a reference for visual and microscopic inspection.

6. EXECUTION

The Shore hardness measurement will be carried out in accordance with ISO 868.

The samples are to remain submerged for 24 hours in a sealed container to prevent fuel evaporation.

Shore Hardness is to be measured before and after the samples are submerged in fuel.

For partially coated or primed parts, measuring of hardness will be made in areas that are not covered.

A visual and microscopic inspection will be carried out following the test.

7. RESULTS

The hardness value will be the mean of five measurements in each of the stages.

8. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Equipment used.
- Average initial Shore hardness.
- Shore hardness variation expressed in % from baseline data.

- Possible changes in volume, shape, colour, or brightness.

TEST METHOD

TEST FOR SPOTS WELDED JOINTS OF ELECTRICAL RESISTANCE

ME-Spot welds-01

INDEX

1. SCOPE AND PURPOSE

The test “welds by electrical resistance points” verifies the quality of the welded joint.

This method only applies to metal parts, as listed in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The functionality of a piece is directly related to the resistance presented by the unions of the parts that compose it.

The test consists of verifying the welding area by electrical resistance points existing in the piece, the distances between welding spots, and the effectiveness of the weld joint.

The test analysis of welded joints is a comparative test between the part supplied by the vehicle manufacturer and the part to be certified (manufacturer).

3. TEST EQUIPMENT

The area where visual checks are carried out should be uniformly illuminated with a light that ensures an average level of illumination of 500 lux, a colour rendering index of 80, and colour temperature (K) from 3500 to 4000.

Caliper.

Pliers and clamps.

4. TEST PIECES

One sample from the manufacturer and one sample from the manufacturer that applies for the certification are to be tested.

The pieces' samples are to have been produced by the same method used in mass production, and they are to be taken from a manufacturing batch of at least 100 pieces.

5. EXECUTION

5.1 VISUAL INSPECTION

This test consists of a visual inspection of the aspect that shows the weld joint, and verification of any imperfections or irregularities in the spots. Some of these are detailed bellow:

- Marks or distortion in the part. Bulges, hollows, or irregularities in the external surface of the part, caused by an incorrect welding process.
- Drilling in the spot centre.
- Penetration depth. Tracks produced by the electrode.
- Remains of molten material. In the track or around it, the remains of material are melted and are expelled from the area, in the shape of droplets.
- Remains of Electrodes on the track.
- Unbonded spots. The material in the areas provided to join, was not properly molten, so that there is no union between them, and a gap appears between the surfaces.

5.2 WELD LOCATION

This should determine the total welding area existing on the piece by measuring the diameter of a certain number of spot welds, using a caliper.

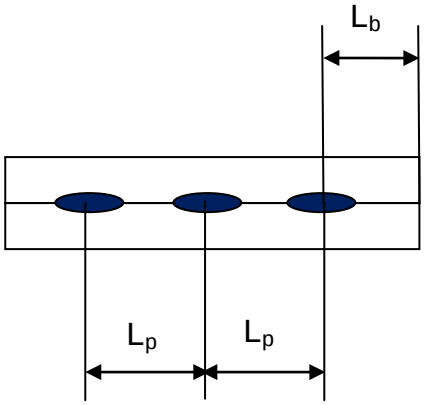
The number of spot welds to be examined is to be at least 15 % of the total number of points of the piece, with a maximum of 10 points.

The different welding spot diameters are to be taken into account in the area calculation.

5.3 DISTANCE BETWEEN SPOTS

A) The distance kept between welding spots is to be subject to a visual inspection for uniformity and similarity with the manufactured part.

B) In the area of the part where the welding spots are closer to each other, the minimum distance between welding spots is to be measured with a caliper: passing distance (Lp) and edge distance (Lb).



5.4 QUALITY OF THE WELDING SPOT

The quality of the welding spot will be verified by a tensile peeled test until joint failure.

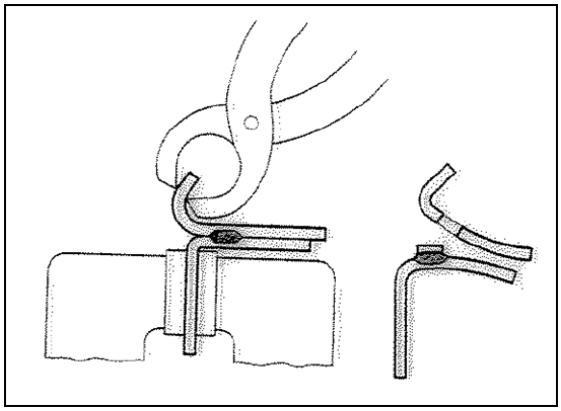
The spot welds number to be examined will be at least 15 % of the total number of points of the piece, to a maximum of 10 points.

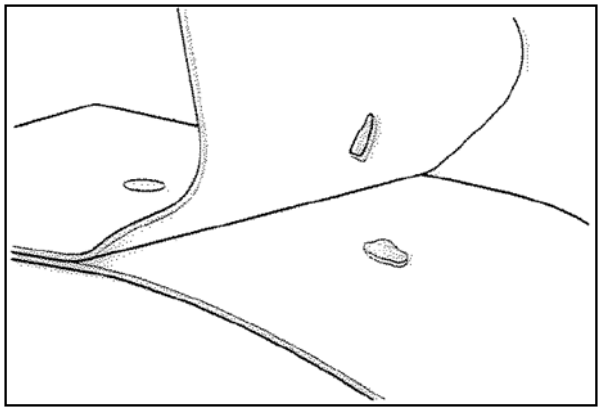
The sample of the piece should that contain a welding spot and have a sufficient dimension so as to allow carrying out the tensile strength test.

The tensile strength test will be carried out holding one of the surfaces of the sample with the pressure clamp of the vise and the other with pincers.

Manually, the join will be submitted to a strip-away effort until it achieves a breach or failure of the join.

How the join failed will be visually inspected, with or without ripping off the base material.





6. RESULTS

The welded area value will be:

Welded area = Total number of welding spots x Π x $(D)^2 / 4$

Where D = diameter of spot weld

The assessment of point 5.1. and point 5.2. will be carried out according to a rating scale from 1 (poor) to 5 (excellent).

7. TEST REPORT

The test report must include at minimum the following information:

- Samples identification.
- The value of the welded area.
- Rating point 5.1. and point 5.2.
- Indication of how the join damage in the tensile peel test happened, with or without stripping off the material.

TEST METHOD

MEASUREMENT OF THICKNESS

ME-Thickness-01

INDEX

1. SCOPE

This method will be applicable to all metal and plastic parts, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ASTM E797, Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse Echo Contact Method.

3. GENERALITIES

The measurement of thickness of a sample, depending on the size or shape thereof, can be simple or complicated, depending on whether one is allowed to use a comparator instrument, a displacement meter, such as a micrometer or a caliper, or an instrument based on ultrasonics.

4. TEST EQUIPMENT

A thickness measuring instrument with an accuracy better than 1%.

5. TEST PIECES

As only one sample non-destructive measurement procedure is used, the thickness measurements will be carried out directly on finished items.

6. TEST CONDITIONS

The samples are to remain at least an hour under a temperature of (23 ±2) ° C and a controlled humidity of (50 ±5) %.

7. EXECUTION

The number of areas to be tested will be based on the size of the sample, with an appropriate relationship of 16 areas per square meter, but never less than 5.

In the case of organic coatings of reduced thickness, its reduction is to be duly tabulated before performing the measurement.

Measurement in every area of reference should be repeated three times.

8. RESULTS

The thickness value will be the mean of the measurements taken in each of the areas.

9. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Equipment used.
- Number of reference areas.
- Thickness average with associated uncertainties.
- Whether the measurement was made with an organic coating or not.

TEST METHOD

RESISTANCE TO HIGH PRESSURE WASHING TEST

ME-Pressure wash-01

INDEX

1. SCOPE

This method only applies to plastic parts with some type of coating, as listed in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The adhesion of primer or paint finish over plastic substrates has limitations due to the properties of the materials, especially polyolefins. However, these limitations can be resolved with an adequate treatment of the substrate surface.

The application of high-pressure washing, besides reproducing a real situation, represents a very effective way of verifying the adherence of the coatings.

In order to reproduce the normal conditions of use of the parts, and to verify that subsequent coatings do not affect the initial adhesion, the parts should be tested with the same coatings intended for use.

3. TEST EQUIPMENT

Pressure water machine or other device that reaches a pressure of 80 bar and a temperature of 90 º C, and which incorporates a rigid device with a water outlet covering 360 º spray area.

Scribe, or similar.

Template transparent with grid to 5 mm.

Timer, or similar.

4. TEST PIECES

At least three significant areas of the part, which are as flat as possible and separated enough to be representative of the entire sample surface, will be tested.

If the part is to be subsequently painted, the samples should be painted before carrying out the test, following the part or coating instructions.

5. TEST CONDITIONS

Once painted, the part is to remain under a controlled temperature of (23 ±2) ° C for 168 hours.

6. EXECUTION

A cross of St. Andrew incision will be made, preferably 150 mm in length, making sure to reach the substrate. For those parts whose dimensions do not permit this, the cross length must be the greatest possible.

Each incision of the sample is to be submitted to a temperature of 90 º C and a pressure of 80 bars from a maximum distance of projection of 100mm, with the water jet at different angles between 30 º and 50 º from the surface and with different orientations along the entire incision for 1 minute, to a maximum distance of 100 mm.

The water jet has to have a fan shape, with an aperture of 30 º.

The sample will be subjected to a visual inspection after the test, indicating any detachment area in cm^2.

7. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Total area of detachment in cm^2.

TEST METHOD

RESISTANCE TO SOLVENTS TEST

ME-Resistance to solvents-01

INDEX

1. SCOPE

This method only applies to plastic parts with some type of covering, as listed in the *Manual of technical criteria for the certification of body parts.*

2. DOCUMENTATION AND REFERENCE STANDARDS

ISO 2812-2. Paints and varnishes. Determination of resistance to liquids. Part 2: Water immersion method.

3. GENERALITIES

Parts made of plastic materials coated with primer, or coatings used as a base prior to application of the final finished paint, must go through a cleaning and degreasing process before being painted in the repair shop.

To verify that, during the cleaning and degreasing process, the coatings are not affected, or even removed, it is necessary to check the resistance of the primer and/or coatings to cleaning products.

The most common solvent components and cleaning products are indicated in paragraph four.

4. SOLVENTS USED IN THE TEST

The solvent types and the recommended testing times are:

Solvents used in the test	Test time (minutes)
Gasoline (95 octane)	10
Automobile Diesel	10
Acetone	10
White Spirit	10
Toluene	10
Xylene (isomers mixed)	10
N-butyl acetate	10
Methylene chloride	10

5. MATERIAL OF TESTING

The test material to be used is in accordance with ISO 2812-2.

6. EXECUTION

Testing and evaluation will be carried out in accordance with ISO 2812-2.

The samples are to remain submerged for 24 hours in a sealed container to prevent fuel evaporation.

The samples are to remain for 16 hours at the test temperature before being subjected to the effect of the solvents.

7. TEST REPORT

The test report must include at minimum the following information:

- Sample identification.
- Liquid of test.

- Time test.
- Assessment.

TEST METHOD

TEST WELD IN PLASTIC

ME-Plastic welds-01

INDEX

1. SCOPE AND PURPOSE

The test “weld in plastic” verifies the quality of the joint.

This method only applies to plastic parts, as listed in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The functionality of a piece is directly related to the resistance presented by the unions of the parts that compose it.

The test consists of verifying the welding joint’s effectiveness existing in the piece.

The test for adhesive joints is a comparative test between the part supplied by the vehicle manufacturer and the part to be certified (manufacturer).

3. TEST EQUIPMENT

The area where visual checks are carried out should be uniformly illuminated with a light that ensures an average level of illumination of 500 lux, a colour rendering index of 80, and colour temperature (K) from 3500 to 4000.

Caliper.

Bumper impact device.

4. TEST PIECES

One sample from the manufacturer and one sample from the manufacturer that applies for the certification are to be tested.

The pieces' samples are to have been produced by the same method used in mass production, and they are to be taken from a manufacturing batch of at least 100 pieces.

5. EXECUTION

5.1 VISUAL INSPECTION

This test consists of a visual inspection of the aspect that shows the weld joint, and verification if imperfections or irregularities in the union exist. Some of them are detailed below:

- Marks or distortion in the part. Bulges, hollows or irregularities in the external surface of the part, caused by an incorrect welding process.
- Molten material visible from outside. There is an overflow or remains of molten material along the external surface of the part that should not be visible.
- Unbonded surfaces. The material in the areas provided to join was not properly molten, so that there is no union between them.

5.2 WELD LOCATION

This test consists of a visual inspection of the number, length or area, and position occupied by the welding.

5.3 STRENGTH OF THE WELD JOINT

The strength of the weld joint will be verified by an impact test on the piece.

The weld joints in bumpers will be verified by assembling the bumper in the vehicle which is designed for the part. The impact is to be carried out according to test method ME-Bumper functionality.

The behaviour of the weld joints will be subject to a visual inspection after the impact (with or without damage).

6. RESULTS

The assessments of point 5.1. and point 5.2. will be carried out according to a rating scale from 1 (poor) to 5 (excellent).

7. TEST REPORT

The test report must include at minimum the following information:

- Samples identification.
- Rating point 5.1. and point 5.2.
- Behaviour of the union welded in the impact test.

TEST METHOD

VISUAL INSPECTION TEST

ME-Visual-01

INDEX

1. SCOPE AND PURPOSE

The visual inspection test assesses the aesthetic appearance of the parts and checks the similarity of shape between two equivalent parts on the same vehicle.

This method applies to “passive parts” as defined in the *Manual of technical criteria for the certification of body parts.*

2. GENERALITIES

The manufacturing process of parts affects the appearance and final finish of the product. These qualities, in turn, directly affect the product assessment of the user.

The visual inspection test is a comparative test between the part supplied by the vehicle manufacturer and the part to be certified (manufacturer).

3. TEST EQUIPMENT

The area where visual checks are carried out should be uniformly illuminated with a light that ensures an average level of illumination of 500 lux, a colour rendering index of 80, and colour temperature (K) from 3500 to 4000.

The photographic equipment used should have at least a resolution capacity of 3.2 megapixel, and the pictures should be taken with a minimum resolution of 640 * 480 pixels.

4. TEST PIECES

One sample from the manufacturer and one sample from the manufacturer that applies for the certification are to be tested.

The pieces' samples are to have been produced by the same method used in mass production, and they are to be taken from a manufacturing batch of at least 100 pieces.

The samples are to be provided by means of the same transport and with the same wrapping commonly used in its distribution to the market, moreover they should not have any damage caused by the transport.

5. EXECUTION

Visual inspection of the part supplied by the vehicle manufacturer and the part to be certified will be carried out at the same time, for the purpose of verifying and comparing similar characteristics.

The different aspects of a part will be analyzed by a visual inspection, verifying and assessing the characteristics established in paragraphs 5.1 to 5.4.

5.1 IDENTIFICATION OF THE PIECE

The identification data of the part and how to incorporate it (stamped or moulded) should be verified:

- Manufacturer's brand (logo, noun).
- Traceability of the part.
- Type of material which the plastic part is manufactured with (PP, PC, and so on).

5.2 GEOMETRY / SHAPE

The external and internal shape should be checked in a general manner.

The number and position of the holes should be checked.

5.3 FINISHING THE PIECE

The finish achieved in the part manufacture should be checked, inspecting the following areas:

- Surface of the part. The existence of imperfections or irregularities in the area should be checked. Some of these are detailed below:
    - o Distortions or dents. Any modifications of the initial shape designed for the part (hollows, bulges, or others).
    - o Cracks, crevices, holes. Breaks in the material.
    - o Scratches or grazes. Scratches or abrasions with slight loss of material on the surface.
    - o Creases and waves. The shape of the surface is adversely impacted by the waves.
    - o Incomplete surface. The shape of the part is incomplete, owing to a lack of material;, for instance, caused by a lack of filling of the material into the mould or by a too-small size of the sheet metal.
    - o Ejector marks. Trades (hollows or bumps) produced on the surface of the part owing to the removal device, in the manufacture.
    - o Plastic shrinkage. Damage to the material caused by shrinkage of the plastic, shaped like a hollow.
    - o Flashes in the plastic. Variations in colour with flash shapes on the surface of the material.
    - o Burnings in the plastic. Lines or areas with a darker shade on the surface of the material.

- Outline and edges of the part. The existence of imperfections or irregularities in the area should be checked. Some of these are detailed below:
    - o Burrs. An excess of material on the edges of the parts.
    - o Cracks. Breaks in the material.

5.4 COATINGS

The finish achieved in the application of the coatings should be checked, inspecting the following areas

- Colour. Colour and shade that show the surface of the coating.
- Brightness. The amount of light reflected from the surface (more or less gloss, or matte).
- Covering or extension. It should be checked that the coating completely covers the area that should be covered, according to the initial design of the part.
- Sharp cut lines. that The limit or cut line between the area with or without coating should be checked for shape and/or fading.
- Surface finish. The existence of imperfections or irregularities should be checked. Some of these are detailed below:
    - o Points with oxide. Areas where red iron oxide is seen.
    - o Burnings. Drillings or cavities on the surface.
    - o Blisters, boils. Small bubbles that are visible.
    - o Draining off. This indicates that the coating has slipped.

- Others particles and inlays. Inclusion of solid particles beneath or within the coating.
- Scratches. Scrapes in the coating.
- Flaking off. The coating is detached in strips.
- Cracks and crevices. Breaks in the coating in strips.
- Peeling. Small detachments of the coating.
- Orange peel. The surface shows a granular appearance similar to that of an orange peel.

6. RESULTS

The assessments of point 5.1. and point 5.2. will be carried out in accordance with a rating scale from 1 (poor) to 5 (excellent).

7. TEST REPORT

The test report must include at minimum the following information:

- Samples identification.
- Characteristics of part identification: Ways of identification and the data contained in them.
- Descriptions and photographs of those remarkable and different characteristics found between compared parts (the part supplied by the vehicle manufacturer and the part to be certified)
- Final assessment of the sample tested on the issues in point 5.1. and point 5.4.:
  - Part identification.

- Geometry / Shape.
- Part finish.
- Coatings.