VOLKSWAGEN
AKTIENGESELLSCHAFT

Group Standard

VW 50185

Issue 2009-07

Class. No.: 50321

Descriptors: open-air weathering, weather resistance, Florida, Kalahari, Arizona

Vehicle Parts

Resistance to Open-Air Weathering

Previous issues

VW 50185: 2000-10

Changes

The following changes have been made as compared to VW 50185: 2000-10:

– Completely revised

1 Scope

This standard describes the testing of resistance to open-air weathering of components of the passenger compartment, the vehicle skin, the engine compartment and of add-on parts installed in the vehicle. It must be applied in the development and standard production monitoring of vehicles, components and material samples. The application of this standard is intended to ensure sufficient resistance to open-air weathering.

2 Definitions

The following definitions are used for the application of this standard:

2.1 General information

Resistance to open-air weathering is tested on vehicles by default. If individual components are tested, special attention must be paid to suitable weathering conditions analogous to position and temperature conditions in the vehicle using appropriate auxiliary constructions.

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2.2 Resistance to open-air weathering (1 year)

Vehicles, assemblies (ASSY) and components are considered resistant to open-air weathering if no complaints are detected after a test duration of **one year** in humid heat (Florida) as well as after a test duration of **one year** in dry heat (Kalahari/Arizona).

Complaints include:

- Material changes in the form of cracks, holes, fractures, disintegration, softening
- Component deformations in the form of dents, waves, warping, displacement, gap changes
- Insufficient secure fit or changed adjustment forces
- Function failures
- Delamination (in the material or between composite layers)
- Deposits, blooming, if not removable by conventional customer use
- Color shifts (e. g. yellowing, reddening, fading to gray)
- Brightness changes, surface haze
- Changes in gloss level (deviation in gloss level < 10% from initial gloss value after 1 year open-air weathering permissible)

Deviations from these complaints are specified in drawings and/or Technical Supply Specifications.

2.2.1 Extended resistance to open-air weathering (for specific components)

The following materials/components are subject to the advanced requirement of more than one year of open-air weathering without complaints:

- Paints on the outside of the body: 3 years
- Paints on the outside of plastic add-on parts: 2 years
- Headlamps (plastic headlamp covering pane): 3 years
- Plastic panes (e.g. side window panes, panoramic sunroofs): 4 years
- For verification of new material concepts: 3 years (alternatively 3 summers)

2.3 Resistance to open-air weathering without major complaints (2 years)

On principle, after **2 years** of open-air weathering there must be no major complaints impairing the function of the component or causing its failure.

Major complaints include amongst others:

- Material decomposition
- Delamination
- Cracks, fractures or holes
- Function failure

3 Description

The drawings and/or Technical Supply Specifications of the affected parts must be provided with the following note:

Resistance to open-air weathering according to VW 50185: no complaints

Deviating or additional requirements must be specified in the drawings and/or Technical Supply Specifications.

4 Requirements

4.1 Validity

The requirement "Resistance to open-air weathering according to VW 50185: no complaints" applies to drawings and Technical Supply Specifications of all

- components
- textiles
- fiber materials
- sandwich systems
- coatings (protective and/or decorative)
- films
- foams

made of metal, polymers, glass/ceramics or natural materials (e. g. wood, leather).

4.2 Proof of resistance to open-air weathering

The proof is to be provided by open-air weathering of the assemblies (ASSY) and the components in as-installed condition on vehicles at the open-air weathering proving grounds used by the Volkswagen Group.

It is permissible to perform the risk assessment acc. to Section 5.2.2 "Components and material samples", for example on complete components/assemblies in the non-installed condition.

Prior to an open-air weathering test, the Volkswagen Group generally requires the supplier to provide a risk assessment based on the short-term test methods specified in Table 1, especially if new materials and/or new manufacturing methods and/or plants are used (as a part of the first sample test report or the production sample test report).

Table 1 – Short-term test method

Laboratory test according to PV 1303 ("high-temperature light exposure" for interior components)
Laboratory test according to PV 1306 ("tackiness test" for interior components based on PP)
Laboratory test according to PV 1323 ("sun test", fade to gray test for add-on parts, only for PP/EPDM-based and TPE materials)
Laboratory test according to PV 3929 ("Kalahari test", simulation of dry-hot climate, test for skin and add-on parts)
Laboratory test according to PV 3930 ("Florida test", simulation of humid-warm climate, test for skin and add-on parts)
Laboratory test acc. to VDA 621-430 "Tests for Coating Methods; Test for Resistance to Cracking of Clear Coats in Dual Layer Metallic Paint Coatings"
Weathering simulation based on DIN 75220
Environmental cycle test according to PV 1200
Environmental cycle test according to PV 2005
Aging at elevated temperature acc. to drawing or agreement, if it can be documented that damage occurring during open-air weathering can be simulated by this method (e. g. DIN 53497, Method B)

For systems on the vehicle exterior not used within the Group yet, compliance with the resistance to open-air weathering as required in Section Section 2.2.1 must be verified by performing the simulation cycles according to PV 3929 and PV 3930.

For parts of the vehicle interior, PV 1303 must be complied with accordingly.

5 Test

5.1 Proving grounds

The Volkswagen Group currently uses the following proving grounds for aging tests:

– Dry-hot climate: Arizona, Kalahari
– Humid-warm climate: Florida

5.1.1 Weather data

The operator of the proving grounds must continually record and document the weather data. The weather data must be made available to users of the proving grounds (Volkswagen intranet, CD-ROM, or hard copy). The data are archived in digital form by the proving grounds operators.

Weather data to be recorded:

– Air temperature
– Global radiation
– UV radiation (UVA and UVB)
– Wind velocity
– Wind direction
– Amount of precipitation
– Relative humidity

5.2 Aging of the test objects

5.2.1 Vehicles

To determine the most critical case, the darkest possible (preferably black) body colors must be selected. During the test, air exchange and/or recirculation is to be prevented in the vehicle interior (air vents closed). The doors, windows, and sunroofs must be kept closed (solar roofs must be de-activated).

5.2.1.1 Surface

– Grass (humid-warm climate)
– Asphalt (dry-hot climate)

The purpose of the grass is to increase the effect of humidity. The asphalt is used to increase the thermal stress on the vehicle.

The vehicle aging areas must be set up so that the vehicles are not standing in water for long periods in case of heavy rainfall.

The distance between the vehicles and/or to other objects (e. g. enclosure) must be selected such that even when the sun is low, the individual vehicles are not shaded by other vehicles or objects (with vehicles standing beside each other, it must be possible to open both doors without touching each other).

5.2.1.2 Orientation of the vehicles

In the northern hemisphere, the front of the vehicles should face southward and in the southern hemisphere northward. Other orientations must be agreed upon between the ordering entity and the proving grounds.

5.2.1.3 Component-specific particularities

Standard equipment to be evaluated (e. g. rear shelf) must not be impaired by optional equipment (e. g., window shades). If optional equipment affects the temperature conditions or radiation intensity in the vehicle interior, the test must be carried out separately or the test duration must be prolonged.

5.2.1.3.1 Parts to be tested statically

- Sun visors: Right side folded down, left side in contact with the headliner. For vehicles with a third sun visor the test must be carried out in coordination with the contact partner at the proving grounds.
- Head restraints: Front and rear passenger side retracted, front and rear driver‘s side pulled out. Rear center head restraint: retracted.
- Center arm rest: folded down
- Steering wheel: height and longitudinal adjustment in highest position
- Air vents: all vents closed
- Glass roof: interior sliding cover half-closed.

5.2.1.3.2 Parts to be moved regularily during resistance to open-air weathering test

- Power windows, glass roofs, liftgates, etc. must be actuated once per week.
- Load compartment cover/net partition: In the vehicle alternately rolled out and retracted for one week each; in the test chamber rolled out without regular actuation (alternatively in an additional vehicle)
- Window shades (side windows and rear window): alternately, one shade to be closed for one week each
- Tray table: Folded into service position for a minimum of 8 hours once per week

NOTE 1 Deviations from the above mentioned particularities and additional scopes must be agreed upon with the proving grounds.

5.2.1.4 Special case: convertible tops and large opening glass roofs

Weekly test cycle:

1st day:	Between 08:00 am and 09:00 am, open and close three times subsequently Between 03:00 pm and 04:00 pm, open and close three times subsequently
2nd day:	Between 08:00 and 09:00 a.m.: open - close - open (roof open for 8 hours) Between 04:00 and 05:00 p.m.: close - open - close
3rd until 7th day:	Roof closed

- Prior to opening, the roof is to be cleaned from coarse soiling (sweep - don't brush).
- Aerodynamic systems such as air deflectors, wind blockers, etc. are to be tested with the roof opened in extended/installed condition.
- The side windows are to be kept closed meanwhile the roof is open.

– Variable luggage systems must always be actuated as well when the roof is opened and closed.
– If opening the roof is not possible due to the respective weather conditions, the opening cycle is to be completed at another day of the same week.

NOTE 2 Electrically opening tops must be opened with the engine running.

5.2.2 Components and material samples

5.2.2.1 Shelves

Closed shelves (90° and 5° to the horizontal) are available for standard aging tests. The shelves are used for open-air weathering of skin and add-on parts.

The aging type for components and material samples is to be selected such that the radiation and temperature load is comparable to the situation on the vehicle (if required, insulate the bottom of the component). This must be guaranteed by comparative temperature measurements and must be documented.

Surface: grass (humid heat), gravel/asphalt (dry heat)

The surface may only be changed with documentation of suitability and in consultation with the Group laboratory.

Orientation: acc. to Section 5.2.1.2.

Examples:

– 90° shelves: wheel trim elements, radiator grilles, front and rear emblems, side turn signals, plastic fenders
– 5° shelves: headlights, taillamp assemblies, windshield wipers

Components with high thermal load such as roof moldings, protective side moldings or plenum chamber covers must be tested only on the vehicle. For such components the thermal load during aging in the shelves does not correspond to the real load in installed condition.

The distance of components towards each other and to other objects (e.g. enclosure) must be chosen such that the respective component is not shaded by other objects even when the sun is low.

5.2.2.2 Glazed test box

The glazed test boxes are used for open-air weathering of components of the vehicle interior. The aging type for components and material samples is to be selected such that the radiation and temperature load is comparable to the situation on the vehicle. This must be guaranteed by comparative temperature measurements and the definition of test conditions.

The test is carried out by the individual brands of the Volkswagen Group. External tests are only permissible in close coordination with representatives of the respective brands.

Surface: grass (humid heat), gravel/asphalt (dry heat)

Orientation: acc. to Section 5.2.1.2.

Boxes of different dimensions and glazings are available (see Table 2).

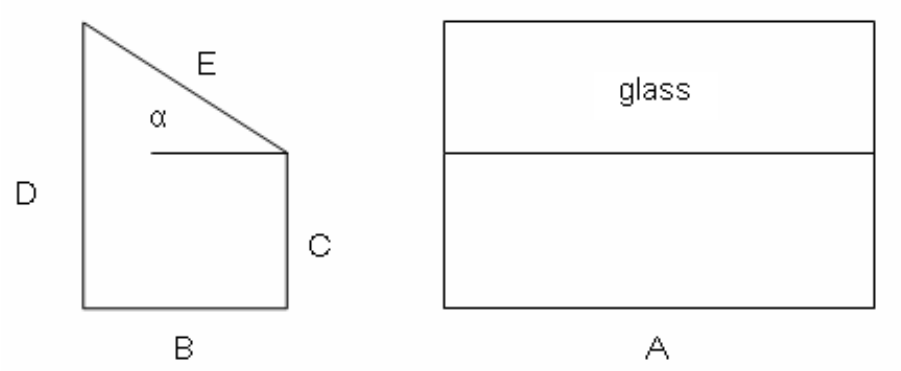
The test boxes must be both dust- and waterproof.

Standard glazing: Single pane glass, clear (thickness: 3,1 mm), laminated safety glass, clear (thickness: 4,9 mm), (see Figure 1). Use of other glazings in consultation with the proving grounds.

The test boxes are tried and tested for the standard aging of dashboards, steering wheels, load compartment covers and rear shelves.

Interior parts made of sensitive materials for high-quality equipment versions (wood trim, Alcantara, etc.) must be preferably tested in the vehicle since in most cases the load in the glazed box is too high (exception: rear shelf and dashboard).

Table 2 – Dimensions and glazings of test boxes (in mm)



Type	Glazing angle α	Width A	Depth B	Height 1 C	Height 2 D
Passenger vehicle, standard 1	30°	1650	625	443	803
Passenger vehicle, standard 2	36°	1900	1100	783	1583
MPV	30°	1650	850	633	1123
Mini van	45°	1900	850	533	1383
MAC	30°	1800	850	543	1033
T5	36°	1900	1000	683	1408

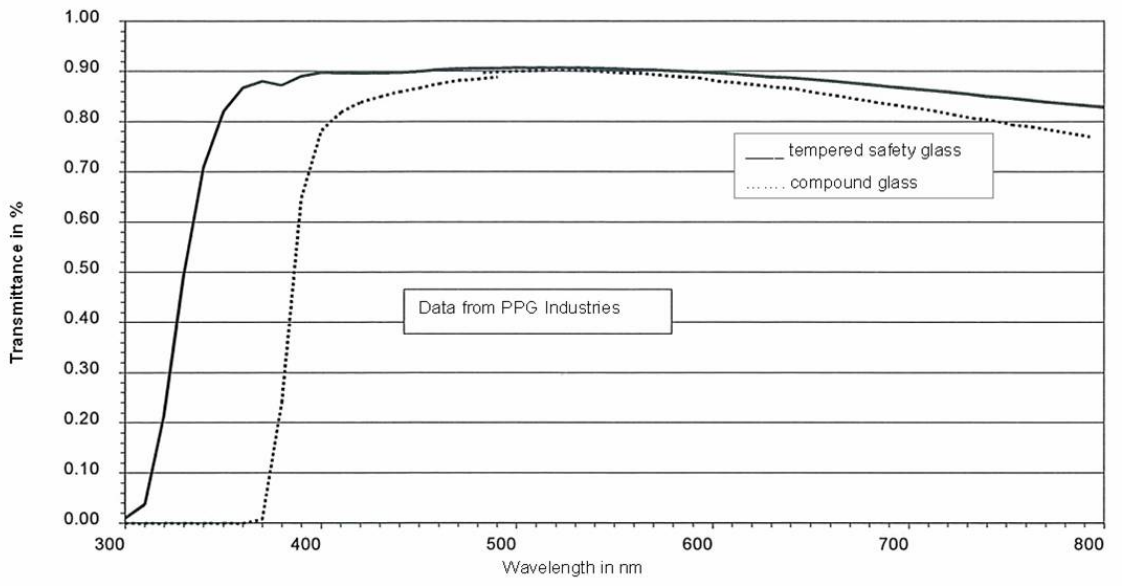


Figure 1 – Spectral light transmission of the standard glazings clear compound glass and clear tempered safety glass

6 Cleaning of test objects

See Table 3. The wet cleaning is performed with tap water.

Table 3

Vehicles	Skin	Wet cleaning at least once per week in summer (in winter according to agreement), preferably with pressure washer, otherwise with soft sponge. Stuck-on foreign matter to be soaked with water.
	Convertible top	Once per week: for textile/PVC convertible tops dry cleaning of the roof with a soft brush. Once per month: wet cleaning of the roof with water and a soft brush
	Passenger compartment	Vacuum cleaning once per month, wet cleaning once per month with a lint-free microfiber cleaning cloth and water. Extraordinarily distinct dirt films (e.g. tackiness, fogging) only upon analysis of the dirt film and in consultation with the purchaser.
	Vehicle interior window panes	Wet cleaning once per month with a lint-free microfiber cleaning cloth and water. Extraordinarily strong fogging only upon dirt film analysis and in consultation with the purchaser using an isopropanol (material no. 291001) - water mixture (90:10 vol.-%).
Test boxes	Glass	External: wet cleaning once per week, interior: if necessary. Extraordinarily strong fogging only upon dirt film analysis and in consultation with the purchaser using an isopropanol (material no. 291001) - water mixture (90:10 vol.-%).
	Samples	As necessary (in the same manner like the vehicle interior). Extraordinarily strong fogging only upon dirt film analysis and in consultation with the purchaser.
Shelves		Wet cleaning of the test objects at least once per week during the summer months (in the same manner like the vehicle).

7 Evaluation

The test objects (vehicles, assemblies, components and material samples) must be evaluated only by persons who have been specially trained at the open-air weathering proving grounds. The evaluation is performed only on washed, dry test objects in suitable weather conditions.

NOTE 3 Cracks in anodized deorative trims become visible only in direct sunlight and at maximum component temperature.

NOTE 4 Certain fault types become clearly visible only at certain daytimes (e.g. when the sun is low). Therefore, the affected components must be evaluated several times at different times of the day if necessary.

The complaints are to be characterized by:

– specification of the component
– type of damage
– evaluation of the damage acc. to the current ABC evaluation scheme (see Figure A.1)

The test objects are evaluated by default every 2 months by the proving grounds personnel. Deviations must be agreed upon between the ordering entity and the proving grounds.

Prior to aging the test objects (particularly the vehicles), their initial condition must be recorded by the ordering entity in a protocol (check list, pictures) ("zero-check").

Complaints regarding the initial condition of vehicles are to be marked on the vehicle using blue arrow stickers which are consecutively numbered (black writing).

Complaints occurring on the vehicle during the open-air weathering test are to be marked using white arrow stickers which are consecutively numbered (black writing) (starting with highest zero-check number).

The protocol is to be provided to the proving grounds together with the test object (escpecially in the case of vehicles). If required, changes in color and/or gloss level are to be documented using appropriate measurement devices. To this end, the respective measurement data must be recorded before and after the test (if required also during the test) on the test object according to VW 50190 and/or VW 50195.

NOTE 5 The arrows used for marking the complaints must be weather-proof. Printable lables have been proven to be suitable for this. Information on proven labels can be obtained from the proving grounds.

8 Documentation of the test results

Each ordering entity receives a report from the respective proving grounds, which documents the complaints with text and a minimum of 2 pictures.

The picture documentation always consists of an overview picture on which the damage area is clearly visible and a detail picture of the damage.

The damage evaluation according to the current evaluation scheme must be stated as well.

The documentation is carried out in digital form.

9 Returning the test objects

After completion of the open-air weathering test, the aged test objects are returned to the ordering entity.

10 Referenced documents

The following documents cited in this standard are necessary for application.

In this Section terminological inconsistencies may occur as the original titles are used.

Standards with the titles given in German are either only available in German or may be procured in other languages from the institution issuing the standard.

PV 1200	Vehicle Parts; Testing of Resistance to Environmental Cycle Test (+80/-40) °C
PV 1303	Non-Metallic Materials; Exposure Test of Passenger Compartment Components
PV 1306	Non-Metallic Materials; Exposure Test for Determining the Tackiness of Polypropylene Parts
PV 1323	Non-Metallic Materials; UV Radiation on Thermoplastic Material, Outside, in Sun Test
PV 2005	Vehicle Parts; Testing of Resistance to Environmental Cycle Test
PV 3929	Non-Metallic Materials; Weather Aging in Dry, Hot Climate
PV 3930	Non-Metallic Materials; Weathering in Moist, Hot Climate
VW 50190	Components of the Vehicle Interior Trim; Colorimetric Evaluation
VW 50195	Colorimetric Evaluation of Automobile Paint Coatings
DIN 53497	Testing of Plastics; Hot Storage Test on Mouldings Made of Thermoplastic Moulding Materials without External Mechanical Stressing
DIN 75220	Ageing of automotive components in solar simulation units
VDA 621-430	Tests for Coating Methods; Test for Resistance to Cracking of Clear Coats in Dual Layer Metallic Paint Coatings

Appendix A (normative) ABC evaluation key (evaluation categories)

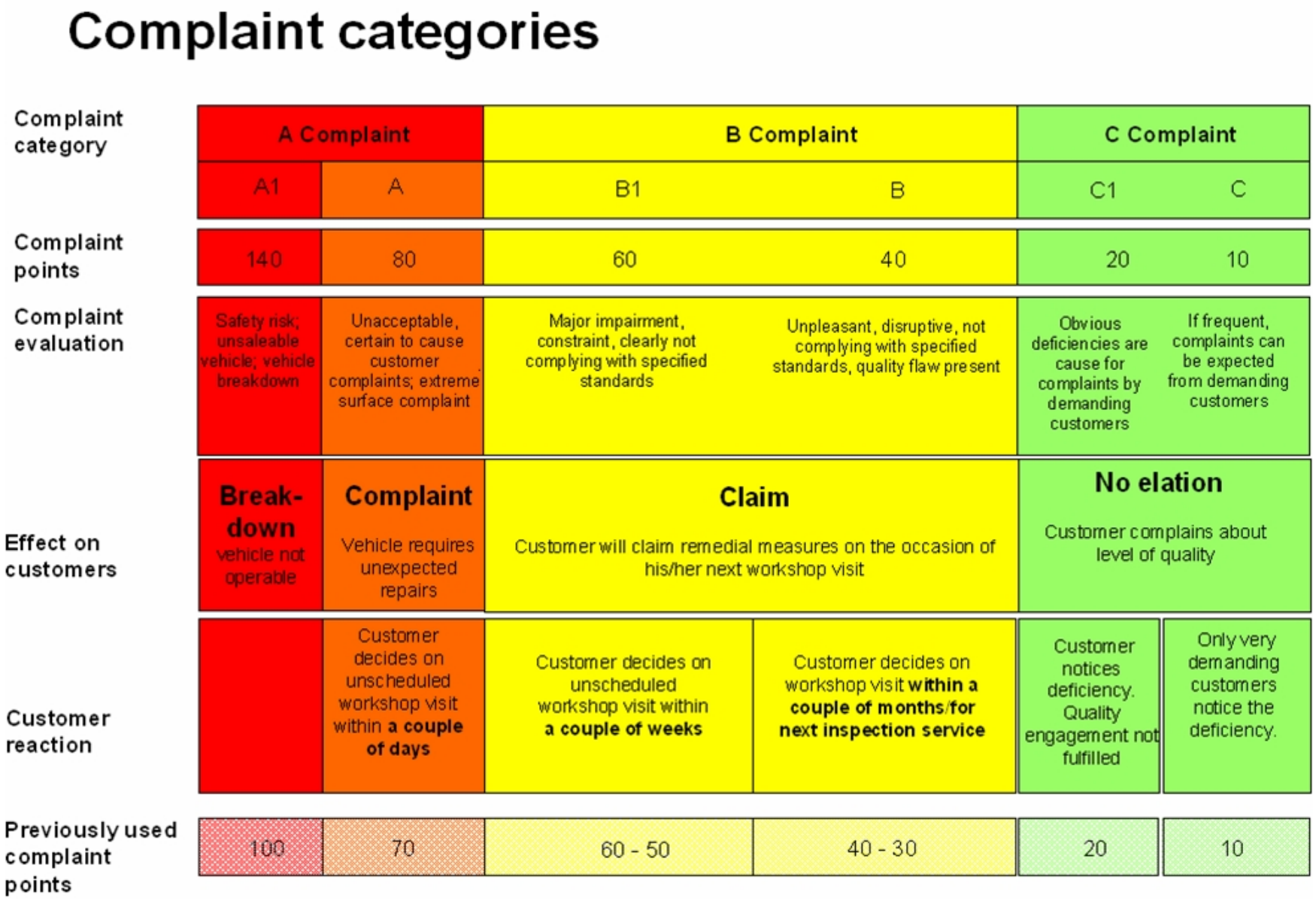


Figure A.1