

The Type Class System applied in the German Vehicle Insurance Industry

(fully and partially comprehensive vehicle insurance, third-party vehicle liability insurance)

(valid as of: **February 2018**)

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Preamble

Since 1973, vehicle type has been one of the parameters used for rating cars for vehicle insurance purposes in the Federal Republic of Germany. This practice has proven so reliable, that a type class system for describing the claims history for third-party vehicle liability insurance was also developed in 1996.

Generally speaking, the assignment of vehicle types to type class is solely based on their statistically measured claims history. However, this statistical base is not available for newly approved vehicle types. The methods described below are applied in this case.

The purpose of this document is to explain the German type class system and classification procedure for manufacturers and importers of motor vehicles.

1. Type class system

1.1 Type class indexes, trustees, classification committee

Every year the GDV provides its members with a non-binding vehicle risk premium tariff for third-party liability, fully comprehensive and partially comprehensive insurance. One element of the net risk premium contained therein is the claims requirement, meaning the cost of claims for a vehicle insured all year round. Among its many other risk characteristics, the vehicle type has a relevant influence on the claims requirement.

Type classes group together vehicle types with a similar claims requirement. This grouping means that the data base is enlarged per risk cell, such that a statistically reliable claims requirement can be calculated in each case.

With regard to third-party liability, fully comprehensive and partially comprehensive insurance, an independent trustee uses market data to annually determine if and to what extent the claims requirement of a vehicle type has increased or reduced in comparison to all other vehicle types. If the claims requirement of a vehicle type changes in comparison to all vehicle types, it may be reassigned to a different type class. The trustee is also responsible for assigning new vehicle types to the type class indexes.

The trustee role is currently performed by the auditors PricewaterhouseCoopers GmbH. The trustee is advised by a classification committee appointed by the same.

1.2 Assignment to the type class

Currently (as of 02/2018) more than 28,000 vehicle types are assigned to the various type classes.

For this purpose, the trustee determines a classification index for each vehicle type, to represent the claims requirement or the forecast claims requirement of the relevant stock. The classification index states by how many percent the forecast claims requirement of the relevant vehicle type, deviates from the average claims requirement for all vehicle types. In the majority of cases, this classification index results from the type statistics (see Chap. 2). If no statistical information is available, the classification index is determined by applying the methods for the initial classification (see Chap. 3). A vehicle type is assigned to a type class on the basis of class limits, in accordance with its classification index. The class limits are described in Appendixes 1 to 3.

2. Type statistics

2.2 Results

Type statistics are prepared annually for third-party liability, fully comprehensive and partially comprehensive insurance. As a result, the claims requirement for each vehicle type is calculated in relation to the average claims requirement of all vehicle types. The resulting claims requirement index states by how many percent the claims requirement of the relevant vehicle type deviates from the average claims requirement for all vehicle types. The average claims requirements index for all vehicle types is nominally set at 100.

Once a year, the newly determined type classes are calculated anew using the data of the last three statistical years. The results are provided to the insurers on June 30th.

The vehicle manufacturers then receive the results of the vehicle types of their own makes.

2.2 Data basis

The type class system only encompasses vehicles assigned by the German Federal Motor Transport Authority (Federal Motor Transport Authority, KBA) to category M1 (passenger vehicles) and M1G (off-road passenger vehicles), and which have a manufacturer code number (HSN) and a type code number (TSN). The Federal Motor Transport Authority assigns each vehicle type with unique HSN/TSN on the basis of technical criteria.

The calculations are based on historical vehicle insurance data provided by the members of the GDV. They provide this data to the GDV. The evaluations are each based on the data for non-fleet passenger vehicles for the last three statistical years. The data resources are split according to risk characteristics as well as the manufacturer and type code number (HSN/TSN). For the purpose of the evaluations, similar vehicle types belonging to one manufacturer are placed into design groups (see Chap. 3.1).

2.3 Formation of design groups

Design groups are used to group vehicle types with similar designs. The relevant criteria include the body style (saloon, estate, coupé, cabriolet), the engine type (petrol, diesel, hybrid, electric), the drive type (front-wheel drive, all-wheel drive, rear-wheel drive) and engine power.

Vehicle types of the same model series are assigned to the same design group, if they have largely similar technical characteristics, in case their claims requirements indexes are similar or it is anticipated this will be the case on the basis of previous or comparable models. To this extent, the composition of design groups differs for third-party liability, fully comprehensive and partially comprehensive insurance.

The composition of the design groups is reviewed when new type statistics are prepared. Vehicle types will be removed from their design group if their claims requirements index differs significantly from their design group, and they have at least one technical characteristic distinguishing them from the other vehicle types in the design group.

The split-off vehicle types form a new design group or will be assigned to other design groups of the same model series with equivalent claims requirement. Design groups comprising vehicle types from older model series will, if necessary, be assigned with other design groups of the same model series, so as to be able to make statistically reliable statements again.

3. Classification of new vehicle types

3.1 Classification time-frame

The classification committee meets five times a year, in order to classify new vehicle types. These meetings regularly take place in February, April, July, September and November.

To ensure that the classifications are performed smoothly

- for new vehicle models, the inspection of the model should take place at least 6 weeks prior to the planned classification meeting,
- the necessary documentation incl. work/painting times and replacement parts prices should be presented to the GDV 4 weeks prior to the scheduled classification meeting, and
- in the case of previously classified model series, the details concerning vehicle type, engine performance, engine capacity and fuel type should be presented to the GDV 3 weeks prior to the meeting.

The trustee sends the classification proposals to the manufacturers in good time, in order to respect a 14-day consultation period (for the manufacturers).

3.2 Classification procedure for new vehicle types

3.2.1 Preliminary remarks

Every year, the 28,000 vehicle types already existing (as of 02/2018) are joined by approximately 1,000 vehicle types new to the market, which are adopted into the type class systems for third-party liability, fully comprehensive and partially comprehensive insurance. Because there is no statistical information available for new vehicle types, the classification procedure described below is used to determine a claims requirements index as a classification index for the type class.

The claims requirements index for fully comprehensive insurance is strongly influenced by the repair costs following accidents. These repair costs depend on the deformation characteristics of the vehicle type in question and on the possible repair procedures. It is therefore only appropriate to apply statistical information about vehicle types if this pertains to the same model series and model generation. In this respect, other information – such as crash test-related – is used in the determination of the average claim index.

For this reason, the average claim index – and therefore the claims frequency index – is separately determined for fully comprehensive insurance. The claims requirements index is the product of both indexes divided by 100.

3.2.2 Classification through assignment to existing design groups

In the case of a new vehicle type, an initial examination is performed to ascertain if an assignment to a pre-existing design group is appropriate for the third-party liability, fully comprehensive and partially comprehensive insurance aspect. The criteria set out in Chap. 2.3 apply. In this case, the claims requirements index – and therefore the type class – corresponds to the design group index for the vehicle type.

If it is not appropriate to assign it to an existing design group, the new vehicle type will form its own, new design group, possibly together with other new vehicle types in the same model series.

3.2.3 Classification through formation of a new design group

3.2.3.1 Assumption of the index of previous/comparable models

This is the standard procedure for the determination of the claims requirements index for third-party liability and partially comprehensive insurance, as well as the claims frequency index for fully comprehensive insurance.

For the vehicle type to be newly classified, the statistically recorded index of the previous model will be applied, if the previous model has an anticipated comparable claims requirement. The applicable criteria include engine performance, drive type and the body shape.

If the previous model is not adequately comparable, or the data for the previous model is not statistically reliable, then other comparable models from the same manufacturer and/or of other manufacturers will be taken into account together with the previous model.

A classification based on comparable models is also possible for the claims average for fully comprehensive insurance. This method is appropriate inter alia, if statistical information is already available for a vehicle type of the same model series.

3.2.3.2 Determination of the average claim index with the type-damage calculation

Basic procedure

Every year, about 40 new model series for which there is no existing statistical information, come onto the market. This procedure for the calculation of the average claim index is generally applied for the relevant vehicle types for the fully comprehensive insurance.

The type-damage calculation is based on the anticipated repair costs for front, rear and side damage. The relevant aspects are

- the scope of the claim – which parts are damaged and how badly,
- the repair times and costs for the standard repair defined by the manufacturer, as well as
- the costs for replacement parts and paint materials.

The scope of the claim for front and rear damage is determined using the standardised RCAR 10° Structural Crash Test¹ (Appendixes 4 and 5), which simulates a typical low-speed accident. To enable defective parts to be identified, the vehicle manufacturer generally makes the "crashed" vehicle available for inspection.

¹ RCAR Low-speed Structural Crash Test Protocol (as amended)(<http://www.rcar.org/> see "Procedures")

If no relevant crash results are available, a "theoretical" scope of claim is assumed. At this juncture, the crash results or scopes of damage of comparable vehicle designs are applied to the vehicle type in question. In the case of a side-on crash, theoretical scope of damage is presumed, and this is identical for all vehicle types (Appendix 6).

For the calculation of the repair costs, the following, annually updated parameters are taken into consideration:

- Hourly working charging rates for bodywork and paint work,
- Costs of painting materials as a percentage of the labour costs for paint work,
- specific manufacturer-based differences between the actual calculated replacement parts prices and the recommended retail prices for replacement parts.

The total repair costs in the type-damage calculation comprise the following: 54% for front damage costs, 30% for rear damage costs and 16% for side damage costs. The average claim index for the vehicle type is produced from the repair costs thus calculated and the claims average regarding a car/car collision claim type.

Consideration of the RCAR Bumper Test

Alongside the RCAR 10° Structural Crash Test, the results of the RCAR Bumper Test² (Appendix 7) are used in order to take the performance of the car bumper system into consideration. Crash tests have demonstrated that the absence of bumpers on the rear of the vehicle, or the use of poorer performing bumpers regularly result in higher repair costs.

As a consequence, the result of the type-damage calculation is increased by one type class, if the rateable vehicle type does not meet the requirements of the RCAR Bumper Test; this is considered separately for the front and rear crash (Appendixes 8 and 9).

With this correction, the new claims requirements index is determined such that the vehicle type assumes the same relative position within the band range of the new type class. With an unchanged claims frequency index, the new average claim index is produced.

Engine power-based correction approach

The accuracy of the type-damage calculation is analysed regularly. At this point, the initial classifications index should correspond as much as possible with the classification index. This will reduce the number of reclassifications in the first few years following the initial classification of a vehicle type.

A parameter based on engine power in kW will be calculated using a regression analysis. The number of reclassifications will be reduced accordingly, if the claims requirements index is modified by the correction factor

$$SB_{kW} = 0.2 * [kW] + 5$$

before taking consideration of the RCAR Bumper Tests. The correction factor is split equally across the claims frequency and average claim index.

The parameters are regularly revised and updated as necessary (see Appendix 10).

² RCAR Bumper Test Procedure (as amended) (<http://rcar.org/>) see "Procedures"

Consideration of emergency braking systems

Autonomous Emergency Braking systems (AEB systems) duly recognize a potential collision with an obstacle or other road user, and warn the driver as necessary.

If the driver does not react, or does not react adequately, Autonomous emergency braking is initiated, which, depending on the speed difference, avoids a collision completely or reduces the collision speed.

Statistical analyses have shown that AEB systems have a positive effect on the claims requirement of vehicles on which they are fitted. In this respect, the anticipated positive effect in accident scenarios is factored in through a reduction of the initial classification of third-party liability and fully comprehensive insurance by one type class in each case, if

- the vehicle type has an AEB system fitted as standard,
- the AEB system fulfils certain minimum requirements regarding functionality, activation and deactivation,
- the previous/comparable vehicle is not fitted with an AEB system as standard (Appendix 11).

To this end, the relevant claims requirements index for third-party liability and fully comprehensive insurance will be reduced such that the vehicle type will assume the same relative position within the range of the new type class. With an unchanged average claim index, the new claims frequency index is produced in the case of fully comprehensive insurance. The AEB system can only be considered if the manufacturer provides all proofs, including references, as defined in Appendix 12.

3.2.3.3 Determination of the average claim index according to the high-price / high-performance method

Generally speaking, the determination of the average claim index for fully comprehensive insurance will not be accurately mapped in the case of particularly high-cost or high-performance model versions within a series.

This is because these model versions – due to the higher value of the vehicle – usually entail significantly higher costs for collision damage, than is the case with the standard motorised versions of a model series.

A high level of performance is also always reflected in the sales price, and therefore on the cost of repairing a vehicle. The average claim index of such a vehicle type is therefore determined by increasing the average claim index of the basic model by a percentage surcharge, corresponding to the added price of the high-price or high-performance version compared to the basis model.

4. Competencies

4.1 Maintaining the type class list

The trustee maintains the type class list and provides these to the insurers and the GDV by 30th of June each year. The type class indexes are publicly announced either by GDV or GDV DL-GmbH (www.typklassen.de).

The GDV also informs insurers five times a year of the classification results of the vehicle types newly classified during the year.

4.2 Type statistics

The GDV requests the insurers to submit their data for the preparation of the type class lists in accordance with the statistics guidelines of GDV. The data is subjected to a verification process.

The GDV performs the necessary statistical calculations, and provides the trustee with the results. The trustee monitors the organisational procedure of the determination of the figures and that the work steps are duly observed.

4.3 Classification committee

The trustee is responsible for convening the classification committee. The classification committee provides guidance to the trustee. The GDV forwards proposals to the classification committee regarding the composition of the design groups, the calculation of the claims requirements indexes per vehicle type and per design group.

4.4 Vehicle manufacturers and importers

Newly rateable vehicles are generally reported to the GDV by the manufacturer or importer or by the KBA. The manufacturer and importers are responsible for the accuracy of this data (incl. specifications concerning engine performance, engine capacity, fuel type, body type etc.).

The data for the type-damage calculation (see 5.1.) is supplied by the manufacturers and importers in the same way. The manufacturer and importers are also responsible for the accuracy of this data.

The basis of the type-damage calculation for the fully comprehensive type class are the crash tests according to the RCAR standard (see references 1 and 2, and Appendixes 4 and 5 as well as Appendix 7). Responsibility for performing these crash tests rests with the manufacturers and importers.

The test vehicle shall be the variant with the largest projected sales volume of the model series to be rated, and fitted with the standard equipment scope relevant for crash purposes.

5. Verification of manufacturers' information by the GDV

5.1 Information for the type-damage calculation

The sum of the type-damage calculation is critical for the fully comprehensive type class. For this reason, the GDV continuously and regularly reviews the accuracy of the manufacturers' information (where available), which forms the basis for the type-damage calculation. This is performed for every model. The review is performed using well-established repair costing systems supplied by Audatex and DAT.

Among the details supplied by the manufacturer / importer for the preparation of the type-damage calculation for the classification of new models with fully comprehensive insurance, are the following:

- Labour values for the replacement and/or removal/installation of replacement parts
- Paint job times (new parts, repair paint jobs)
- Replacement part prices (net, in Euro)

The initial classification procedure requires that the applied replacement part prices and the labour values remain unchanged for at least one year.

If it transpires that the initial classification of a rated vehicle was conducted using a different data basis, a new calculation will be performed for the initial classification. This will be the case, for example, if a review crash test shows that the damage pattern relevant to the determination of the repair costs differs significantly from the damage pattern presented by the manufacturer during the initial classification procedure.

The type-damage calculation may likewise have to be updated in the event of different working time specifications or non-approved repair procedures, or if replacement parts are not available or are considerably more expensive than stated.

If differences do emerge – irrespective of whether these concern the damage pattern, the labour times or the replacement parts prices – these shall be presented to the classification committee, and the implications for the classification will be examined. If deviations in standard labour times or the replacement parts prices result in difference type classes, the manufacturer / importers will be contacted and requested to eliminate the differences within a reasonable period of time. If the costing providers require a longer period of time in which to perform a correction, this shall be granted to them. The manufacturer / importer in question is expected to issue a written statement, specifying the point in time at which the differences are eliminated. If no correction takes place, the fully comprehensive type class for the model series in question, will be updated on the basis of the new calculation. A significant deviation in the damage pattern will in any case, result in the updating of the type class.

5.2 Verification tests

The classification committee reserves the right to subject every rated model to verification tests (15 km/h RCAR 10° Structural Crash Test, RCAR Bumper Test, AEB test according to RCAR / Euro NCAP test procedures for assisted emergency braking systems). For this purpose, a model will be purchased from an official licensed dealer, with specifications that more or less correspond with those of the manufacturer's test vehicle. GDV will commission a service provider to purchase the vehicle, perform the tests and the subsequent repairs, and to conduct the resale.

German Insurance Association
(Gesamtverband der Deutschen Versicherungswirtschaft e.V., GDV e. V.)
Berlin, February 28, 2018

**Appendix 1: Index points of the type classes for the fully coverage
(as february 2018)**

<u>Type class</u>	<u>Type class limits</u>	
10	up to	39,4
11	39,5	53,0
12	53,1	62,6
13	62,7	68,9
14	69,0	74,2
15	74,3	80,1
16	80,2	88,2
17	88,3	96,7
18	96,8	105,4
19	105,5	116,4
20	116,5	125,1
21	125,2	135,8
22	135,9	145,2
23	145,3	156,1
24	156,2	169,5
25	169,6	184,2
26	184,3	206,2
27	206,3	232,2
28	232,3	276,3
29	276,4	330,0
30	330,1	377,4
31	377,5	438,6
32	438,7	516,5
33	516,6	696,6
34	more than	696,7

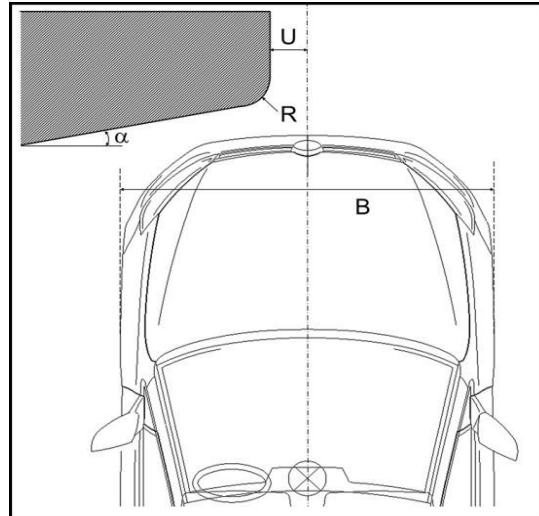
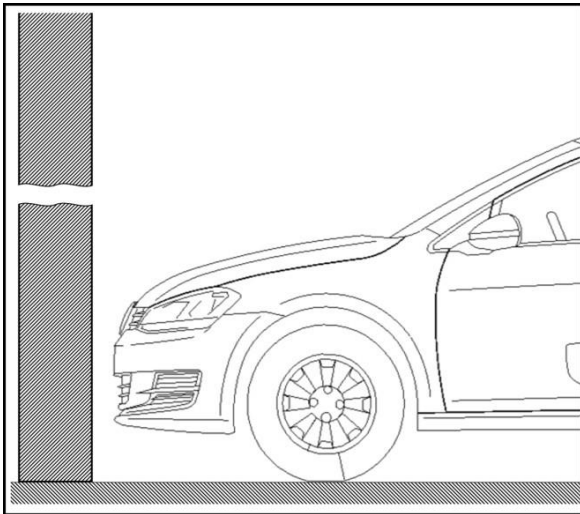
**Appendix 2: Index points of the type classes for the partially coverage
(as february 2018)**

<u>Type class</u>	<u>Type class limits</u>	
10	up to	36,3
11	36,4	47,4
12	47,5	56,2
13	56,3	65,2
14	65,3	75,1
15	75,2	87,4
16	87,5	97,1
17	97,2	109,6
18	109,7	122,1
19	122,2	133,5
20	133,6	147,7
21	147,8	166,3
22	166,4	183,5
23	183,6	210,8
24	210,9	241,6
25	241,7	271,7
26	271,8	306,6
27	306,7	354,8
28	354,9	416,4
29	416,5	486,9
30	487,0	628,7
31	628,8	763,8
32	763,9	975,4
33	more than	975,5

**Appendix 3: Index points of the type classes for the third party liability
(as february 2018)**

<u>Type class</u>	Type class limits	
10	up to	49,4
11	49,5	61,8
12	61,9	71,5
13	71,6	79,7
14	79,8	86,5
15	86,6	91,9
16	92,0	97,6
17	97,7	103,6
18	103,7	110,3
19	110,4	117,9
20	118,0	125,3
21	125,4	133,2
22	133,3	143,9
23	144,0	165,3
24	165,4	195,9
25	more than	196,0

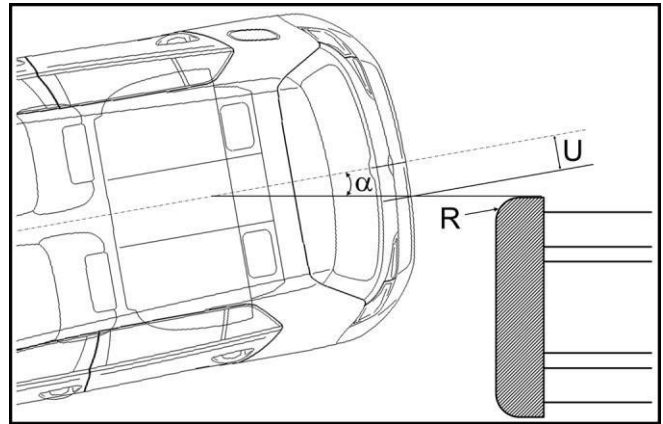
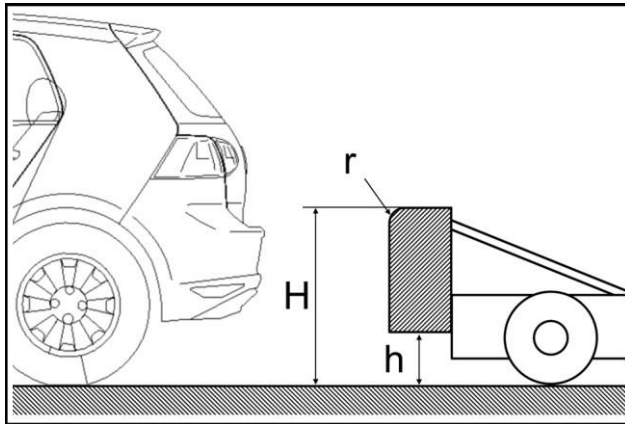
Appendix 4: Front-repair crash test 10° for the type-damage calculation
(AZT Automotive GmbH, Allianz Zentrum für Technik)



Test arrangement	The front of the vehicle is driven against a rigid angular barrier with an overlap of 40% on the driver`s side. Test houses may decide to test the other side of the car, if appropriate.
Referent width Overlap	B = Vehicle width without mirrors O = 0,40 x B ↔ U = 0,1 x B
Vehicle	F = Vehicle Free of any exterior or propelling force at the moment of impact
Condition	Serviceable, battery connected, ignition „on“. Safety equipment (belt pretensioner, airbags) in function. Air conditioning system drained and pressure checked. Brakes released, gear lever in neutral position.
Load	1 Dummy, 50% male, driving position, secured with seat belt Fuel tank filled with petrol or diesel, water also permissible.
Measurements	Axle alignment and body gaps checked before and after impact. Body alignment checked before and after impact. Actual vehicle`s mass in test configuration. Vehicle acceleration on left and right sill (base of the “B” post)
Barrier dimensions	
Barrier Angle	α = 10° (also permissible at short barrier surface -⊖-)
Height	Barrier clearly higher than the vehicle front
Depth	No contact of the vehicle front with the wall adjacent to the barrier
Rounding	R = 150 mm
Impact speed	V _F = 15,0 km/h (+1/-0 km/h)
Remark:	The front door on the impacted side shall be opened completely after the crash test.

Appendix 5: Rear repair crash test 10° for the type-damage calculation

(AZT Automotive GmbH, Allianz Zentrum für Technik)



Test arrangement	The rear is impacted by a mobile barrier on the driver`s side with an overlap of 40%. Test houses may decide to test the other side of the car, if appropriate
Referene width Overlap	$B = \text{Vehicle width without mirrors}$ $O = 0,40 \times B \leftrightarrow U = 0,1 \times B$
Vehicle	$F = \text{Vehicle}$
Condition	Serviceable, battery connected, ignition „on“. Safety equipment (belt pretensioner, airbags) in function. Stationary, brakes released, gear lever in neutral position
Load	1 Dummy, 50% male, driving position, secured with seat belt. Fuel tank filled with petrol or diesel, water also permissible.
Vehicle Angle	$\alpha = 10^\circ$
Measurements	Axle alignment and body gaps checked before and after impact. Body alignment checked before and after impact. Actual vehicle`s mass in test configuration. Vehicle acceleration on left and right sill (base of the “B” post).
Mobile barrier	StW = Mobile barrier Free of any exterior or propelling force at the moment of impact.
Mass	$m_{StW} = 1.400 \text{ kg}$, center of gravity “S” in the middle plane.
Sled dimensions	Wheel base $Y \geq 1,5 \text{ m}$ Width $A \geq 1,2 \text{ m}$
Barrier dimensions	
Height	$H = 700 \text{ mm}$
Lower edge	$h = 200 \text{ mm}$
Rounding	$R = 150 \text{ mm}$ $r = 50 \text{ mm}$
Impact speed	$V_{StW} = 15,0 \text{ km/h } (+1/-0 \text{ km/h })$

Appendix 6: Type damage calculation: side damage- scope of claim (trolley)

Spare parts side damage (driver side) in €, without tax:

- side wall or
- side sill entry area (partialm repair)
- sill cover
- step plate-sill inner
- door
- seal entry car body
- seal door
- door outer cover
- window outer belt/ moulding
- windows guide
- door window
- window lifter
- engine for window lifter
- door handle outer
- door lock
- key cylinder
- striker
- door hinge lower
- cover B-pillar door

work items (h):

- remove and install door
- new door including parts exchange
- side sill partial repair between A-B-pillar or if not possible
- complete side sill
- remove & install trim parts, parts in repair area

paint times (h):

- door
- handle (if necessary)
- side sill
- side sill cover (if necessary)
- preparation times

• **proportion spare parts:**

- | | | |
|--|-----------------|-------|
| <input type="checkbox"/> side cover/ protection moldings | rate in _____ % | price |
| <input type="checkbox"/> other door window | rate in _____ % | price |
| <input type="checkbox"/> sill cover | rate in _____ % | price |

Appendix 7: RCAR Bumper Test

AZT (RCAR) Bumper Test Front/ Rear



Main test parameter:

Test arrangement: Vehicle impact on a rigid bumper barrier with energy absorbing element centerline of the car aligned with centerline of the barrier (+/- 50 mm)

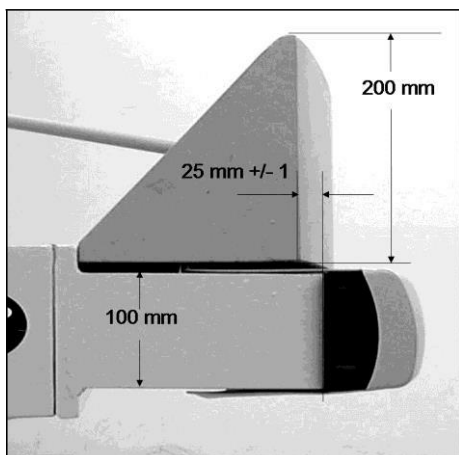
Vehicle ride height: at construction level as defined by the manufacturer (+/- 5 mm)
(Test houses may decide to test the vehicle „as delivered“)

Condition and load: Tire pressure: standard, vehicle serviceable, battery connected
Tank filled with fuel or water (>90%)
1 Dummy 75 ± 5 kg (e.g. 50% male) in driver position, secured with seat belt

Barrier ground clearance:

Front crash	H = 455 mm (+/- 3 mm)
Rear crash	H = 405 or 455 mm (+/- 3 mm) (USA optional 455 mm)

Impact speed: **V = 10.0 km/h (+/- 0.5 km/h)**



Appendix 8

Integration of the RCAR bumper tests into the initial rating procedure used by the German motor insurance industry for fully comprehensive vehicle insurance

Issue November 2017

0. Introduction

The classification commission of the German motor insurers sees the RCAR bumper test as a suitable method for assessing how well a vehicle's bumper system protects the vehicle from damage in low-speed impacts in real-world crashes. The goal is to encourage vehicle manufacturers to further improve the level of self-protection of passenger cars and to increase the vehicles' geometric compatibility in collisions.

The RCAR bumper test is a necessary complement to the current RCAR 10° structural test necessary to avoid undesirable developments in the bumper system, such as too small or too weak bumper beam or even no bumper beam at all.

The applied rating procedure is based on the RCAR paper "RCAR Bumper Test", Issue 2.1 and Appendix 1 "Dimensions and Specifications of the RCAR Bumper Barrier System", both as amended, with the following additions and explanations.

1. Application

The RCAR bumper test is used in addition to the RCAR 10° structural test in determining the initial classification of new cars into the comprehensive insurance type classification system as of 01 January 2010.

The RCAR bumper test shall be used for all vehicles, which are homologated as passenger cars in the European type approval procedure (M1 or M1G) and listed in the type classification list.

2. Requirements

In order to pass the bumper test, a vehicle must fulfill the requirements in 2.1 through 2.3 below for both the front and the rear bumper test:

2.1 Geometric requirements

- a) The relevant bumper engagement of the bumper beam with the barrier must be ≥ 75 mm (see section 5.1.1 of the RCAR paper). For the German market, the relevant position of the barrier is that described in section 6.2 of the RCAR paper, with a barrier ground clearance of 455 mm for frontal impacts, and 405 mm for rear impacts.

Alternatively:

- b) In cases where the relevant bumper engagement is ≤ 75 mm, but a positive test result is expected, the qualifying bumper beam height shall be ≥ 100 mm (see section 5.1.1 of the RCAR paper).

2.2 Dynamic test

When the vehicle collides with the barrier, the vehicle/bumper beam must not underride or override the barrier, with the barrier subsequently intruding into the vehicle above or below the bumper beam. A purely vertical movement of the test vehicle along the barrier without subsequent forward movement is acceptable.

2.3 Damages to vehicle following the test

- a) Front impact test:

- No damage to the vehicle structure: The vehicle structure includes, in particular, the main chassis members as well as any parts or panels welded to the vehicle (e.g. crash boxes). Any change in the position of the main chassis members by more than ± 3 mm (tolerance, measurement before and after the test) is considered damage. Components/panels that, for assembly-related reasons, are welded on at a few welding points but are installed with screws/bolts in case of a repair, are not considered welded parts.
- No damage to cooling package, consisting of intercooler, A/C and radiator. Damage to fastening elements of the cooling packages or individual elements thereof is acceptable if it can be repaired using screw-on replacement fasteners.

- b) Rear impact test:

- No damage to the vehicle structure: The vehicle structure includes, in particular, the main chassis members as well as any parts or panels welded to the vehicle (e.g. rear end panel, floor panel, etc.).
- No damage to the boot lid or tailgate caused directly by the barrier. Indirect damage, caused for instance by wrinkling of the bumper cover, is tolerated.

3. Effect on the initial rating of vehicles for fully comprehensive insurance

The RCAR bumper test is introduced only in the initial rating procedure for fully comprehensive insurance, as a complement to the RCAR 10° structural test. If the vehicle fulfills the bumper test requirements set forth in section 2 above, the result of the type damage calculation from the RCAR 10° structural test will be used without any changes. If the test requirements are not fulfilled, the result of the type damage calculation from the RCAR 10° structural test is increased by one type class each for the front impact and the rear impact tests. Therefore, the impact of the bumper test is limited to a maximum of +2 type classes.

4. Test vehicle

The test vehicle must be the variant with the largest projected sales volume of the model series to be rated. The ride height of the test vehicles differs from the nominal ride height of the vehicle by maximum +/- 10 mm, as specified by the manufacturer (see section 4.0 of the RCAR paper). If different suspension setups are available, the standard suspension setup is to be used. The test vehicle must be fitted with air-conditioning. For vehicles with adjustable body height (e.g. in case of air suspension), the vehicle must be set to normal position at city speed (50 km/h).

Where, in case of variants with charged engines, an intercooler must be taken into account, these variants shall be assessed separately based on the remaining clearances between the bumper beam and the AC condenser. Body variants within a model series, which have a different nominal ride height (i. e. Coupes) will be assessed separately also. The vehicle manufacturer may perform simulations or additional tests to be on the safe side.

5. Presentation of the test results

The GDV will inspect the test results either directly on the crash vehicle or through detailed photo/video documentation of the test. In this case, the test vehicle can be repaired and reused for the RCAR 10° structural test. Specifically, the following points must be documented in an adequate manner:

- Design height (nominal ride height) of the test vehicle under test conditions as specified by the manufacturer.
- Actual ride height of the test vehicle under test conditions (photo of the measurement)
- Qualifying bumper beam height (see sections 5.1.2 through 5.1.4 of the RCAR paper)
- Relevant bumper engagement with the barrier (see section 5.1.7 of the RCAR paper; photo showing the test vehicle with removed bumper cover face-to-face with the barrier, including photographic documentation of the measurement)
- Video footage of the bumper test in side view (y axis) and top view (z axis) allowing to assess override/underide.
- Logs detailing the measurements of the vehicle structure (underbody) before and after the crash test (e.g. crash boxes left and right, or other suitable points, as well as at least two additional points along the x axis of the main chassis members). If the same vehicle is used for the 10° structural test, the post-measurements of the bumper test can be used as pre-measurements for the 10° structural test.
- Gap measurements before and after the crash.
- Documentation of damaged/undamaged vehicle parts (see section 2.3) before and after the crash with meaningful photos.

Appendix 9

Documentation of the results of the RCAR Bumper Tests for initial classification into the GDV type class system

- References:**
- RCAR Bumper Test Procedure Issue 2.1 - as amended
 - Appendix 1: Dimensions and Specifications of the RCAR Bumper Barrier System Issue 2.1 – as amended
 - Integration of the RCAR Bumper Tests into the initial rating procedure of the full comprehensive coverage of the German motor insurance (GDV paper “Integration of the RCAR Bumper test” November 2017 – Appendix 8)

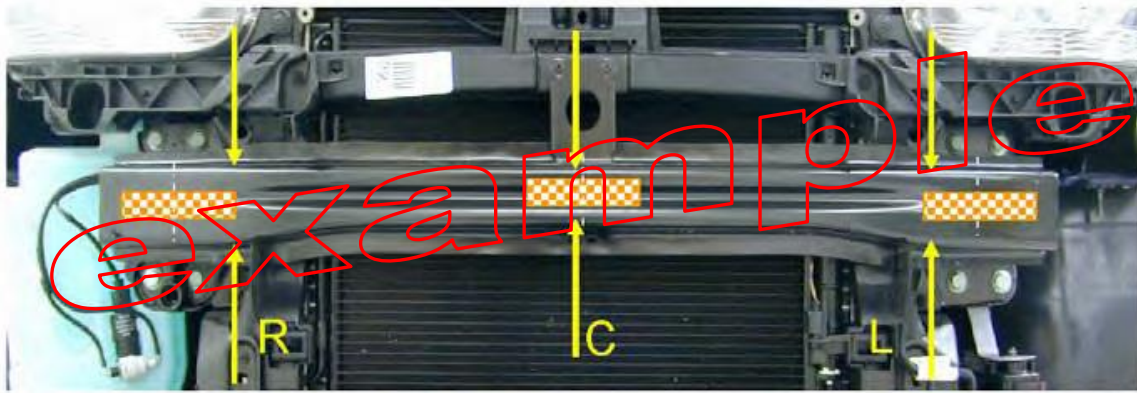
Vehicle Data:

Manufacturer:	
Modelname:	
Type:	
Version:	
Number of doors:	
Chassis suspension:	
Enginepower [kW]:	
Displacement:	
Fuel type:	
Drive:	
Vehicle nominal ride height	Nominal dimension incl. measure point
Test vehicle ride height	Picture documentation of measurement

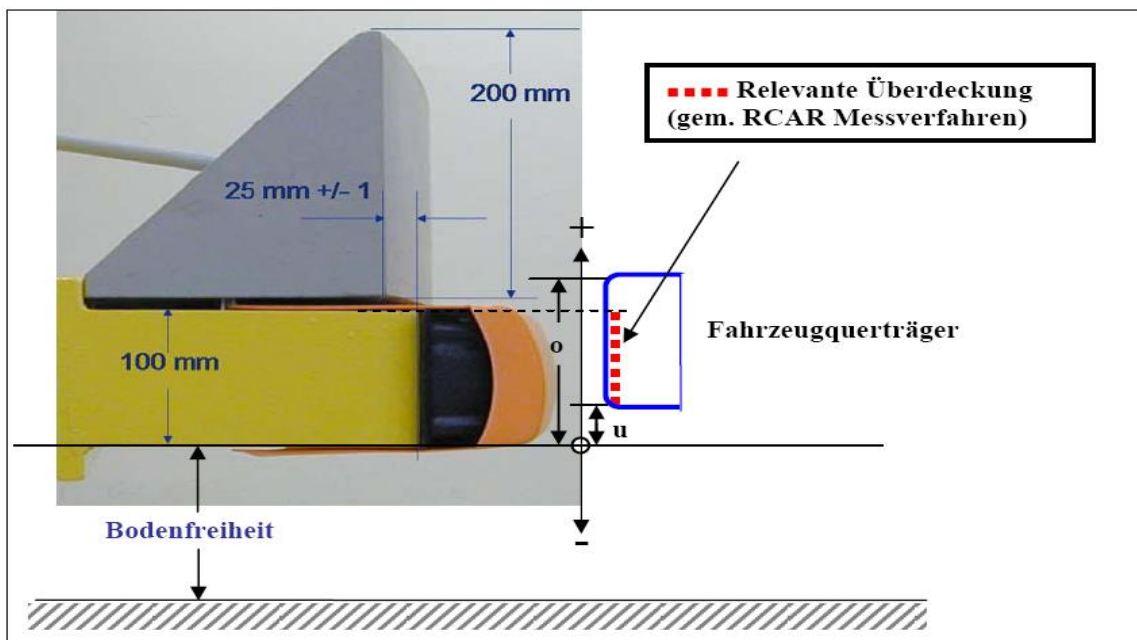
Front test: crash weight incl. Dummy [kg]	
Front test: crash speed [km/h]	
Rear test: crash weight incl. Dummy & if applicable free wheel support [kg]	
Rear test: crash speed [km/h]	

Bumper beam front:

Drawing or picture of bumper beam:



Bumper beam height measuring point right [mm]:	
Bumper beam height measuring point center[mm]:	
Bumper beam height measuring point left [mm]:	
Qualifying bumper beam height per RCAR [mm]:	
Barrier ground clearance [mm]:	
Position bumper beam to barrier bottom edge (u) Measuring point right / center / left [mm]:	
Position bumper beam to barrier top edge (o) Measuring point right / center / left [mm]:	
Relevant engagement of bumper beam RCAR [mm]:	



Measurements before & after impact

- Body gaps fender / front door LH and RH
- Side member LH & RH at side member flange and min. 2 other measuring points in x-direction (unstressed condition)

During testing:

- Lineup with & without bumper cover (fascia)



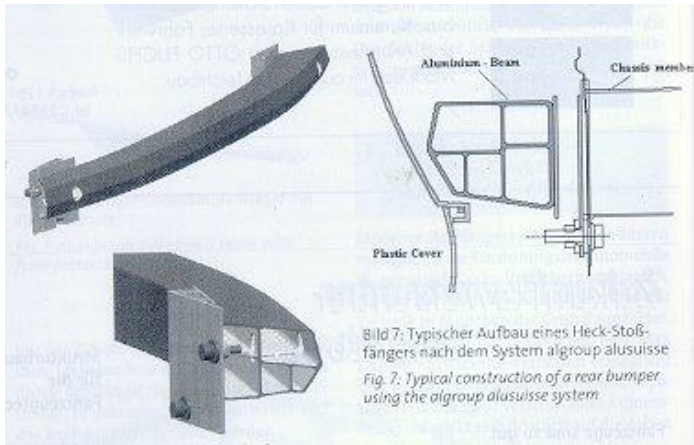
- Video documentation side (y-direction) & top view (z-direction)
Remarks:
 - Display detail side view: Front incl. front wheel
 - Front wheel mark with white dot on tyre wall
 - Display detail top view: complete vehicle width incl.
 - windscreen bottom edge
- Measurement of vehicle deceleration in x- and z-direction at RH or LH side member behind flange to establish path of vehicle structure with 2-time integration
- Judgement of override/underide based on video and path.
Criteria: Vertical movement of test vehicle during forward motion must be smaller than relevant engagement as per RCAR.

Documentation of damage after impact:

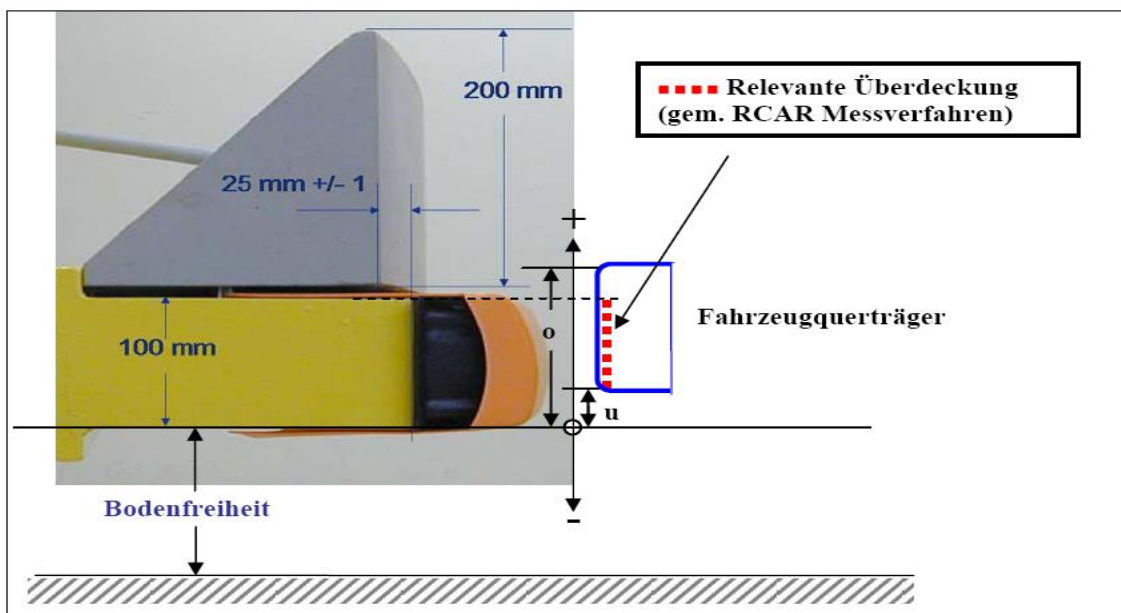
- List of damaged parts
- Front view with & without bumper beam
- Pictures of damaged parts
- Pictures of cooling package (in case of movement also from back side and from fixing points)
- Pictures of side member flange LH & RH

Bumper beam rear

Drawing or picture of bumper beam:



Bumper beam height measuring point right [mm]:			
Bumper beam height measuring point center [mm]:			
Bumper beam height measuring point left [mm]:			
Qualifying bumper beam height per RCAR [mm]:			
Barrier ground clearance [mm]:			
Position bumper beam to barrier bottom edge (u) Measuring point right / center / left [mm]:			
Position bumper beam to barrier top edge (o) Measuring point right / center / left [mm]:			
Relevant bumper engagement RCAR [mm]:			



measurement before and after Test:

- Body gaps rear fender / rear door LH & RH
- Body gaps tailgate / body
- Side member LH & RH at side member flange and min. 2 other Measuring points in x-direction (unstressed condition)

During testing:

- Lineup with & without bumper cover (fascia)



- Video documentation side (y-direction) & top view (z-direction)
Remarks:
 - Display detail side view: Rear incl. rear wheel
 - Rear wheel mark with white dot on tyre wall
 - Display detail top view: complete vehicle width incl. rear screen bottom edge or roof edge
- Measurement of vehicle deceleration in x- and z-direction at RH or LH side member behind flange to establish path of vehicle structure with 2-time integration
- Judgement of override/under ride based on video and path.
Criteria: Vertical movement of test vehicle during rearward motion must be smaller than relevant engagement as per RCAR.

Documentation of damage after impact:

- List of damaged parts
- Rear view with & without bumper beam
- Pictures of damaged parts
- Pictures of Rear panel
- Pictures of tailgate
- Pictures of side member flange LH & RH

Appendix 10: Application of CC (Claims Costs) method in the type-damage calculation:

1. From type damage calculation: CF_{TSB} , CA_{TSB} , CC_{TSB} .

2. Add the correction factor to the CC:

$$CC(SB_{kW}) = 0,2 * [kW] + 5.$$

3. The new CC-Index-kW is calculated as follow:

$$CC_{TSB-kW} (SB_{TSB-kW}) = CC_{TSB} (SB_{TSB}) + CC_{kW} (SB_{kW})$$

4. This CC_{TSB-kW} is, if necessary, corrected with Bumper Test Result.

5. The final CC-Index definite the type class (see appendix 1).

This is an **example** (excel sheet can provided):

example type
damage cal-
culation

196 . meeting of classification committee fully compr. insurance proposal



Konz.-Nr. / Hersteller : 123 / example AG

Modell : FF (Model XY 2.0), 100 kW / 136 PS, 1999 ccm

TSN: 1234-BBN = KG

overall-CA: 3.138,00 € CA-reduction: -11,6 % charge for recom. retail price: 6,0 %
hrs-repair: 109,00 € hrs-paint: 118,00 € tax 19,0 %

remarks example with no failed Bumper Test and AEB-Bonus.

front damage repair costs:	710,68 €		
front damage paint costs:	792,96 €		
front damage spare parts:	3.224,26 €		
sum front damage:	4.727,90 €	54 %	2.553,07 €
side damage repair costs:	1.253,50 €		
side damage paint costs:	941,64 €		
side damage spare parts:	2.216,03 €		
sum side damage:	4.411,17 €	16 %	705,79 €
rear damage repair costs:	245,25 €		
rear damage paint costs:	363,44 €		
rear damage spare parts:	704,61 €		
sum rear damage:	1.313,30 €	30 %	393,99 €
sum - type damage - CA:			3.652,85 €
(incl. Tax)			3.842,65 €

Index CA/TSB:	122,5
Index CF:	144,5
Index CC:	177,0

Index CA: (incl. CC-kW)	134,1	(27)
Index CF: (incl. CC-kW)	158,1	
Index CC-kW: (incl. kW) 150 kW; CCkW =	35,0	212,0

Bumper Test Front: passed TKL Korrektur: + 0
Bumper Test Rear: passed TKL Korrektur: + 0

Index CA: (incl. Bumpertest)	134,1
Index CF:	158,1
Index CC: (incl. Bumpertest)	212,0

classification with AEB-System

Index CA: (incl. Bumpertest und kW-Aufschlag)	134,1
Index CF: (incl. AEB-Abschlag)	141,0
Index CC: (incl. Bumpertest und AEB-Abschlag)	189,1

type class fully comprehensive:

26

remarks for Index CF out of statistic: CF = 144,5 gemittelt aus

HSN/TSN	Typ	kW	JE	SH	TKL
1234-ABC	XY	150	10.000	144,5	24

Appendix 11:

Consideration of driver assistance systems
“**Autonomous Emergency Braking function – AEB system**”
at the initial classification procedure
(status as of January 2018)

Description:

The AEB system duly recognizes a potential collision with an obstacle or other road user travelling in the same direction (parallel traffic), and alerts the driver, if necessary. If the driver does not react, or does not react adequately, automatic emergency braking is initiated, which, depending on the speed difference, avoids a collision completely or reduces the collision speed.

Requirements:

- Standard equipment or 100 % equipment of all vehicles, at least at the type key number (TSN) level.
- Automatic system activation upon ignition start
- Deactivation option:
 - o The AEB system can be deactivated only by performing at least 3 discrete actions or selection options in the system control or by actuation of a control switch for at least more than 2 seconds (so called long push).
 - o During deactivation the new status of the AEB system is shown to the driver by a visual notification / warning.
 - o Whenever the ignition is started, the AEB system must be active again.
- The AEB system is activated at a speed of $v \leq 10$ km/h and more.
- Reacts to stationary and ahead-driving two-track vehicles in parallel traffic.
- **Complete avoidance of a collision with a stationary vehicle up to a speed difference of at least ≥ 30 km/h**
- Documentation and description of the system's efficiency through manufacturer self-assessment

Self-assessment, i. a.:

- Proof of the automatic braking function's efficiency according to RCAR/Euro NCAP test procedures for advanced emergency braking systems.
- What other targets are recognized?
(One-track motor vehicles, bicycles, pedestrians etc.)
- What are the limitations?
(Distance, speed, cross traffic, overlap rate, light and weather conditions etc.)
- If alert function is included:
 - o Time and parameters of the collision alert
 - o Type of collision alert (haptic, visual, acoustic)

- Description of the pre-fill of the brake system, if a potential collision is detected.
- Full description of the deactivation strategy in case of driver reaction.
- What sensors are being used?
- (Place of installation, spare part price, replacement time, calibration in case of repair, cost in case of replacement of the windshield, if part of the system is installed at/behind the windshield)
- Existing, system-specific capabilities and efficacy analyses regarding the event of accidents.

Consideration in the classification procedure:

If the above prerequisites and minimum requirements are met, the positive effect to be expected in the event of an accident will be considered as follows:

- motor liability insurance: reduction of the initial classification by one type class
- full comprehensive motor insurance: reduction of the initial classification by one type class

The manufacture should use the GDV documentation for AEB-Systems (Appendix 12)

Consideration of the AEB system will apply throughout the period of validity of the initial classification, and will then be replaced, as hitherto, by statistical data taken from actual claims settlement. When classifying new model series, whose forerunner models had an AEB system that was already considered in the classification procedure, no discount will be granted.

Appendix 12:

**Documentation of the Driver's Assistance (FAS)
„ Autonomous Emergency Braking function (AEB-System)“ for the
initial classification procedure for the GDV Type Class System**

“The AEB system duly recognizes a potential collision with an obstacle or other road user travelling in the same direction (parallel traffic), and alerts the driver, if necessary. If the driver does not react, or does not react adequately, automatic emergency braking is initiated, which, depending on the speed difference, avoids a collision completely or reduces the collision speed.”

Based on: - Decision of the classification committee (170.KK) as of Feb. 20th, 2013
- FAS Test document – 20.11.2013

Manufacturer:

Model/Version:

Name of the System:

Classification in meeting:

Overview: List of all vehicles to be classified (according engine output):

Model Name	HSN	TSN	Fuel Type	Typ KBA	Engine Output (kW)	Displ. (cm3)	FAS Standard	Launch Date

Documentation FAS / AEB City

Requirements:	fulfilled:		link / side
	yes	no	
- Serial standard respectively 100 %-fitment of all vehicles on Level HSN/TSN	<input type="checkbox"/>	<input type="checkbox"/>	
- system is activated after ignition on by standard	<input type="checkbox"/>	<input type="checkbox"/>	
- system deactivation:			
o The AEB-System can be deactivated by min. three discrete /independent actions or options or a „long push“ button > 2 sec.	<input type="checkbox"/>	<input type="checkbox"/>	
o The deactivation is indicated visually by a warning symbol.	<input type="checkbox"/>	<input type="checkbox"/>	
o Each ignition-on cycle activates the AEB.	<input type="checkbox"/>	<input type="checkbox"/>	
- The AEB-System is active from $v < 10$ km/h.	<input type="checkbox"/>	<input type="checkbox"/>	
- Response on stationary and vehicles in front in parallel traffic.	<input type="checkbox"/>	<input type="checkbox"/>	
- Full avoidance of an impact with a stationary vehicle with a difference of a relative speed at least ≥ 30 kp/h	<input type="checkbox"/>	<input type="checkbox"/>	
- Documentation and description of the effectiveness by Self-Assessment of the vehicle manufacturer.	<input type="checkbox"/>	<input type="checkbox"/>	
 <u>Evidence presented:</u>			
- Documentation according Test-Standard	<input type="checkbox"/>	<input type="checkbox"/>	
- Operation / Warning Indication / Display	<input type="checkbox"/>	<input type="checkbox"/>	
- Repair description Radar system (parts cost, Working times, adjustments/initialization)	<input type="checkbox"/>	<input type="checkbox"/>	
- Video or other confirmation	<input type="checkbox"/>	<input type="checkbox"/>	

List of abbreviations

AEB	Autonomous Emergency Brake
AZT	Allianz Center for Technology
CA	Claims Average
CC	Claims Costs
CF	Claims Frequency
DAT	Deutsche Automobil Treuhand GmbH
EuroNCAP	European New Car Assessment Program
FAS	Fahrer-Assistenz-System / Driver-Assistance-System
GDV	Gesamtverband der Deutschen Versicherungswirtschaft e.V. / German Insurance Association
HSN	Herstellerschlüsselnummer / manufacturer code number
KBA	Kraftfahrt-Bundesamt / Federal Motor Transport Authority
kW	kilowatt (engine power)
RCAR	Research Council for Automobile Repairs (www.rcar.org)
TSN	Typschlüsselnummer / type code number