

22 March 1994

AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM CONDITIONS OF APPROVAL AND RECIPROCAL RECOGNITION OF APPROVAL FOR MOTOR VEHICLE EQUIPMENT AND PARTS

done at Geneva on 20 March 1958

Addendum 47: Regulation No. 48

Revision 1

Incorporating:

Supplement 1 to the original version of the Regulation - Date of entry into force: 27 June 1987
Supplement 2 to the original version of the Regulation - Date of entry into force: 8 January 1991
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UNIFORM PROVISIONS CONCERNING THE APPROVAL
OF VEHICLES WITH REGARD TO THE INSTALLATION OF LIGHTING AND
LIGHT-SIGNALLING DEVICES



UNITED NATIONS

6.2.3. Arrangement

No special requirement.

6.2.4. Position

- 6.2.4.1. In width: that edge of the apparent surface in the direction of the reference axis which is farthest from the vehicle's median longitudinal plane shall be not more than 400 mm from the extreme outer edge of the vehicle. The inner edges of the apparent surfaces in the direction of the reference axes shall be not less than 600 mm apart.

This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1,300 mm.

- 6.2.4.2. In height: not less than 500 mm and not more than 1,200 mm above the ground.

- 6.2.4.3. In length: at the front of the vehicle. This requirement shall be deemed to be satisfied if the light emitted does not cause discomfort to the driver either directly, or indirectly through the rear-view mirrors and/or other reflecting surfaces of the vehicle.

6.2.5. Geometric visibility

Defined by angles α and β as specified in paragraph 2.13.

α = 15° upwards and 10° downwards,

β = 45° outwards and 10° inwards.

Since the photometric values required for dipped-beam headlamps do not cover the full geometric field of vision, a minimum value of 1 cd in the space remaining is required for type-approval purposes. The presence of partitions or other items of equipment near the headlamp shall not give rise to secondary effects causing discomfort to other road users.

6.2.6. Orientation

Towards the front.

- 6.2.6.1. After adjustment of the initial inclination, the vertical inclination of the dipped beam, expressed in per cent, shall be measured in static conditions under all the loading conditions defined in Annex 5.

The initial downward inclination of the cut-off of the dipped-beam to be set in the unladen vehicle state with one person in the drivers's seat shall be specified within an accuracy of 0.1 per cent by the manufacturer and indicated in a clearly legible and indelible manner on each vehicle close to either headlamps or the manufacturer's plate by the symbol shown in Annex 7.

The value of this indicated downward inclination shall be defined in paragraph 6.2.6.1.1.

6.2.6.1.1

Depending on the mounting height in metres (h) of the lower edge of the apparent surface in the direction of the reference axis of the dipped-beam headlamp, measured on the unladen vehicles, the vertical inclination of the cut-off of the dipped-beam shall, under all the static conditions of Annex 5, remain between the following limits and the initial aiming shall have the following values:

h < 0.8

limits : between -0.5% and -2.5%
initial aiming: between -1.0% and -1.5%

0.8 ≤ h ≤ 1.0

limits : between -0.5% and -2.5%
initial aiming: between -1.0% and -1.5%

or, at the discretion of the manufacturer,

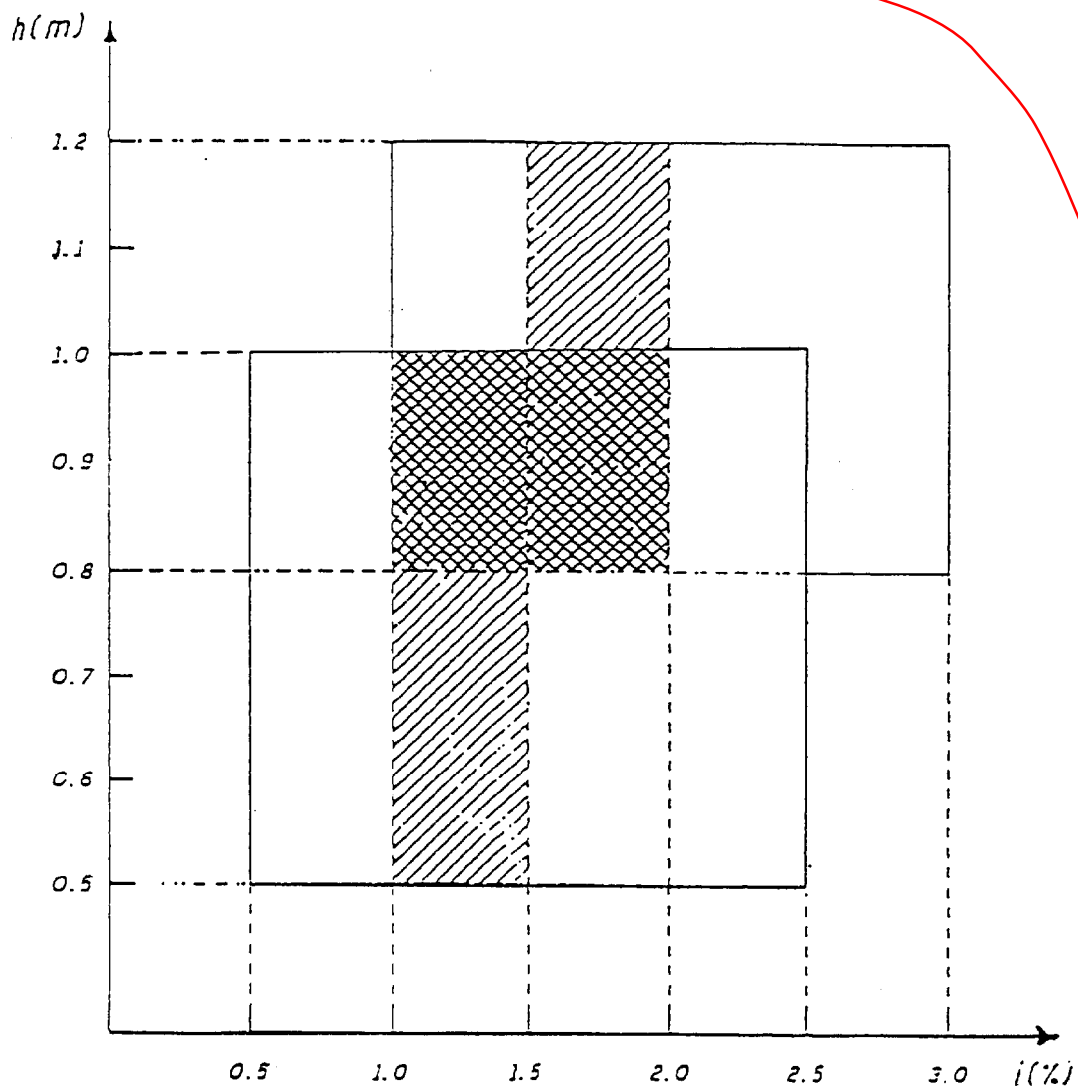
limits : between -1.0% and -3.0%
initial aiming: between -1.5% and -2.0%

The application for the vehicle type-approval shall, in this case, contain information as to which of the two alternatives is to be used.

h > 1.0

limits : between -1.0% and -3.0%
initial aiming: between -1.5% and -2.0%

The above limits and the initial aiming values are summarized in the diagram below.



6.2.6.2. If the foregoing condition is met by means of a device acting on the position of the headlamp in relation to the vehicle, the beam shall not in the event of failure of the device assume a position in which the dip is less than it was at the time when the failure of the device occurred.

6.2.6.2.1. The conditions laid down in paragraph 6.2.6.2. above shall be met by automatic means.

6.2.6.2.2. Devices which are adjusted manually, either continuously or non-continuously, shall nevertheless be permitted, provided they have a stop position at which the lamps can be returned to the initial inclination defined in paragraph 6.2.6.1. by means of the usual adjusting screws.

These manually adjustable devices must be operable from the driver's seat.

Continually adjustable devices must have reference marks indicating the loading conditions that require adjustment of the dipped beam.

The number of positions on devices which are not continuously adjustable must be such as to ensure compliance with the range of values prescribed in paragraph 6.2.6.1.1. in all the loading conditions defined in Annex 5.

For these devices also, the loading conditions of Annex 5 that require adjustment of the dipped beam shall be clearly marked near the control of the device (see Annex 8).

6.2.6.2.3. The measurement of the variation of dipped-beam inclination as a function of load must be carried out in accordance with the test procedure set out in Annex 6.

6.2.7. Electrical connections

The control for changing over to the dipped beam must switch off all main-beam headlamps simultaneously.

The dipped beams may remain switched on at the same time as the main beams.

6.2.8. Tell-tale

Tell-tale optional.

6.2.9. Other requirements

The requirements of paragraph 5.5.2. shall not apply to dipped-beam headlamps.

Dipped-beam headlamps shall not swivel according to the angle of lock of steering.

Annex 5

STATES OF LOADING TO BE TAKEN INTO CONSIDERATION IN DETERMINING VARIATIONS IN
THE VERTICAL ORIENTATION OF THE DIPPED-BEAM HEADLAMPS

Loading conditions on axles referred to in paragraph 6.2.6.1

1. For the following tests, the mass of the passengers shall be calculated on the basis of 75 kg per person.
2. Loading conditions for different types of vehicles:
 - 2.1. Vehicles in category M1: 1/
 - 2.1.1. The angle of the light beam of the dipped-beam headlamps shall be determined under the following load conditions:
 - 2.1.1.1. one person in the driver's seat;
 - 2.1.1.2. the driver, plus one passenger in the front seat farthest from the driver;
 - 2.1.1.3. the driver, one passenger in the front seat farthest from the driver, all the seats farthest to the rear occupied;
 - 2.1.1.4. all the seats occupied;
 - 2.1.1.5. all the seats occupied, plus an evenly distributed load in the luggage boot, in order to obtain the permissible load on the rear axle or on the front axle if the boot is at the front. If the vehicle has a front and a rear boot, the additional load must be appropriately distributed in order to obtain the permissible axle loads. However, if the maximum permissible laden mass is obtained before the permissible load on one of the axles, the loading of the boot(s) shall be limited to the figure which enables that mass to be reached;
 - 2.1.1.6. driver, plus an evenly distributed load in the boot, in order to obtain the permissible load on the corresponding axle.

However, if the maximum permissible laden mass is obtained before the permissible load on the axle, the loading of the boot(s) shall be limited to the figure which enables that mass to be reached.
 - 2.1.2. In determining the above loading conditions, account must be taken of any loading restrictions laid down by the manufacturer.

2.2. Vehicles in categories M2 and M3; 1/

The angle of the light beam from the dipped-beam headlamps must be determined under the following loading conditions:

- 2.2.1. vehicle unladen and one person in the driver's seat;
- 2.2.2. vehicles laden such that each axle carries its maximum technically permissible load or until the maximum permissible mass of the vehicle is attained by loading the front and rear axles proportionally to their maximum technically permissible loads, whichever occurs first.

2.3. Vehicles in category N with load surfaces:

2.3.1. The angle of the light beam from the dipped-beam headlamps must be determined under the following loading conditions;

- 2.3.1.1. vehicle unladen and one person in the driver's seat;
- 2.3.1.2. driver, plus a load so distributed as to give the maximum technically permissible load on the rear axle or axles, or the maximum permissible mass of the vehicle, whichever occurs first, without exceeding a front axle load calculated as the sum of the front axle load of the unladen vehicle plus 25 per cent of the maximum permissible payload on the front axle. Conversely, the front axle is so considered when the load platform is at the front.

2.4. Vehicles in category N without a load surface:

2.4.1. Drawing vehicles for semi-trailers:

- 2.4.1.1. unladen vehicle without a load on the coupling attachment and one person in the driver's seat;
- 2.4.1.2. one person in the driver's seat: technically permissible load on the coupling attachment in the position of the attachment corresponding to the highest load on the rear axle.

2.4.2. Drawing vehicles for trailers:

- 2.4.2.1. vehicle unladen and one person in the driver's seat;
- 2.4.2.2. one person in the driver's seat, all the other places in the driving cabin being occupied.

1/ For definitions of the categories, see the Consolidated Resolution on the Construction of Vehicles (R.E.3, Annex 7) (TRANS/SC1/WP29/78/Amend.3).

Annex 6

MEASUREMENT OF THE VARIATION OF DIPPED-BEAM
INCLINATION AS A FUNCTION OF LOAD

1. Scope

This annex specifies a method for measuring variations in motor vehicle dipped-beam inclination, in relation to its initial inclination, caused by changes in vehicle attitude due to loading.

2. Definitions

2.1. Initial inclination

2.1.1. Stated initial inclination

The value of the dipped-beam initial inclination specified by the motor vehicle manufacturer serving as a reference value for the calculation of permissible variations.

2.1.2. Measured initial inclination

The mean value of dipped-beam inclination or vehicle inclination measured with the vehicle in condition No. 1, as defined in Annex 5, for the category of vehicle under test. It serves as a reference value for the assessment of variations in beam inclination as the load varies.

2.2. Dipped-beam inclination

It may be defined as follows:

either as the angle, expressed in milliradians, between the direction of the beam towards a characteristic point on the horizontal part of the cut-off in the luminous distribution of the headlamp and the horizontal plane,

or by the tangent of that angle, expressed in percentage inclination, since the angles are small (for these small angles, 1 per cent is equal to 10 mrad).

If the inclination is expressed in percentage inclination, it can be calculated by means of the following formula:

$$\frac{(h_1 - h_2)}{L} \times 100$$

where:

h_1 is the height above the ground, in millimetres, of the above-mentioned characteristic point, measured on a vertical screen perpendicular to the vehicle longitudinal median plane, placed at a horizontal distance L .

h_2 is the height above the ground, in millimetres, of the centre of reference (which is taken to be the nominal origin of the characteristic point chosen in h_1):

L is the distance, in millimetres, from the screen to the centre of reference.

Negative values denote downward inclination (see figure 1).

Positive values denote upward inclination.

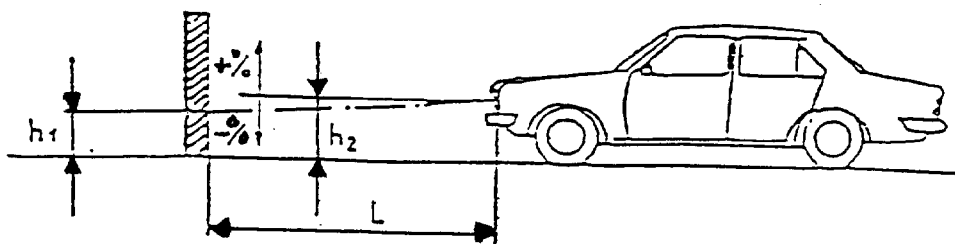


Figure 1

Dipped-beam downward inclination of a category M1 vehicle

Notes:

1. This drawing represents a category M1 vehicle, but the principle shown applies equally to vehicles of other categories.
2. Where the vehicle does not incorporate a headlamp levelling system, the variation in dipped-beam inclination is identical with the variation in the inclination of the vehicle itself.

3. Measurement conditions

- 3.1. If a visual inspection of the dipped-beam pattern on the screen or a photometric method is used, measurement shall be carried out in a dark environment (for example, a dark room) of sufficient area to allow the vehicle and the screen to be placed as shown in Figure 1. Headlamp centres of reference shall be at a distance from the screen of at least 10 m.
- 3.2. The ground on which measurements are made shall be as flat and horizontal as possible, so that the reproducibility of measurements of dipped-beam inclination can be assured with an accuracy of ± 0.5 mrad (± 0.05 per cent inclination).
- 3.3. If a screen is used, its marking, position and orientation in relation to the ground and to the median longitudinal plane of the vehicle, shall be such that the reproducibility of the measurement of the dipped-beam inclination can be assured with an accuracy of ± 0.5 mrad (± 0.05 per cent inclination).
- 3.4. During measurements, the ambient temperature shall be between 10 and 30 °C.

4. Vehicle preparation

- 4.1. Measurements shall be carried out on a vehicle which has travelled a distance of between 1,000 km and 10,000 km, preferably 5,000 km.
- 4.2. Tyres shall be inflated to the full-load pressure specified by the vehicle manufacturer. The vehicle shall be fully replenished (fuel, water, oil) and equipped with all the accessories and tools specified by the manufacturer. Full fuel replenishment means that the fuel tank must be filled to not less than 90 per cent of its capacity.
- 4.3. The vehicle shall have the parking brake released and the gearbox in neutral.
- 4.4. The vehicle shall be conditioned for at least 8 h at the temperature specified in paragraph 3.4. above.
- 4.5. If a photometric or visual method is used, headlamps with a well-defined dipped-beam cut-off should preferably be installed on the vehicle under test in order to facilitate the measurements. Other means are allowed to obtain a more precise reading (for example, removal of the headlamp lens).

5: Test procedure

5.1. General

The variations in either dipped-beam or vehicle inclination, depending on the method chosen, shall be measured separately for each side of the vehicle. The results obtained from both left and right headlamps under all the load conditions specified in Annex 5, shall be within the limits set out in paragraph 5.5. below. The load shall be applied gradually without subjecting the vehicle to excessive shocks.

5.2. Determination of the measured initial inclination

The vehicle shall be prepared as specified in paragraph 4 above and laden as specified in Annex 5 (first loading condition of the respective vehicle category).

Before each measurement, the vehicle shall be rocked as specified in paragraph 5.4. below.

Measurements shall be made three times.

5.2.1. If none of the three measured results differ by more than 2 mrad (0.2 per cent inclination) from the arithmetic mean of the results, that mean shall constitute the final result.

5.2.2. If any measurement differs from the arithmetic mean of the results by more than 2 mrad (0.2 per cent inclination), a further series of 10 measurements shall be made, the arithmetic mean of which shall constitute the final result.

5.3. Measurement methods

Any method may be used to measure variations of inclination provided that the readings are accurate to within ± 0.2 mrad (± 0.02 per cent inclination).

5.4. Treatment of vehicle in each loading condition

The vehicle suspension and any other part likely to affect dipped-beam inclination shall be activated according to the methods described below.

However, the technical authorities and manufacturers may jointly propose other methods (either experimental or based upon calculations), especially when the test poses particular problems, provided such calculations are clearly valid.

5.4.1. M1 category vehicles with conventional suspension

With the vehicle standing on the measuring site and, if necessary, with the wheels resting on floating platforms (which must be used if their absence would lead to restriction of the suspension movement likely to affect the results of measurements), rock the vehicle continuously for at least three complete cycles, for each cycle, first the rear and then the front end of the vehicle is pushed down.

The rocking sequence shall end with the completion of a cycle. Before making the measurements, the vehicle shall be allowed to come to rest spontaneously. Instead of using floating platforms, the same effect can be achieved by moving the vehicle backwards and forwards for at least a complete wheel revolution.

5.4.2. M2, M3 and N category vehicles with conventional suspension

5.4.2.1. If the treatment method for category M1 vehicles described in paragraph 5.4.1. is not possible, the method described in paragraphs 5.4.2.2. or 5.4.2.3. may be used.

5.4.2.2. With the vehicle standing on the measuring site and the wheels on the ground, rock the vehicle by temporarily varying the load.

5.4.2.3. With the vehicle standing on the measuring site and the wheels on the ground, activate the vehicle suspension and all other parts which may affect the dipped-beam inclination by using a vibration rig. This can be a vibrating platform on which the wheels rest.

5.4.3. Vehicles with non-conventional suspension, where the engine has to be running.

Before making any measurement wait until the vehicle has assumed its final attitude with the engine running.

5.5. Measurements

The variation of the inclination of the dipped-beam shall be assessed for each of the different loading conditions in relation to the measured initial inclination determined in accordance with paragraph 5.2. above.

If the vehicle is fitted with a manual headlamp-levelling system, the latter shall be adjusted to the positions specified by the manufacturer for given loading conditions (according to Annex 5).

5.5.1. To begin with, a single measurement shall be made in each loading condition. Requirements have been met if, for all the loading conditions, the variation in inclination is within the calculated

limits (for example, within the difference between the stated initial inclination and the lower and upper limits specified for approval) with a safety margin of 4 mrad (0.4 per cent inclination).

- 5.5.2. If the result(s) of any measurement(s) does (do) not lie within the safety margin indicated in paragraph 5.5.1. or exceed(s) the limit values, a further three measurements shall be made in the loading conditions corresponding to this (these) result(s) as specified in paragraph 5.5.3.
- 5.5.3. For each of the above loading conditions:
- 5.5.3.1. If none of the three measured results differs by more than 2 mrad (0.2. per cent inclination) from the arithmetic mean of the results, that mean shall constitute the final result.
- 5.5.3.2. If any measurement differs from the arithmetic mean of the results by more than 2 mrad (0.2 per cent inclination), a further series of 10 measurements shall be made, the arithmetic mean of which shall constitute the final result.
- 5.5.3.3. If a vehicle is fitted with an automatic headlamp-levelling system which has an inherent hysteresis loop, average results at the top and bottom of the hysteresis loop shall be taken as significant values.
- All these measurements shall be made in accordance with paragraphs 5.5.3.1. and 5.5.3.2.
- 5.5.4. Requirements have been met, if, under all loading conditions, the variation between the measured initial inclination determined in accordance with paragraph 5.2. and the inclination measured under each loading condition is less than the values calculated in paragraph 5.5.1. (without safety margin).
- 5.5.5. If only one of the calculated upper or lower limits of variation is exceeded, the manufacturer shall be permitted to choose a different value for the stated initial inclination, within the limits specified for approval.
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