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Motorcycles — Measurement of variation of dipped beam inclination as a function of load

Motocycles — Mesurage des variations d'inclinaison du faisceau de croisement en fonction de la charge

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9987 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

Annex A forms an integral part of this International Standard. Annexes B and C are for information only.

International Organization for Standardization
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Motorcycles — Measurement of variation of dipped beam inclination as a function of load

1 Scope

This International Standard specifies a method of measuring the variation of motorcycle dipped beam inclination, with respect to its initial inclination, caused by the changes in vehicle attitude due to loading.

NOTE 1 The loading conditions of the vehicle are specified in annex A.

It applies to two-wheeled motorcycles as defined in ISO 3833.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3833:1977, *Road vehicles — Types — Terms and definitions.*

ISO 6726:1988, *Mopeds and motorcycles with two wheels — Masses — Vocabulary.*

ISO 7227:1987, *Road vehicles — Lighting and light signalling devices — Vocabulary.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 dipped beam inclination: Inclination, for measuring the dipped beam variation for which it is necessary to choose only one reference point within the luminous distribution in the beam, defined

— either as the angle, expressed in milliradians, between the direction of a characteristic point, chosen by the manufacturer, in the luminous distribution of the headlamp and the horizontal plane;

— or by the tangent of that angle, expressed in percent inclination (since the angles are small 1 % is equal to 10 mrad).

If the inclination is expressed in percent inclination [with negative values denoting downward inclination and positive values denoting upward inclination (see figure 1], it can be calculated from the following formula:

$$\frac{h_1 - h_2}{l} \times 100$$

where

h_1 is the height above the ground, in millimetres, of a characteristic point of the cut-off on the opposite side to traffic[1], 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 reference centre of the headlamp;

l is the distance, in millimetres, from the screen to the centre of the headlamp.

NOTE 2 If the headlamp is fixed to the handlebars or to the frame of the vehicle and has not been reset after load variation, the variation of the dipped beam inclination is

1) For European-type dipped beams, this part of the cut-off is therefore independent of the characteristic point chosen.

identical to the variation of the inclination of the vehicle itself and can be derived from it (see annex B).

3.2 measured initial inclination: Mean value of dipped beam inclination (3.1) (or vehicle inclination if note to 3.1 applies), measured in accordance with 6.2.

It serves as a reference value for assessing the variation of the beam inclination as the load varies.

3.3 manufacturer's maximum total mass inclination: Mean value of dipped beam inclination (3.1) (or vehicle inclination if note to 3.1 applies), measured in accordance with 6.5.

3.4 variation of dipped beam inclination: Difference between the maximum total mass inclination (3.3) and the measured initial inclination (3.2), positive values denoting upward inclination and negative values denoting downward inclination.

3.5 reference centre of headlamp: (See definition 3.41 of ISO 7227:1987.)

3.6 headlamp levelling device: (See definition 3.44 of ISO 7227:1987.)

NOTE 3 This device may be either automatic or manual.

4 Measurement conditions

4.1 If visual inspection of the dipped beam pattern on the screen, or a photometric method, is used, measurements shall be carried out in a dark place (for example a dark room) of sufficient area to allow the vehicle and screen to be placed as shown in figure 1. The reference centre of the headlamp (3.5) shall be at a distance l of at least 10 m from the screen (or the optical equivalent) and as specified by the manufacturer.

4.2 The vehicle and the screen shall be located in such a way that the requirements given in 4.2.1 and 4.2.2 are met.

4.2.1 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 ensured to an accuracy of ± 0,5 mrad (± 0,05 % inclination).

4.2.2 If a screen is used, its marking, position and orientation with respect to the ground and the median longitudinal plane of the vehicle shall be such that the reproducibility of measurements of dipped beam inclination can be ensured to an accuracy of ± 0,5 mrad (± 0,05 % inclination).

4.3 During the measurements, the ambient temperature shall be between 10 °C and 30 °C.

5 Vehicle preparation

5.1 Measurements shall be carried out on a vehicle which has travelled at least 1 000 km.

5.2 Tyres shall be inflated to the pressure specified by the manufacturer for the condition of "manufacturer's maximum total mass", as defined in ISO 6726.

The vehicle shall be in the condition "vehicle kerb mass", as defined in ISO 6726.

5.3 The vehicle shall have the gearbox in neutral and the parking brake, if fitted, shall be released.

5.4 The vehicle shall be conditioned for at least 8 h at the temperature specified in 4.3.

5.5 If a photometric or a visual method is used, then means to obtain a more precise reading can be taken in agreement with the vehicle manufacturer in order to facilitate the measurements (for example removal of headlamp lens, masking of the headlamp, use of a headlamp with a well defined dipped beam cut-off, etc.).

NOTE 4 Various measurement methods, for the different types of headlamp, are given in annex B, and a photometric method is given in annex C.

6 Test method

6.1 General test conditions

6.1.1 The loads specified in annex A shall be applied gradually without subjecting the vehicle to excessive shocks.

6.1.2 The vehicle shall be maintained by a supporting system in the normal "vertical" position of use as defined by the vehicle manufacturer; no variation of the "vertical" position allowed by the supporting system shall introduce a variation of beam inclination greater than 0,5 mrad.

6.2 Determination of initial inclination

6.2.1 The vehicle shall be in the conditions specified in clause 5 and loaded to condition No. 1, specified in annex A.

Before any measurement, the vehicle shall be rocked as specified in 6.4. During the measurements, the vehicle shall be kept vertical by means of a supporting system which does not interfere with the suspension (see 6.1.2).

The handlebars shall be blocked in such a position that the front wheel centre plane is parallel to the vehicle longitudinal median plane.

6.2.2 Measurements shall be carried out three times.

If none of the three measured results differs by more than 2 mrad (0,2 % inclination) from the arithmetic mean of the results, that mean shall constitute the final result.

If, for any measurement, this difference is greater than 2 mrad (0,2 % inclination) a further series of 10 measurements shall be taken, the arithmetic mean of which shall constitute the final result.

6.3 Headlamp class and measurement methods

Depending on the headlamp class as defined in annex B, various measurement methods are applicable, provided that the readings are within an accuracy of ± 0,2 mrad (± 0,02 % inclination). Examples of test methods are given in annex B; alternative methods are allowed provided that they give equivalent results.

6.4 Measurement of load variation

The vehicle shall be loaded to condition No. 2, specified in annex A.

After varying the load, the vehicle suspension and any other part likely to affect the dipped beam inclination shall be activated using the following method:

With the vehicle standing on the measuring site, rock the body longitudinally continuously for at least three complete cycles, each cycle consisting in pushing down first the rear and then the front end of the vehicle.

If necessary, the wheels may rest on floating platforms, obtained, for example, by placing metal balls between the bottom plate on the ground and the top plate supporting the wheel; they shall be used only if their absence would lead to a restriction of the suspension movement likely to influence the measurement results.

The rocking sequence shall end with the completion of a cycle. Before taking the measurements, wait until the vehicle comes to rest by itself.

6.5 Measurement of manufacturer's maximum total mass inclination

6.5.1 The vehicle shall be loaded to condition No. 2, specified in annex A. Before each measurement, the vehicle shall be rocked as specified in 6.4.

6.5.2 Measurements shall be carried out three times.

If none of the three measured results differs by more than 2 mrad (0,2 % inclination) from the arithmetic mean of the results, that mean shall constitute the final result.

If, for any measurement, this difference is greater than 2 mrad (0,2 % inclination), a further series of 10 measurements shall be taken, the arithmetic mean of which shall constitute the final result.

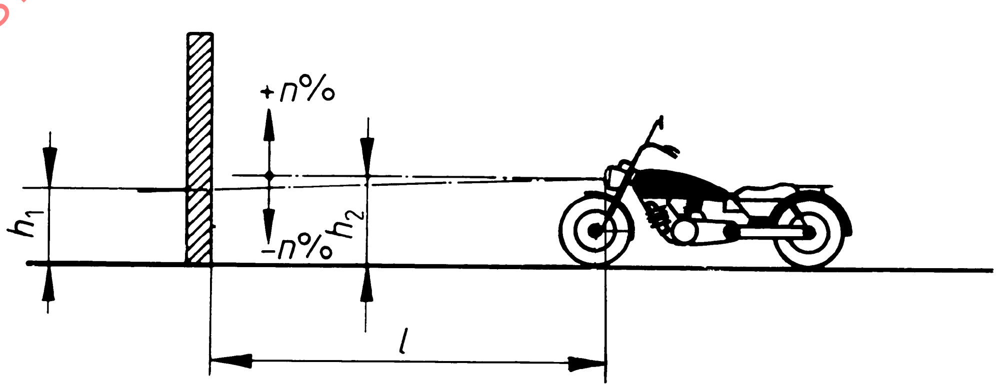


Figure 1 — Dipped beam downward inclination for motorcycle

Annex A
(normative)

Loading conditions

A.1 General

In order to meet the loading conditions specified in clause A.2, the seat of the motorcycle shall be loaded with masses simulating either the rider alone, or the rider, passenger and the luggage, as appropriate.

The vehicle's suspension and the vehicle's headlamp levelling device, if any, shall be adjusted as prescribed by the manufacturer for each loading condition. It shall be possible to adjust the suspension or the headlamp either by using a simple tool, or manually.

A.2 Loading conditions

Variations of dipped beam inclination caused by the changes in vehicle attitude due to loading shall be measured under the load conditions specified in A.2.1 and A.2.2.

A.2.1 Condition No. 1: Rider alone

A mass of 75 kg $\pm$ 1 kg, simulating the rider, shall be placed on the seat of the vehicle in such a way as to reproduce the axle loads declared by the manufacturer for this loading condition.

A.2.2 Condition No. 2: Manufacturer's maximum total mass

Masses, simulating the manufacturer's maximum total mass, shall be placed on the seat of the vehicle in such a way as to reproduce the axle loads declared by the manufacturer for this loading condition.

Annex B
(informative)

Headlamp classes and applicable methods of measurement

B.1 Purpose

Examples of various methods for assessing the magnitude of variations in dipped beam inclination are given in clause B.3. Some of these methods do not apply to vehicles equipped with certain types of headlamp installation but for the purposes of this annex, headlamps are considered to belong to one of three classes defined in clause B.2; applicable methods of measurement are indicated for each headlamp class.

B.2 Headlamp classes and applicable methods

B.2.1 Class I

Class I headlamps are headlamps which are fixed rigidly to the handlebars or to the frame of the vehicle, and in which the optical elements do not move to compensate for variations in vehicle loading.

NOTE 5 Semi-fixed aiming devices (for initial aim setting) and mechanisms for headlamp concealment are both considered as rigidly fixed.

Applicable methods: B.3.1.1 or B.3.1.2

B.3.2.1 or B.3.2.2

B.3.3.1 or B.3.3.2

B.2.2 Class II

Class II headlamps are headlamps which can be reset (manually or automatically) using a headlamp levelling device with respect to the handlebars or to the frame to compensate for variations in vehicle loading.

Applicable methods: B.3.1.1 or B.3.1.2

B.3.2.1 or B.3.2.2

B.2.3 Class III

Class III headlamps are headlamps in which the lens is rigidly fixed to the handlebars or to the frame of the vehicle, but in which the reflector or the other optical elements can be reset (manually or automatically) to compensate for variations in vehicle loading.

Applicable methods: B.3.1.1 or B.3.1.2

B.3 Measurement methods

The examples given in B.3.1 to B.3.3 are not intended to provide a comprehensive list: other suitable methods may be used by agreement between the test laboratory and the vehicle manufacturer.

B.3.1 Direct measurement of dipped beam inclination

The dipped beam shall be projected onto a screen. The distance shall be not less than 10 m (or optical equivalent) and as specified by the vehicle manufacturer. All measurements of inclination and its variation shall be taken from a chosen characteristic point in the dipped beam pattern. The lens may be masked partially to increase the sharpness of the beam pattern on the screen. If the dipped beam pattern has a well defined horizontal cut-off, a characteristic point shall be chosen on a suitable part of the horizontal cut-off line.

B.3.1.1 Visual inspection of chosen characteristic point

Variations in the height above the ground of the characteristic point may be measured directly, for example by reference to suitable graduations marked on the screen.

B.3.1.2 Photometric means

The position of the characteristic point, and the variations in its height above the ground may be determined by a photometric method such as that described in annex C. In this case, the electrical supply to the headlamps shall be stabilized.

B.3.2 Measurement of headlamp orientation in vertical plane

B.3.2.1 Laser and mirror

A flat mirror, of good optical quality and with the reflective coating on its exposed surface, shall be mounted in the centre of the headlamp lens. A helium-neon (He-Ne) laser is recommended. The distances from the laser to the mirror and from the mirror to the measuring point shall be greater than 3 m. Unless the optical layout is so arranged that both the incident and the reflected rays are substantially horizontal, a correction will be necessary to compensate for vertical displacements of the headlamp due to variations in vehicle loading.

B.3.2.2 Inclinometer

A suitable inclinometer, which may be one of the following types, shall be connected directly to the headlamp:

— electronic inclinometer;

— bubble level with vernier.

B.3.3 Measurement of vehicle attitude

B.3.3.1 Direct measurement of vehicle height

Two reference points, lying on the same vertical plane, shall be chosen. The horizontal distance between the two points shall be at least 60 % of the vehicle overall length.

These two reference points shall be part of the suspended portion of the vehicle.

B.3.3.2 Inclinometer

The inclinometer shall be attached securely to a suitable rigid part of the vehicle frame or bodywork.

Annex C
(informative)

Photometric method for determining position of point of conventional cut-off

This method can be used until committee TC 4.10 of the CIE (International Commission on Illumination) has given a more precise definition of conventional cut-off.

C.1 Definition of conventional cut-off

For the purposes of this International Standard, the horizontal part of the conventional cut-off is considered as being located in the direction where beam intensity, I, expressed in candelas, is equal to

$$0{,}15\, I_1 + 500$$

where I_1 represents the beam intensity at 1° below the direction of intensity I.

This definition applies exclusively to the determination of the chosen characteristic point of the conventional cut-off reference position whenever dipped beam variation is checked (see figure C.1). The angular diameter of the photometric receiver shall be approximately 1 mrad.

C.2 Measurement method

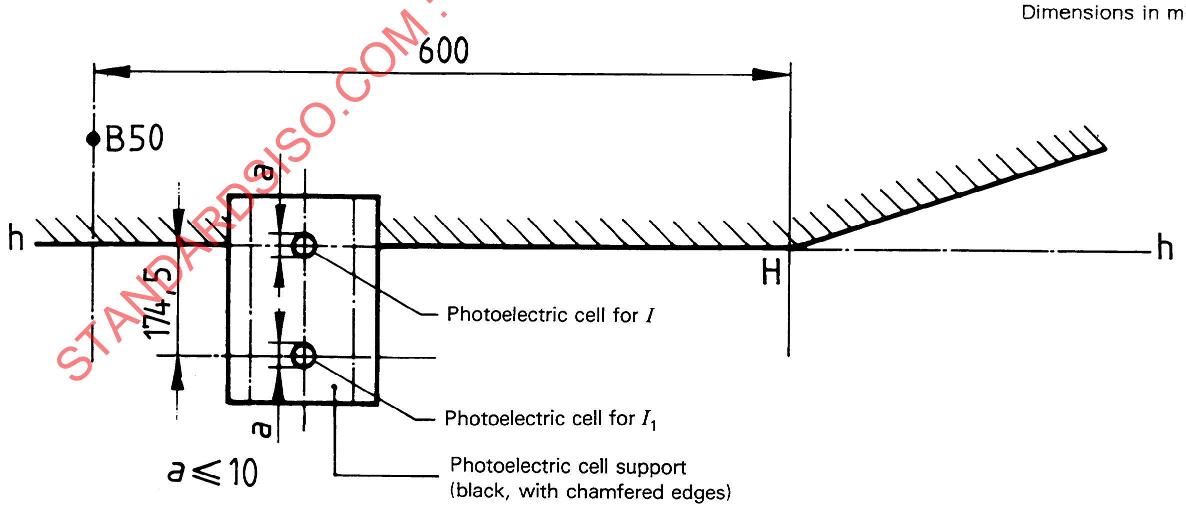
Carry out measurements in a dark room, taking care to eliminate reflections on floor and side walls completely.

The measuring system may consist of two photoelectric cells not sensitive to infra-red radiations, fitted with neutral colour filters having such light transmittance factors that the output signals have a ratio of 1 to 0,15, and arranged in accordance with figure C.1.

The light signals shall be compared using an indicator whose zero point is equivalent to a 500 cd light signal. Tolerance on the 0,15 ratio and on intensity shall not exceed 5 %.

The measurement is taken by moving the photoelectric cell support vertically until the indicator reading is zero. The characteristic point of the cut-off corresponds to the centre of the uppermost photoelectric cell.

Dimensions in millimetres



NOTE — Since this layout is very sensitive to voltage variations at the terminals of the headlamp, the voltage shall be stabilized to better than ± 0,1 V for the duration of the test.

Figure C.1 — Photometric receiver arrangement on screen for l = 10 m (see figure 1)