SVENSK STANDARD

SMS SVERIGES MEKANSTANDARDISERING

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BILAR – MÄTNING AV ISLAGSHASTIGHETEN VID KOLLISIONSPROVNING

Denna standard utgörs av den engelska versionen av den internationella standarden ISO 3784–1976, Road vehicles – Measurement of impact velocity in collision tests.

ROAD VEHICLES – MEASUREMENT OF IMPACT VELOCITY IN COLLISION TESTS

This Swedish standard consists of the English version of the International Standard ISO 3784–1976, Road vehicles – Measurement of impact velocity in collision tests.

Road vehicles – Measurement of impact velocity in collision tests

1 SCOPE AND FIELD OF APPLICATION

This International Standard lays down the accuracy of measurement of the impact velocity in collision tests on road vehicles. In addition, some typical methods suitable for the measurement of this impact velocity are described in the annex. These methods are intended to facilitate the comparison of data obtained in similar tests by different laboratories.

2 PERFORMANCE

2.1 The accuracy of velocity measurement shall be ± 1 %.

2.2 The impact velocity measurement shall be made within 0,2 s prior to impact.

3 METHODS OF MEASUREMENT

Typical methods for measuring impact velocity are described in the annex. Other methods may be used provided they meet the requirements of 2.1 and 2.2.

ANNEX

TYPICAL METHODS OF MEASUREMENT OF VELOCITY

Velocity measurement methods can be classified in three general categories :

a) Doppler effect method;

b) summation of the units of distance in a given time (fifth wheel method);

c) measurement of the time needed to cover a given distance.

A.1 DOPPLER EFFECT METHOD

This effect utilizes the apparent frequency variation of a wave in motion. This variation is proportional to the speed of the body in relation to the observer and is governed by the following formula :

$$f = \frac{v_1 f_0}{v_1 - v_2}$$

where

f is the apparent frequency;

f_0 is the emitted frequency;

v_1 is the speed of the wave emitted in an ambient medium;

v_2 is the speed of the vehicle.

The emitted electromagnetic waves which are generally used are situated in two different wavelength bands :

a) centimetric waves : radar with an accuracy that is only of the order of 2 %;

b) micrometric waves : the laser.

The laser system, more perfected than the radar system, permits measurements with an error less than 1 %. It should be noted, however, that the cost of this type of equipment is very high.

A.2 SUMMATION OF THE UNITS OF DISTANCE IN A GIVEN TIME (FIFTH WHEEL METHOD)

A wheel attached to the rear of the vehicle by an articulated yoke is maintained in contact with the ground by a spring. Mounted axially on this wheel is a disc containing slits spaced regularly around the circumference. A photoelectric transmitter-receiver system is located on either side of the disc.

Passage of the slits in front of a photoelectric cell activates a series of impulses corresponding to the distance covered. The summation of these data permits direct reading from a galvanometer, or a recording on an ultra-violet oscillograph. Careful machining permits an accuracy of the order of 1 %.

An alternative method is to use an induction proximity sensor in place of the photoelectric receiver. Its advantages are simpler assembly and resistance to weather.

A further variation involves attaching the transmitter directly to a rear wheel of the vehicle instead of the fifth wheel. In this case it is difficult to calibrate the system and there must be no tyre slip at the road surface. However, the calibration must be carried out carefully.

A.3 MEASUREMENT OF TIME NEEDED TO COVER A GIVEN DISTANCE

The following typical methods are in general use :

A.3.1 System using a photoelectric barrier

A transmitter and a receiver are located on either side of a shutter in a U-shaped arrangement fixed rigidly on the vehicle.

The transmitter consists of a lamp emitting a light beam with essentially parallel rays which illuminate a photoelectric cell which constitutes the receiver.

Successive cutting of the light beam by the arms of the U start and stop a digital chronometer.

The transmitter is placed approximately 1 m from the receiver. A diaphragm can be placed on the receiver to limit parasitic reflections.

The cutting of the beam is effected by means of a shutter in a U shape mounted on the side of the vehicle. This mounting should be very rigid in order to avoid any deflection tending to spread or tilt the two arms, thus altering their separation. The spacing between the arms of the U should be known within approximately 0,2 %. The U is painted matt black to avoid any reflections.

The passage of the first arm of the shutter through the barrier produces a variation in voltage at the amplifier. This difference in potential applied at entrance A of a digital chronometer whose time base is regulated to 10^{-5} s, initiates the time recording. When the second arm obscures the receiver, it produces a new voltage variation at entrance B of the chronometer, stopping the recording.