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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Road vehicles — Measurement techniques in impact tests — Optical instrumentation

Véhicules routiers — Techniques de mesurage lors des essais de chocs — Instrumentation optique

Reference number
ISO 8721 : 1987 (E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8721 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Road vehicles — Measurement techniques in impact tests — Optical instrumentation

1 Scope and field of application

This International Standard defines performance criteria for an optical data channel used in impact tests on road vehicles, when numerical time and space data are taken from the images to analyse impact test results.

The requirements are to facilitate comparison between results obtained by different laboratories.

The annex gives a method of measuring the distortion index as a quality parameter of the optical data channel using a standard target, and, as an alternative, an indirect method.

This International Standard complements ISO 6487 which covers non-optical instrumentation used in impact tests on road vehicles.

2 Reference

ISO 6487, *Road vehicles — Techniques of measurement in impact tests — Instrumentation.*

3 Definitions

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

3.1 optical data channel[1]: System composed of an image-taking device (e.g. a camera), a recording medium for these images (film, disc, magnetic tape, etc.) and a system for analysing the images, including any analysis procedure and data correction that modify the content of the data.

3.2 distortion index: Quality parameter of the optical data channel.

3.3 analysis system: System to measure and collect the coordinates of target points as a function of time.

3.4 time-base system: Device allowing determination of the time interval elapsing between any two recorded events.

3.5 time origin identification device: Device to identify the instant chosen as the time origin, usually the beginning of the impact.

3.6 imaging rate: Frequency of renewal of information for a given point expressed in renewals per second or in images per second when all the points of the image are renewed simultaneously.

4 Performance

The performance of the optical data channel shall be evaluated initially to establish performance levels; this evaluation shall be repeated whenever the system is modified to an extent which could cause a change in accuracy.

4.1 Distortion index

The distortion index shall be assessed using the photographic target and procedure described respectively in A.1.1 and A.1.2 of the annex. It shall be evaluated as indicated in A.1.3. The distortion index shall not exceed 1 %.

4.2 Time base

A time base is required. It shall permit determination of the time between recorded events to an accuracy of the reciprocal of the imaging rate or 1 % of the actual time, whichever is greater.

4.3 Time origin identification device

The accuracy of the device shall be equal to the reciprocal of the imaging rate.

4.4 Imaging rate

The imaging rate shall be left to the user's discretion, taking account of all factors including:

— the goal to be attained;

— the limitations due to the equipment (e.g. blur);

— the need to combine data from several image-taking devices and from electronic recordings of the impact test.

The user's choice shall be guided by the distance the recorded point moves between two images analysed. This distance shall not exceed any accuracy requirement there may be on determination of position.

4.5 Reference length

A length calibration shall be carried out which permits determination of lengths within any requirements there may be on accuracy.

In the absence of such requirements, it is recommended that determinations of length to within ± 1 % of the diagonal of the picture should be possible.

1) The influence of the operator on accuracy has not been taken into account during the development of this International Standard.

Annex

Distortion index measurement methods

(This annex forms an integral part of the Standard.)

A.1 Standard target method

A.1.1 Test target

A rectangular target of type and dimensions in conformity with the figure shall be used.

This target shall be divided into four parts by joining the centre points of the two opposite sides. In each quadrant thus obtained, and at the target centre, circles 400 ± 1 mm in diameter shall be drawn.

The five circles shall be marked on their circumferences with 16 reference marks, this defining eight diameters for each, and hence 40 diameters for the whole target.

A.1.2 Test method

The target shall be recorded full-frame by the image-taking device which forms one element of the optical data channel to be tested.

The image-recording medium to be used for calibration shall be of the same type and quality as those used for impact testing. It shall be analysed using the analysis system.

The coordinates of the marks of each diameter d_i shall be measured on the same frame while the coordinates of the marks of different diameters shall be measured on consecutive analysed images.

A.1.3 Calculation of results

The 40 diameters d_i shall be calculated between two points, P and Q, from the equation

$$d_i = [(x_P - x_Q)^2 + (y_P - y_Q)^2]^{0,5}$$

The diameter, $\bar{d}$, and the standard deviation, s, respectively shall be calculated taking the 40 diameter values d_i into account from the following equations:

$$\bar{d} = \frac{\sum_{i=1}^{N} d_i}{N}$$

where $N = 40$

$$s = \left[\frac{\sum_{i=1}^{N} (d_i - \bar{d})^2}{N - 1} \right]^{0,5}$$

where $N - 1 = 39$

The distortion index is equal to the ratio of the standard deviation, s, to the mean diameter, $\bar{d}$, i.e.

$$\frac{s}{\bar{d}}$$

A.2 Alternative (indirect) method

Other targets with different sizes or patterns of reference marks may be used, in which case the user shall determine the distortion index indirectly. There is then also a need to show that the indirect method gives results equivalent to those using the target specified in A.1.1.

This may be of advantage when for instance a target with a rectangular pattern of reference marks is used for the determination of lens corrections, which are needed in case of some wide-angle lenses.

Dimensions in millimetres

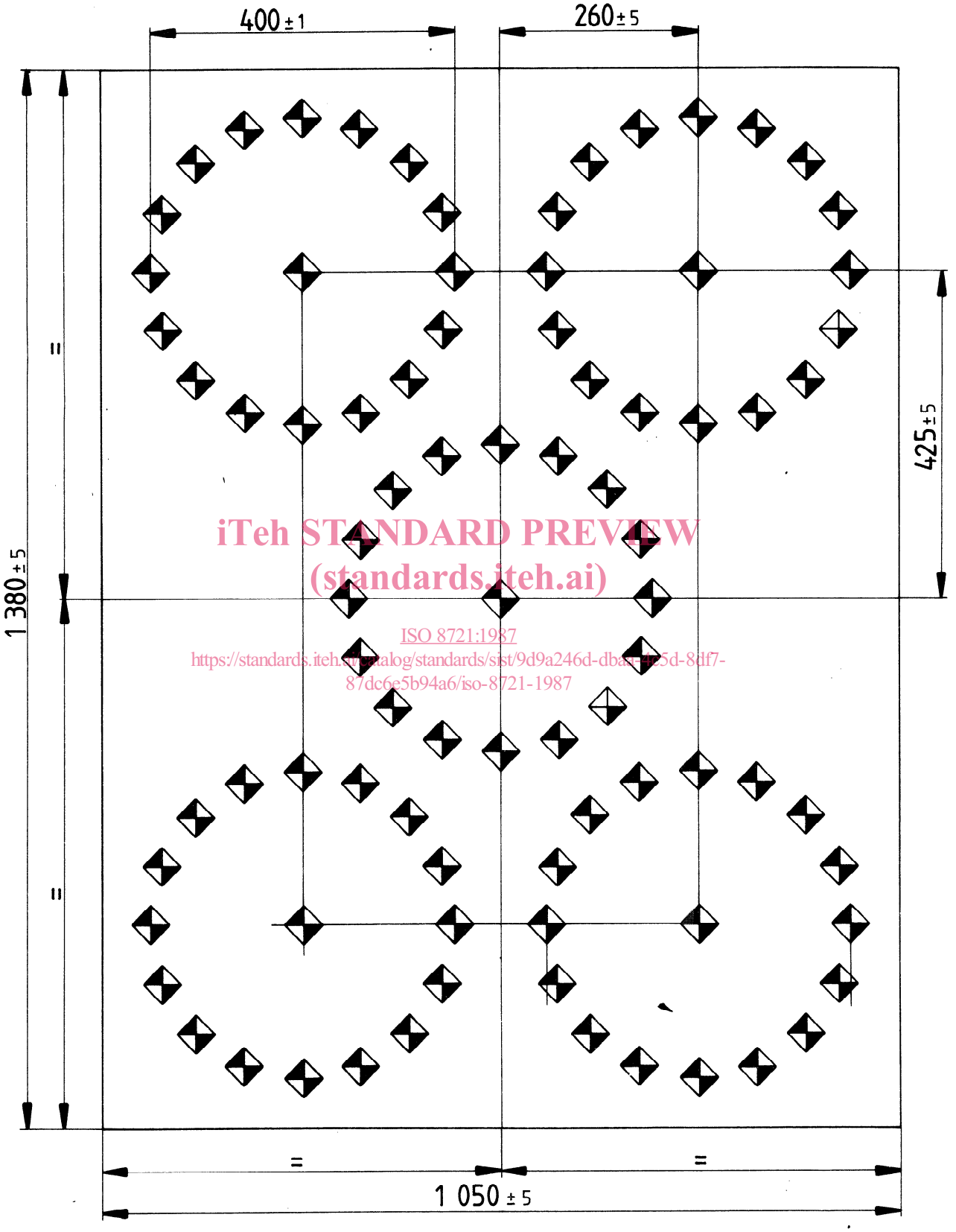

Figure — Target for distortion index determination

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