



**DEFINITION OF STATIC UNBALANCE
OF STEEL AND LIGHT METAL WHEELS FOR
CARS, ESTATE CARS, VANS AND CAR TRAILERS**

**ES
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*DEFINITION DE L'EQUILIBRAGE STATIQUE DES ROUES DE VEHICULES DE TOURISME,
CAMIONNETTES ET REMORQUES DE VOITURE, EN ACIER OU EN ALLIAGE LEGER.*
BESTIMMUNG DER STATISCHEN UNWUCHT VON STAHL- UND
LEICHTMETALLRÄDERN FÜR PKW, KOMBI, LKW AND PKW-ANHÄNGER.

1 - SCOPE AND FIELD OF APPLICATION

This specification covers the static unbalance of steel and aluminium wheels for passenger cars, estate cars, light trucks and car trailers.

Wheel unbalance is not a process capable feature due to several reasons from raw material, tooling and process. Possible reasons could be thickness variations of the disc or rim material for steel wheels, eccentricity of PCD to centre bore, radial run out or machining/heat treatment differences for cast wheels.

A statement on capability can only be made by a large random test.

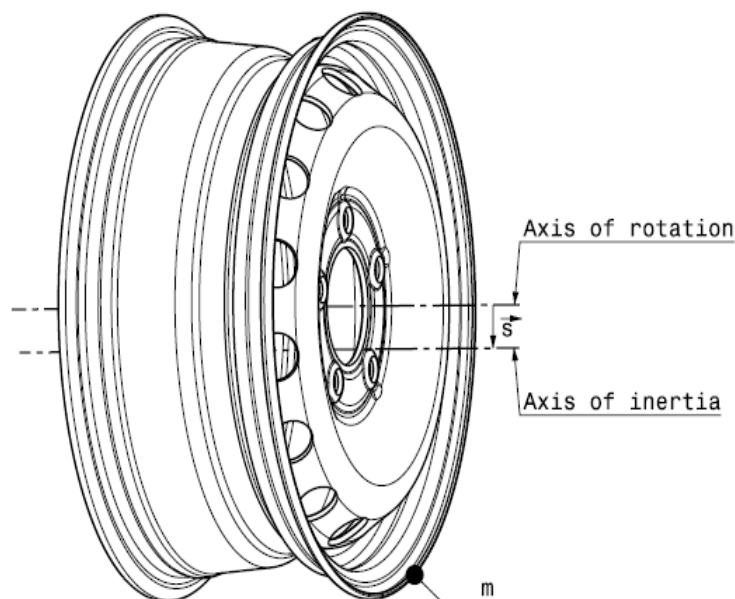
2 - DEFINITION

The axis of the centre of gravity is displaced parallel to the axis of rotation by an unequal distribution of mass to the axis of rotation.

By this displacement a bending moment is generated. In order to compensate this unbalance, a mass is placed opposite (180°) to the unbalance on a fixed radius. As per DIN ISO 1925 the product of the mass of a rotating body **m** and the length of the displacement vector **s** generates an unbalance vector

$$\mathbf{U} = \mathbf{m} \times \mathbf{s}.$$

At a given angular velocity ω the Unbalance **U** generates the centrifugal force $\mathbf{F} = \mathbf{U} \times \omega^2$.



Main changes compared to the last issue:

3 - PROCEDURE

Standard balancing machines are commercially available.

Centring: by the centre hole using an expanding mandrel.

With this equipment the balancing moment is ascertained in value and angle position. If the part shall be balanced, a balancing mass has to be fixed in the indicated angle position. The amount of this mass results from the unbalance U divided by the radius s of the point where the balancing mass is fixed. Usual methods are a single or multi piece clip on weight at the rim flange or a glued type of weight (especially alloy wheels). The type of fixation in car position and on the balancing machine has to be taken into consideration. There should not be a major eccentricity between PCD and centre of the centre bore in order to avoid artificial unbalance at the vehicle. Since TPMS systems are getting used more frequently, which can easily generate more than 700 gcm unbalance, a design driven unbalance elimination is a valid option for the wheel. If this is done, the unbalance of the valve/TPMS must be taken into consideration as well.

4 - MEASURING RESULTS

Unit: kgm (kgmm, gmm and gcm are allowed too; $1 \text{ kgm} = 1000 \text{ kgmm} = 10^6 \text{ gmm} = 10^5 \text{ gcm}$).

5 - VALUES OF THE ADMISSIBLE STATIC UNBALANCE

The value of static unbalance refers to the mean values + 3 standard deviations with dependence of wheel weight (see figure on page 3). Since mass and distance to the axis of rotation are factors to the unbalance, a higher mass and/or a bigger diameter contributes to its value.

Unbalance Limits

