Former issues of this standard: May 2011, first release

- Bestimmung der statischen Unwucht von Stahl- & Leichtmetallrädern für PKW, Kombi, LLKW und PKW- Anhänger
- Définition de l'équilibrage statique des roués de Véhicules de Tourisme, Camionnettes & Remorques de Voitures, en Acier ou en Alliage légère.

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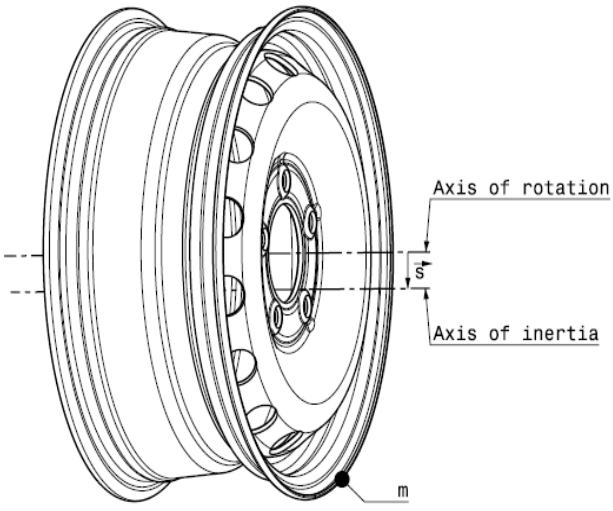
1. Scope and field of application:

1.1. 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

2.1. 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 **U = m** x **s**. At a given angular velocity **ω** the Unbalance **U** generates the centrifugal force **F = U** x **ω^2**.



3. Procedure

3.1. Standard balancing machines are commercially available.
Centring: by the pilot bore using an expandable mandrel.

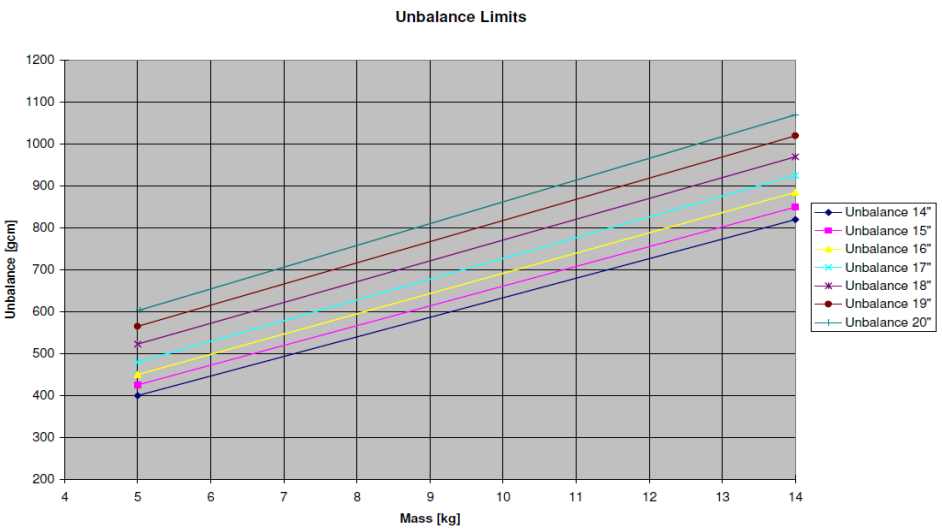
With this equipment, the balancing moment is ascertained in value and angle position. If the part shall be balanced, a balancing mass has to be fixed in the indicated angle position. The amount of this mass results from the unbalance U divided by the radius s of the point where the balancing mass is fixed.
Usual methods are a single or multi piece clip on weight at the rim flange or "stick on" 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 center of the center 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 g*cm 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. Usually a compensation mass of 13 g (TR413/414 valve) is taken into consideration for aluminium wheels.

4. Measuring results

4.1. Unit: kg*m (kg*mm, g*mm and g*cm are allowed too; 1 kg*m = 1000 kg*mm = 10^6 g*mm = 10^5 g*cm).

5. Values of the admissible static unbalance of steel wheels

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



6. Values of the admissible static unbalance of light metal wheels

6.1. Due to the different production process steps for a cast wheel uneven mass distribution in the rim area may occur, which have direct influence on the unbalance.
The ratio between diameters and unbalance is expressed by the graph below.