
International Standard



8306

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Cranes — Overhead travelling cranes and portal bridge cranes — Tolerances for cranes and tracks

Appareils de levage — Ponts roulants et ponts portiques — Tolérances des appareils de levage et des voies de roulement

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Descriptors : handling equipment, lifting equipment, travelling cranes, dimensional tolerances.

Foreword

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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 8306 was prepared by Technical Committee ISO/TC 96, *Cranes, lifting appliances and related equipment*.

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Cranes — Overhead travelling cranes and portal bridge cranes — Tolerances for cranes and tracks

1 Scope and field of application

This International Standard specifies the manufacturing tolerances for overhead travelling cranes and, when applicable, for portal bridge and semi-portal bridge cranes (also known as gantry and semi-gantry cranes respectively). These tolerances can be modified, if the same service life and safe operation is achieved by other forms of crane construction.

These tolerances apply at the standard reference temperature of 20 °C.

The design rules in applicable International Standards presuppose that the tolerances specified for cranes and tracks shall be maintained. These tolerances apply to a lifting appliance loaded solely by its own mass. These tolerances take no account of elastic deformation during operation.

2 References

ISO 286, *ISO system for limits and fits*.¹⁾

ISO 4301/1, *Cranes and lifting appliances — Classification — Part 1: General*.

ISO 4306/1, *Lifting appliances — Vocabulary — Part 1: General*.

3 Measuring procedure

Calibrated steel measuring tapes shall be used, in accordance with the rules for their use. Readings obtained shall be corrected for tape measure sag and for any divergence from the standard reference temperature.

All measurements for one and the same crane shall be made with the same tape measure and the same tension force.

4 Crane tolerances affecting running conditions

4.1 Tolerances, Δs , on the crane span, s , expressed in metres, from specified dimensions shall not exceed the following values (see figure 1):

- for $s \leq 10$ m: $\Delta s = \pm 2$ mm
- for $s > 10$ m: $\Delta s = \pm [2 + 0,10 \times (s - 10)]$ mm to a maximum of ± 10 mm

4.2 Crane girders, supported at their ends, shall have no sag, even if the original specification did not lay down a camber; i.e. the track of the trolley with unloaded crane shall not deviate downward from the horizontal.

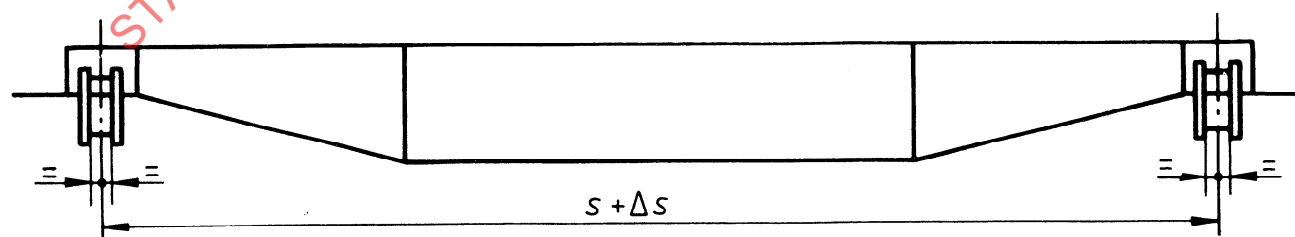


Figure 1

NOTE — For portal bridge cranes with a hinged leg, greater tolerances can be allowed.

1) At present at the stage of draft. (Revision of ISO/R 286-1962.)

4.3 Where the top of the rail is flat, the inclination of the wheel axis from the horizontal, for the crane without trolley (see figure 2), shall be such that

$$0 < \tan \alpha < 0,002\ 5$$

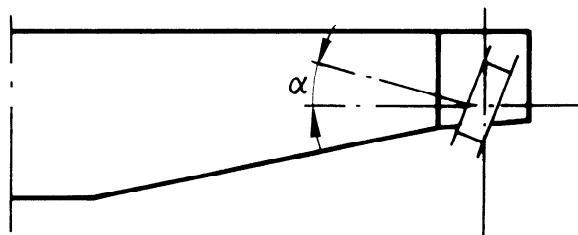


Figure 2

NOTE — For portal bridge cranes with a hinged leg, the direction of inclination should be designed to minimize the inclination when the crane is loaded.

4.4 The trolley rail centre distance shall not differ from the nominal dimension s by more than ± 3 mm (see figure 3).

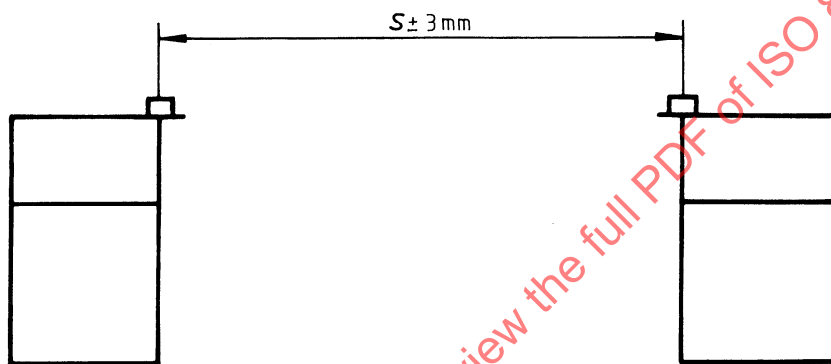


Figure 3

4.5 The difference in height, Δh , between two opposite points of the trolley track perpendicular to the travel direction of the trolley shall not exceed 0,15 % of the trolley rail centre distance, s (see figure 4), within the limits of 3 mm minimum and 10 mm maximum (see figure 5).

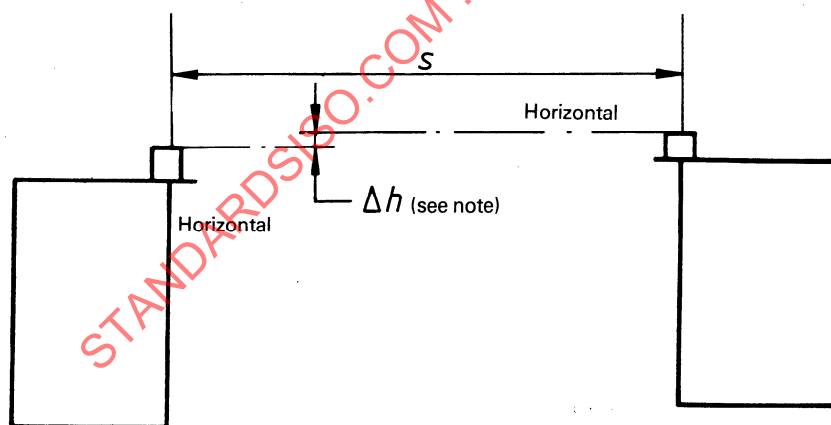


Figure 4

NOTE — For $s \leq 2$ m ; $\Delta h \leq 3$ mm
For 2 m $< s < 6,6$ m; $\Delta h \leq 0,001\ 5\ s$
For $6,6$ m $\leq s$; $\Delta h \leq 10$ mm

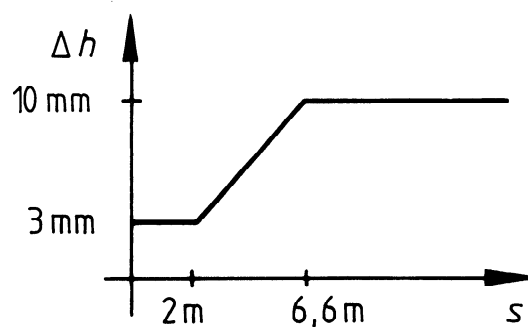


Figure 5

4.6 The local vertical irregularity of the trolley rails, Δh_r , shall not exceed the smaller of the following values (see figure 6) :

$$\Delta h_r \leq 0,001 a \quad \text{or}$$

$$\Delta h_r \leq 0,001 s$$

where

a is the trolley wheel-base;

s is the wheel-span.

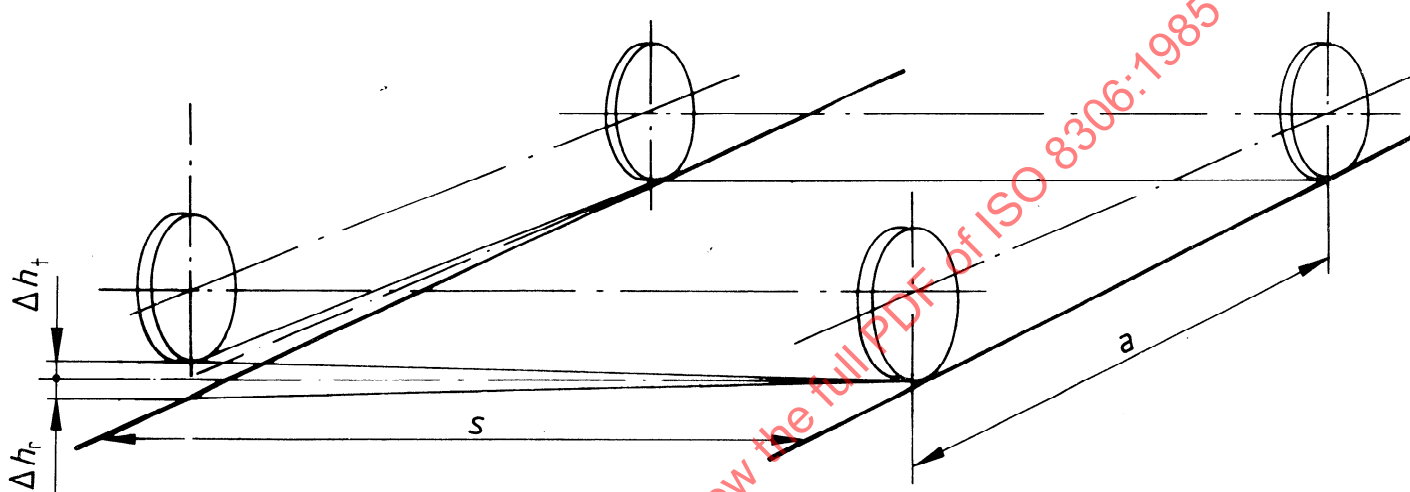


Figure 6

4.7 The distortion of the unloaded trolley shall be limited so that the vertical deviation, Δh_v , of one wheel from the plane formed by the three others shall not exceed $\frac{2}{3} \Delta h_r$ (see figure 6).

4.8 The trolley rail should not have misalignment at rail joints and the lateral straightness of the rail shall comply with the following requirements :

- a) the centre axis shall not diverge by more than 1,0 mm per rail length of 2 m (see figure 7); and
- b) the straightness tolerance, b , for the whole rail length, shall not exceed the following values (see figure 7) :
 - for $s \leq 10$ m: $b = 6$ mm
 - for $s > 10$ m: $b = 6 + 0,2 \times (s - 10)$ mm to a maximum of 10 mm where the wheel span, s , is expressed in metres.

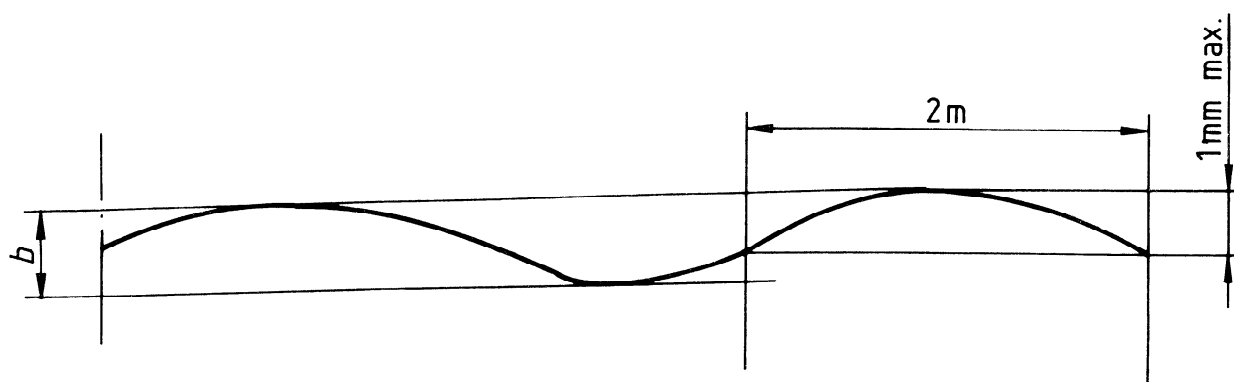
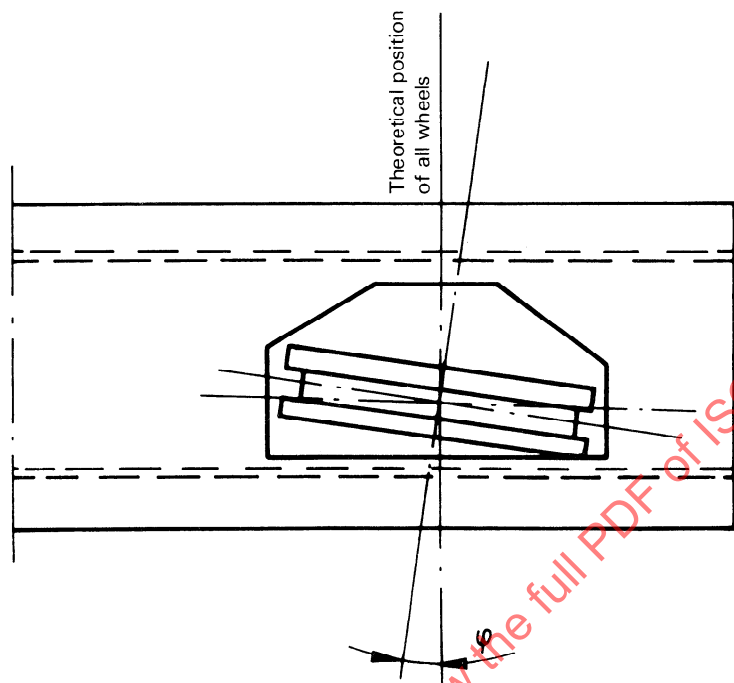


Figure 7

4.9 The angular deviation, φ , of the wheel in the horizontal plane shall be within the tolerance given in the table (see figure 8).



Table

Group classification of the travelling mechanism	$\tan \varphi$
M1	0,000 8
M2 to M4	0,000 6
M5 to M8	0,000 4

Figure 8

4.10 The alignment deviation, δ , (vertical or horizontal) of the opposite wheels driven by the common shaft in an undistorted crane bridge or trolley shall not exceed $0,001 s$, with a maximum of 15 mm (see figure 9).

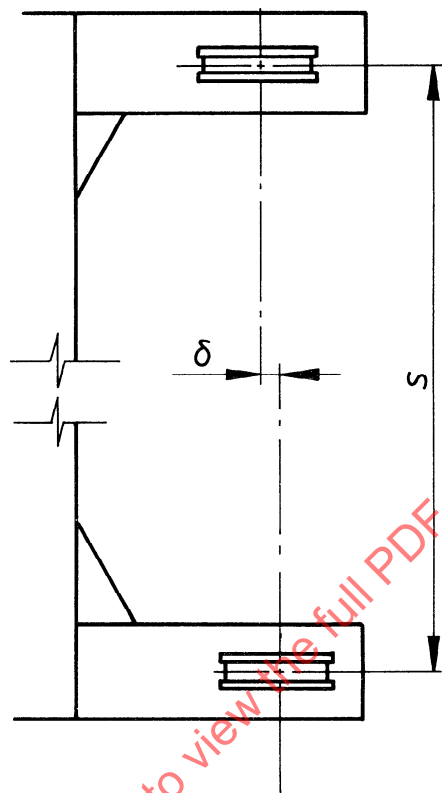


Figure 9

4.11 The centres of wheels rolling on a common rail shall not deviate more than ± 1 mm from the rail centre (see figure 10).

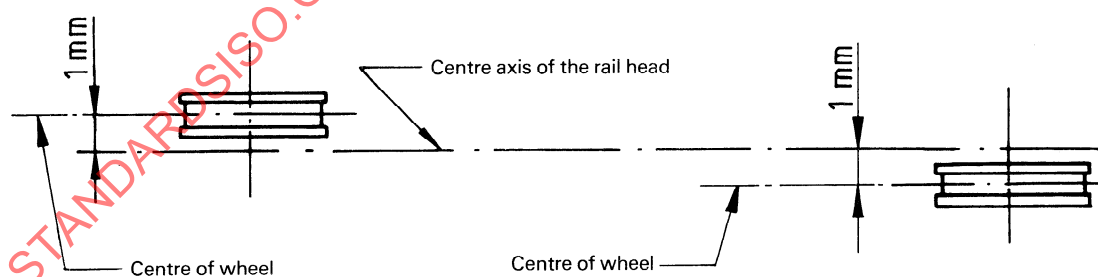


Figure 10

For bushed wheels, the above tolerances apply with the wheel in a central position between the wearing plates to either side of the wheel boss.

4.12 If horizontal guide rollers are used, the centre of the distance between guide rollers at one corner shall not deviate more than ± 1 mm from the centre axis of the rail (see figure 11).

4.13 The diameter tolerance of the wheels shall be h9 (see ISO 286).

If driven wheels are synchronized, electrically or mechanically, smaller tolerances may be required. These will have to be determined from case to case.

5 Tolerances for crane tracks

The tolerances specified apply to new crane tracks. If in the course of use, these tolerances are exceeded by 20 %, the track shall be re-aligned. Where crane behaviour deteriorates noticeably, it may be necessary to re-align the track, even if the tolerance excess has not reached 20 %.

5.1 The greatest tolerance, Δs , from the span, s , expressed in metres, is (see figure 1):

$$\text{— for } s \leq 10 \text{ m: } \Delta s = \pm 3 \text{ mm}$$

$$\text{— for } s > 10 \text{ m: } \Delta s = \pm [3 + 0,25 \times (s - 10)] \text{ mm to a maximum of } \pm 15 \text{ mm}$$

If horizontal guide rollers are provided on one rail only, the tolerances for the other rail only (rail without guide rollers) may be increased to three times the above values, but shall not exceed 25 mm; the wheel surface shall always cover the rail width.

5.2 It is assumed that, with the trolley positioned in the centre of the span, the deflection of both rail tracks is approximately equal.

5.3 The greatest permissible tolerance of the running surface of the rail is ± 10 mm from the theoretical height. The theoretical height is either the horizontal position, or if applicable, the theoretical camber curve. The heights of the two rails may show a divergence of 10 mm. The curvature in a longitudinal direction, at each point of a measured length of 2 m, shall not exceed 2 mm.

5.4 For the total length of rail, the maximum lateral tolerance from a straight line is ± 10 mm. The curvature at the longitudinal rail axis in a horizontal direction shall not exceed a lateral deviation of ± 1 mm, measured per 2 m rail length (see figure 12).

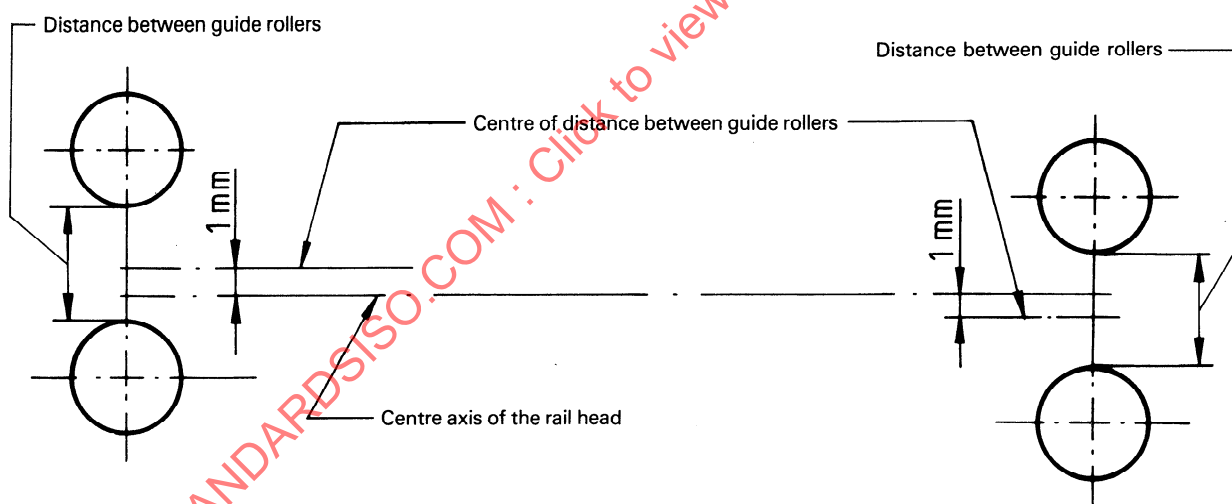


Figure 11

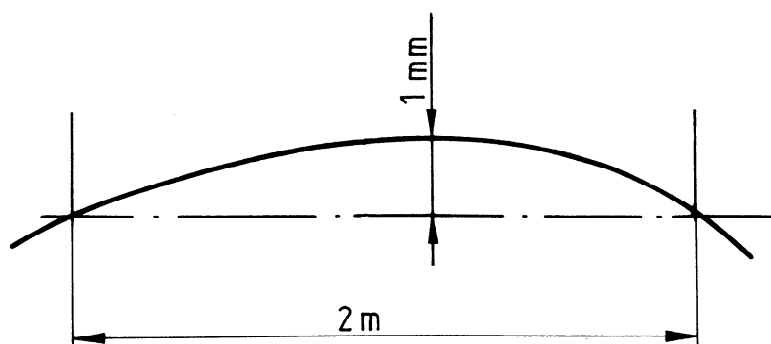


Figure 12

For cranes guided on both sides by horizontal rollers, the above values are valid also for the rail surfaces of the horizontal rollers.

For cranes guided on one rail only, the requirement for the straightness of the non-guiding rail can be lowered, by agreement between the user and the crane manufacturer.

5.5 No account need be taken for misalignment at the rail joints. It is recommended that welded rail joints be used.

6 Tolerances for rail positioning

The tolerances given below apply for both trolley and crane rails.

6.1 The centre of the rail shall not diverge from the centre of the rail girder web by more than half the thickness of the rail girder web (see figure 13). A greater divergence may be allowed when the necessary strength of the web under the rail can be guaranteed.

6.2 The inclination of the rail rolling surface shall not exceed the following values as compared with the theoretical position (see figure 14):

- longitudinally: $\tan \beta \leq 0,003$
- laterally: $\tan \beta \leq 0,005$

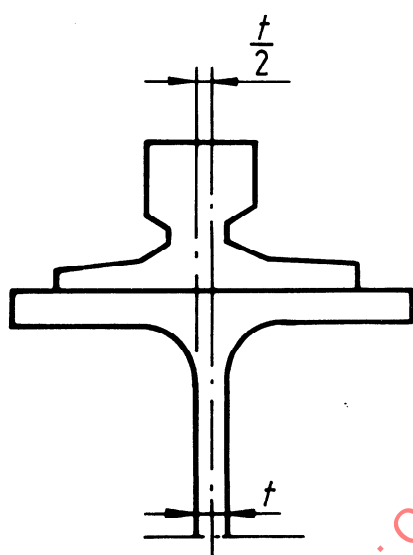


Figure 13

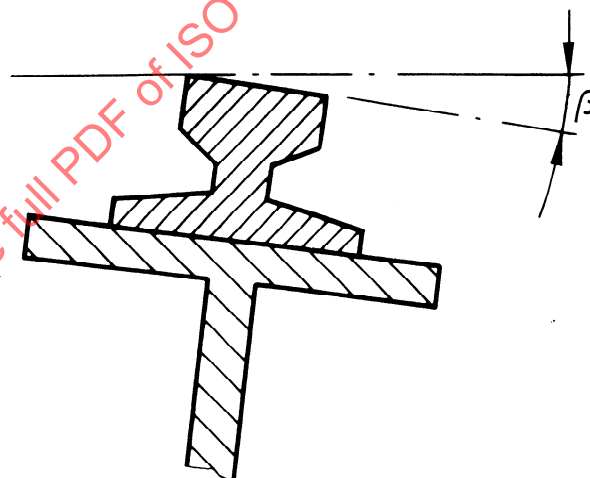


Figure 14